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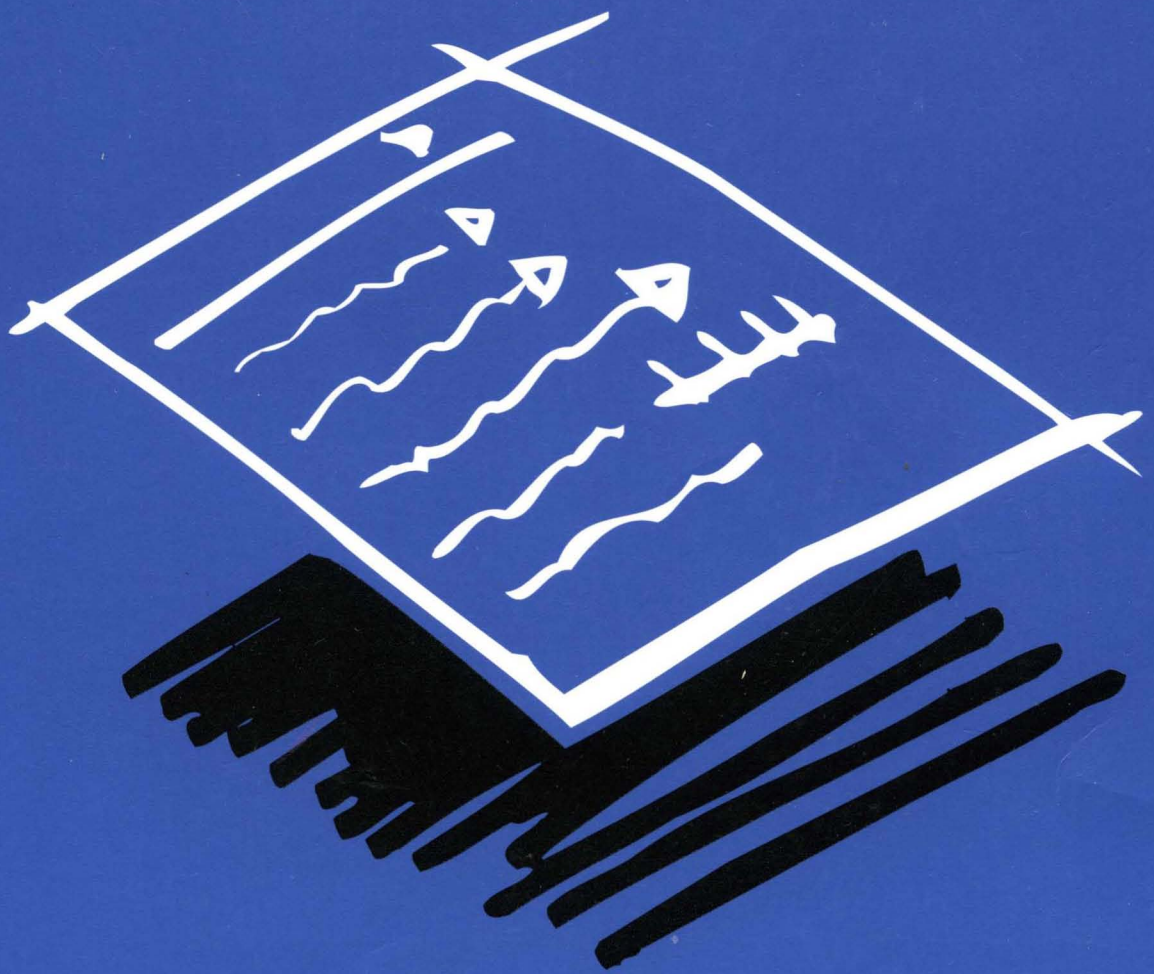
PenPoint™ Application Programmatic Interface

Volume I



PenPoint

PenPoint™

PenPoint™ API Reference

VOLUME I

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PenPoint Application Writing Guide provides a tutorial on writing PenPoint applications, including many coding samples. This is the first book you should read as a beginning PenPoint applications developer.

PenPoint Architectural Reference Volume I presents the concepts of the fundamental PenPoint classes. Read this book when you need to understand the fundamental PenPoint subsystems, such as the class manager, application framework, windows and graphics, and so on.

PenPoint Architectural Reference Volume II presents the concepts of the supplemental PenPoint classes. You should read this book when you need to understand the supplemental PenPoint subsystems, such as the text subsystem, the file system, connectivity, and so on.

PenPoint API Reference Volume I provides a complete reference to the fundamental PenPoint classes, messages, and data structures.

PenPoint API Reference Volume II provides a complete reference to the supplemental PenPoint classes, messages, and data structures.

PenPoint User Interface Design Reference describes the elements of the PenPoint Notebook User Interface, sets standards for using those elements, and describes how PenPoint uses the elements. Read this book before designing your application's user interface.

PenPoint Development Tools describes the environment for developing, debugging, and testing PenPoint applications. You need this book when you start to implement and test your first PenPoint application.

PenPoint™

PenPoint™ API Reference

VOLUME I

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Preface

The *PenPoint API Reference* provides reference information on the subsystems of the PenPoint™ operating system. Volume I describes the functions and messages that you use to manipulate classes and describes the fundamental classes used by almost all PenPoint applications. Volume II describes the supplemental classes and functions that provide many different capabilities to PenPoint applications. The text in this volume was generated from the header files in \PENPOINT\SDK\INC.

Intended Audience

The *PenPoint API Reference* is written for people who are developing applications and services for the PenPoint operating system. We assume that you are familiar with the C language, understand the basic concepts of object-oriented programming, and have read the *PenPoint Application Writing Guide.*

What's Here

The *PenPoint API Reference* is divided into several parts, which are split across two volumes. Volume I contains these parts:

- *Part 1: Class Manager* describes the PenPoint class manager classes, which supports object-oriented programming in PenPoint.
- *Part 2: PenPoint Application Framework* describes the PenPoint Application Framework classes, which provides you the tools you use to allow your application to run under the notebook metaphor.
- *Part 3: Windows and Graphics* describes ImagePoint classes and how applications can control the screen (or other output devices).
- *Part 4: UI Toolkit* describes the PenPoint classes that implement many of the common features required by the PenPoint user interface.
- *Part 5: Input and Handwriting Translation* describes the PenPoint input system classes and classes that provide programmatic access to the handwriting translation subsystems.

Volume II contains these parts:

- *Part 6: Text Component* describes the PenPoint classes that allow any application to provide text editing and formatting capabilities to its users.
- *Part 7: File System* describes the PenPoint file system classes.
- *Part 8: System Services* describes the function calls that applications can use to access kernel functions, such as memory allocation, timer services, process control, and so on.

- *Part 9: Utility Classes* describes a wide variety of classes that save application writers from implementing fundamental things such as, list manipulation, data transfer, and so on.
- *Part 10: Connectivity* describes the classes that applications can use to access remote devices.
- *Part 11: Resources* describes the classes used to read, write, and create PenPoint resource files.
- *Part 12: Installation API* describes the PenPoint classes that support installing applications, services, fonts, dictionaries, handwriting prototypes, and so on.
- *Part 13: Writing PenPoint Services*, describes classes used in writing an installable service.

Other Sources of Information

As mentioned above, the *PenPoint Application Writing Guide* provides a tutorial on writing PenPoint applications. The tutorial is illustrated with several sample applications.

The *PenPoint Development Tools* describes how to run PenPoint on a PC, how to debug programs, and how to use a number of tools to enhance or debug your applications. This volume also contains a Master Index to the five volumes included in the PenPoint SDK.

The *PenPoint Architectural Reference* groups the PenPoint classes into several functional areas and describes how to use these classes. The *PenPoint Architectural Reference* is divided into two volumes. The first volume describes the fundamental classes that all application developers will use; the second volume describes supplemental classes that application developers may, or may not, use.

To learn how to use PenPoint, you should refer to the PenPoint user documentation. The user documentation is included with the PenPoint SDK, and is usually packaged with a PenPoint computer. The user documentation consists of these books:

- *Getting Started with PenPoint*, a primer on how to use PenPoint
- *Using PenPoint*, a detailed book on how to use PenPoint to perform tasks and procedures.

Type Styles in This Book

To emphasize or distinguish particular words or text, we use different fonts.

Computerese

We use fonts to distinguish two different forms of "computerese":

- C language keywords and preprocessor directives, such as `switch`, `case`, `#define`, `#ifdef`, and so on.
- Functions, macros, class names, message names, constants, variables, and structures defined by PenPoint, such as **msgListAddItem**, **clsList**, **stsBadParam**, P_LIST_NEW, and so on.

Although all these PenPoint terms use the same font, you should note that PenPoint has some fixed rules on the capitalization and spelling of messages, functions, constants, and types. By the spelling and capitalization, you can quickly identify the use of a PenPoint term.

- Classes begin with the letters "**cls**"; for example, **clsList**.
- Messages begin with the letters "**msg**"; for example, **msgNew**.
- Status values begin with the letters "**sts**"; for example, **stsOK**.
- Functions are mixed case with an initial upper case letter and trailing parentheses; for example, **OSMemAvailable**().
- Constants are mixed case with an initial lower case letter; for example, **wsClipChildren**.
- Structures and types are all upper case (with underscores, when needed, to increase comprehension); for example, U32 or LIST_NEW_ONLY.

Placeholders

Anything you do *not* have to type in exactly as printed is generally formatted in italics. This includes C variables, suggested filenames in dialogs, and pseudocode in file listings.

Other Text

The documentation uses *italics* for emphasis. When a Part uses a significant term, it is usually emphasized the first time. If you aren't familiar with the term, you can look it up in the Glossary in the *PenPoint Application Writing Guide* or the index of the book.

DOS filenames such as \\BOOT\PENPOINT\APP are in small capitals. PenPoint file names can be upper and lower case, such as \My Disk\\Package Design Letter.

Book names such as *PenPoint Application Writing Guide* are in italics.

PENPOINT API REFERENCE / VOL I
CONTENTS

Part 1 / Class Manager

CLSMGR.H

The Class Manager supports object-oriented programming.

clsObject inherits from null.

clsObject is the root of the Object System. It defines the basic capabilities of all objects.

clsClass inherits from **clsObject.**

clsClass is the root of all classes. **clsClass** provides class creation capabilities.

```
#ifndef CLSMGR_INCLUDED
#define CLSMGR_INCLUDED
```

Overview

This file defines all the subroutines and messages that implement Object-oriented programing under PenPoint. The most important of these are:

- ObjectCall() and related routines, especially the Debugging Routines
- MsgHandler() and related macros
- MakeMsg() macro
- clsClass, CLASS_NEW_DEFAULTS, etc.
- clsObject, OBJECT_NEW_DEFAULTS, etc.
- msgNew, **msgNewDefaults**, **msgInit**, **msgDestroy**, **msgFree**, **msgSave**, **msgRestore**

Look at the functions starting with ClsStsToString too.

This is one of PenPoint's key header files. Developers should browse through this file and be familiar with its contents. Other key header files are go.h, app.h, and win.h.

To fully understand what's going on here, you should read the Class Manager section of the PenPoint Architecture Reference.

Guidelines

Normally you should call your ancestor before processing a message. Possible exceptions include:

- messages that are defined by your class. Obviously, these shouldn't go to your ancestor at all.
- messages that you want to explicitly override. Depending on whether you want to override the message some of the time or all the time.
- msgFreeOK, **msgFreeing**, **msgFree** should use **objCallAncestorAfter**.
- protocols that requires the subclass to act on the message before the ancestor receives it.

Debugging Flags

The ClsMgr debugging flag set is 'C'. Defined values are:

000001 Show calls to ObjectCall().

000002 Show calls to ObjectCallAncestor().

000004 Show calls to ObjectSend().

000008 Show calls to ObjectPost().

000010 Show indirect calls (class messages) for traced objects.

000020 Show object new and free calls.

000040 Show observer related actions: add, remove, notify and post.

000080 Show messages as they are dispatched.

000100 Show objects as they are saved and restored.

000200 Gather ObjectCall depth statistics.

000400 Show objects as they are scavenged at task termination.

000800 Enter Debugger(), if bad object is passed to ObjectCall().

001000 Show calls to ObjectCallAncestor() for traced objects.

002000 Enable detailed messages from ObjectValid(). These messages are not necessarily errors if the client code handles **stsBadObject**. Because null objects are common they are not reported under C2000.

004000 Enable miscellaneous error/warning messages: Bad **newStruct**, Message not understood, WKN already exists, WKN replaced (warning).

008000 Enter the debugger after printing a warning.

Temporary flags:

010000 Fills the stack w/F0's before calling a method. This is useful for catching uninitialized variables.

020000 Show calls to extended ObjectCall() and ObjectCallAncestor().

Implementor Flags:

100000 Show all clsmgr statuses, legitimate errors are included.

```
#ifndef GO_INCLUDED
  #include <go.h>
#endif
#ifndef OSTYPES_INCLUDED
  #include <ostypes.h>
#endif
#ifndef UID_INCLUDED
  #include <uid.h>
#endif
```

Status Values

```
#define  stsBadObject              MakeStatus(clsObject, 2)
#define  stsBadAncestor            MakeStatus(clsObject, 4)
#define  stsBadContext             MakeStatus(clsObject, 6)
#define  stsProtectionViolation    MakeStatus(clsObject, 8)
#define  stsScopeViolation         MakeStatus(clsObject, 10)   // (.asm)
#define  stsTaskTerminated         MakeStatus(clsObject, 12)
#define  stsSizeLimit              MakeStatus(clsObject, 14)
#define  stsBadPropTag             MakeStatus(clsObject, 16)
#define  stsNewStructError         MakeStatus(clsObject, 18)
#define  stsClassHasReferences     MakeStatus(clsObject, 20)
#define  stsNotUnderstood          MakeStatus(clsObject, 22)
#define  stsVetoed                 MakeStatus(clsObject, 26)
#define  stsWellKnownExists        MakeStatus(clsObject, 28)
#define  stsBadMethodTable         MakeStatus(clsObject, 30)   // (.asm)
```

Non-Error Status Values

stsMessageIgnored is equal to **stsRequestForward** for historical reasons. MakeWarning is used to force the entry into the symbols DB.

```
#define  stsMessageIgnored         MakeWarning(clsGO, 2)
#define  stsAlreadyAdded           MakeWarning(clsObject, 2)
#define  stsAlreadyRemoved         MakeWarning(clsObject, 3)
#define  stsSendTaskInvalid        MakeWarning(clsObject, 4)
#define  stsWellKnownReplaced      MakeWarning(clsObject, 6)
#define  stsTraceOn                MakeWarning(clsObject, 7)
#define  stsTraceOff               MakeWarning(clsObject, 8)
```

Object Capabilities

```
#ifndef M_I86                      // 32 bit compiler
Enum32(OBJ_CAPABILITY)             // default for: OBJECT  CLASS
{                                  // ----------------------------
  objCapOwner       = flag1,       //              TRUE    FALSE
  objCapFree        = flag2,       //              TRUE    FALSE
  objCapSend        = flag3,       //              TRUE    FALSE
  objCapObservable  = flag4,       //              TRUE    TRUE
  objCapInherit     = flag6,       //              n/a     TRUE
  objCapScavenge    = flag7,       // enable only: n/a     FALSE
  objCapCreate      = flag8,       //              FALSE   FALSE
  objCapProp        = flag9,       //              TRUE    TRUE
  objCapMutate      = flag10,      //              TRUE    TRUE
  objCapCall        = flag15,      //              FALSE   TRUE
  objCapCreateNotify = flag16,     // create only: FALSE   FALSE
  objCapUnprotected = flag17,      // create only: n/a     FALSE
  objCapNonSwappable = flag18      // create only: FALSE   FALSE
};
#else                              // 16 bit compiler
typedef U32 OBJ_CAPABILITY;
#endif
```

Types Derived Directly from Base Types

OBJECT, TAG, STATUS, etc. are defined in <go.h>

```
typedef OBJECT              CLASS, *P_CLASS;
typedef TAG                 MESSAGE, *P_MESSAGE;
typedef P_UNKNOWN           P_ARGS, *PP_ARGS;
typedef P_UNKNOWN           CONTEXT, *P_CONTEXT;
typedef P_UNKNOWN           P_IDATA, *PP_IDATA;
typedef U32                 OBJ_KEY, *P_OBJ_KEY;
#define  objWKNKey          ((OBJ_KEY)0)
typedef const U32           *P_MSG, **PP_MSG;          // message table
```

Constants and Types Derived from Structs

NewArgs used to create an object.

```
typedef struct OBJECT_NEW {
  U32   newStructVersion;           // Out: [msgNewDefaults] Validate msgNew
                                    // In:  [msgNew] Valid version
  OBJ_KEY               key;        // In:  [msgNew] Lock for the object
  OBJECT                uid;        // In:  [msgNew] Well-known uid
                                    // Out: [msgNew] Dynamic or Well-known uid
  OBJ_CAPABILITY        cap;        // In:  [msgNew] Initial capabilities
  CLASS                 objClass;   // Out: [msgNewDefaults] Set to self
                                    // In:  [msgObjectNew] Class of instance
                                    // In:  [msg*] Used by toolkit components
  OS_HEAP_ID            heap;       // Out: [msgNewDefaults] Heap to use for
                                    // additional storage. If capCall then
                                    // OSProcessSharedHeap else OSProcessHeap
  U32                   spare1;     // Unused (reserved)
  U32                   spare2;     // Unused (reserved)
} OBJECT_NEW_ONLY, OBJECT_NEW, * P_OBJECT_NEW_ONLY, * P_OBJECT_NEW;
```

New defaults fields for subclassing OBJECT.

```
#define objectNewFields     OBJECT_NEW_ONLY object;
```

Fields for initializing a class.

```
typedef struct CLASS_NEW_ONLY {
  P_MSG             pMsg;           // In: Can be pNull for abstract class
  CLASS             ancestor;       // In: Ancestor to inherit behavior from
  SIZEOF            size;           // In: Size of instance data, can be 0
                                    //     (see comment below)
  SIZEOF            newArgsSize;    // In: Size of XX_NEW struct, can be 0
                                    //     Value limited to U16
  U32               spare1;         // Unused (reserved)
} CLASS_NEW_ONLY, * P_CLASS_NEW_ONLY;
```

Limits on instance data size:

Instance data for any class is limited to 64K bytes. Instance data for an entire objects is limited to 64K of protected data. Unprotected instance data is limited to 64K bytes per class but there is no limit for the object.

New defaults fields for subclassing CLASS.

```
#define classNewFields  objectNewFields     CLASS_NEW_ONLY  cls;
```

NewArgs used to create a class.

```
typedef struct CLASS_NEW {
  classNewFields
} CLASS_NEW, * P_CLASS_NEW;
```

Enable/Disable capabilities

```
typedef struct OBJ_CAPABILITY_SET {
  OBJ_CAPABILITY            cap;    // In: Capabilities to enable/disable
  OBJ_KEY                   key;    // In: Unlocks object, e.g., objWKNKey
} OBJ_CAPABILITY_SET, * P_OBJ_CAPABILITY_SET;
```

Set/Get owner

```
typedef struct OBJ_OWNER {
  OS_TASK_ID        task;           // In:  [msgSetOwner] New owner
                                    // Out: [msgObjectOwner] Current owner
  OBJECT            object;         // In:  [msgObjectOwner] Source object
  OBJ_KEY           key;            // In:  [msgSetOwner] If required by caps
} OBJ_OWNER, * P_OBJ_OWNER;
```

Set/Get properties

```
typedef struct OBJ_PROP {
  TAG               propId;         // In:  [msgProp] Name of property
  P_IDATA           pData;          // In:  [msgProp] Pointer to data
                                    // In:  [msgSetProp] Data to copy to prop
  SIZEOF            length;         // In:  [msgProp] # of bytes to copy
                                    // Out: [msgProp] Length of data in bytes
                                    // In:  [msgSetProp] # of bytes to write
  OBJ_KEY           key;            // In:  [msgSetProp] If required by cap
} OBJ_PROP, * P_OBJ_PROP;
```

Add/Get observers

```
typedef struct OBJ_OBSERVER_POS {
  OBJECT            observer;       // In:  [msgAddObserverAt] New observer
                                    // Out: [msgGetObserver] Observer at pos
  U16               position;       // In:  Position in observer list
} OBJ_OBSERVER_POS, * P_OBJ_OBSERVER_POS;
```

Notify observers

```
typedef struct OBJ_NOTIFY_OBSERVERS {
  MESSAGE           msg;            // In:  Message to send/post observers
  P_ARGS            pArgs;          // In:  Args for message
  SIZEOF            lenSend;        // In:  Length of Args
} OBJ_NOTIFY_OBSERVERS, * P_OBJ_NOTIFY_OBSERVERS;
```

Buffer to hold symbol string. Used with ClsStsToString, etc.

```
#define clsSymBufSize 80
typedef char    P_CLS_SYMBUF[clsSymBufSize];
```

Array entry for OBJECT in the symbols database.

```
typedef struct CLS_SYM_OBJ {
  OBJECT            obj;
  P_STRING          name;
} CLS_SYM_OBJ, *P_CLS_SYM_OBJ, * *PP_CLS_SYM_OBJ;
```

Array entry for message in symbols database.

```
typedef struct CLS_SYM_MSG {
  MESSAGE           msg;
  P_STRING          name;
} CLS_SYM_MSG, *P_CLS_SYM_MSG, * *PP_CLS_SYM_MSG;
```

Array entry for STATUS in symbols database.

```
typedef struct CLS_SYM_STS {
  STATUS            sts;
  P_STRING          name;
} CLS_SYM_STS, *P_CLS_SYM_STS, * *PP_CLS_SYM_STS;
```

Types Required for msgSave and msgRestore

Resouce IDs

```
typedef TAG     RES_ID, *P_RES_ID;          // Resource ID
```

System flags for save and restore.

```
Enum16(RES_SAVE_RESTORE_FLAGS) {
    resDoingCopy    = flag0                 // Creating a copy of object
};
typedef struct OBJ_SAVE {
  OBJECT            file;           // In:  File to save object to
  RES_ID            resId;          // In:  Resource Id of root-level object
  OBJECT            root;           // In:  Uid of root-level object
  P_UNKNOWN         pEnv;           // In:  Environment to be saved
  U16               minSysVersion;  // In/Out: Min acceptable system version
  U16               minAppVersion;  // In/Out: Min acceptable app version
  RES_SAVE_RESTORE_FLAGS sysFlags;  // In:  System flags
  U16               appFlags;       // In:  App flags
  P_UNKNOWN         pFile;          // In:  StdIO FILE* bound to file above
  U32               spare1;         // Unused (reserved)
  U32               spare2;         // Unused (reserved)
} OBJ_SAVE, * P_OBJ_SAVE;
typedef struct OBJ_RESTORE {
  OBJECT_NEW        object;         // In:  New defaults for restored object
  OBJECT            file;           // In:  File to restore object from
  RES_ID            resId;          // In:  Resource Id of root-level object
  OBJECT            root;           // In:  Uid of root-level object
  P_UNKNOWN         pEnv;           // In:  Saved environment
  U16               sysVersion;     // In:  Sys version number of filed data
  U16               appVersion;     // In:  App version number of filed data
  RES_SAVE_RESTORE_FLAGS sysFlags;  // In:  System flags
  U16               appFlags;       // In:  App flags
  P_UNKNOWN         pFile;          // In:  StdIO FILE* bound to file above
  U32               spare1;         // Unused (reserved)
  U32               spare2;         // Unused (reserved)
} OBJ_RESTORE, * P_OBJ_RESTORE;
```

Method Definition Macros

Definition of a pointer to a method.

```
#ifdef __HIGHC__
```

Function Prototype

```
 typedef CDECL STATUS (* P_MSG_HANDLER) (
#else
```

Function Prototype

```
 typedef STATUS (CDECL * P_MSG_HANDLER) (
#endif
    MESSAGE     msg,
    OBJECT      self,
    P_ARGS      pArgs,
    CONTEXT     ctx,
    P_IDATA     pData
);
```

Definition of a method.

```
#define  MSG_HANDLER    STATUS CDECL
```

Shorthand used to declare a method.

```
#define MsgHandler(fn) MSG_HANDLER MsgHandlerPrimitive(fn, P_ARGS, P_IDATA)
```

Shorthand used to declare a method with **pArgs** cast to appropriate type. Note: **pArgsType** must be a pointer type.

```
#define MsgHandlerArgType(fn, pArgsType) \
    MSG_HANDLER MsgHandlerPrimitive(fn, pArgsType, P_IDATA)
```

Shorthand used to declare a method with casts for **pArgs** and instance data. Note: **pArgsType** and **pInstData** must be pointer types.

```
#define MsgHandlerWithTypes(fn, pArgsType, pInstData) \
    MSG_HANDLER MsgHandlerPrimitive(fn, pArgsType, pInstData)
```

Shorthand used to declare a method. Very fast and very dangerous. DS is NOT loaded. Don't use strings, local functions, statics, etc.

```
#define MsgHandlerRingCHelper(fn) \
    STATUS CDECL MsgHandlerPrimitive(fn, P_ARGS, P_IDATA)
```

Shorthand used to declare a method.

```
#define MsgHandlerPrimitive(fn, pArgsType, pInstData) fn(\
    const MESSAGE   msg,    \
    const OBJECT    self,   \
    const pArgsType pArgs,  \
    const CONTEXT   ctx,    \
    const pInstData pData)
```

Cast **pData** to the appropriate type.

```
#define IDataPtr(pData, type) ((type*)pData)
```

Copy protected instance data block into local storage.

```
#define IDataDeref(pData, type) (*(type*)pData)
```

Shorthand used to ignored any unused parameters in a method.

```
#define MsgHandlerParametersNoWarning \
     Unused(msg); Unused(self); Unused(pArgs); Unused(ctx); Unused(pData)
```

Message Macros

message numbers are between 0 and 254, inclusive. Message number 255

```
#define MakeMsg(wkn,msg)        MakeTag(wkn,msg)
```

Extract the message portion of a message.

```
#define MsgNum(msg)             TagNum(msg)
```

The WKNValue unique represents a class.

```
#define ClsNum(msg)             WKNValue(msg)
```

Messages defined with MsgNoError() will not generate a **msgNotUnderstood** error if they reach **clsObject**. Instead, **stsMessageIgnored** is returned.

```
#define MsgNoError(msg)         ((msg)|msgNoErrorFlag)
#define msgNoErrorFlag          (1L<<21)
```

Messages that are handled as class messages have this flag added to the message value.

```
#define msgClassMessageFlag     (1L<<22)
```

Compare two messages for equality.

```
#define MsgEqual(m1,m2)         (m1==m2)
```

Object Scope Macros (Well-Known and Dynamic)

```
#define ObjectIsDynamic(o)        ((U32)(o)&objDynamicFlag)
#define ObjectIsWellKnown(o)      (!ObjectIsDynamic(o))
#define ObjectIsWKN(o)            ObjectIsWellKnown(o)
#define ObjectIsGlobal(o)         (ObjectIsDynamic(o)||ObjectIsGlobalWKN(o))
#define ObjectIsLocal(o)          (!ObjectIsGlobal(o))
#define ObjectIsGlobalWKN(o)      (ObjectIsWKN(o) && WKNScope(o)==wknGlobal)
#define ObjectIsProcessGlobalWKN(o) \
    (ObjectIsWKN(o) && WKNScope(o)==wknProcessGlobal)
#define ObjectIsPrivateWKN(o)     (ObjectIsWKN(o) && WKNScope(o)==wknPrivate)
```

All dynamic objects have this bit set in their UID.

```
#define objDynamicFlag            0x800000
```

Messages

```
// Recycle:
// Next available: 120
```

msgNull

Not a real message, just a place holder.

Takes **pNull**, returns STATUS.

```
#define msgNull MakeMsg(objNull, 0)
```

msgNewDefaults

Initializes new struct to default values.

Takes new struct for object being created, returns STATUS. Category: class message.

```
#define msgNewDefaults  MakeMsg(clsObject, 2)
```

msgNew

Creates an object and sends **msgInit** to the new object.

Takes new struct for object being created, returns STATUS. Category: class message.

```
#define msgNew  MakeMsg(clsObject, 4)
```

Comments

Developers normally send this message to class objects in order to create instances but they do NOT write code that handles **msgNew**. The class manager does some processing on **msgNew** internally and finally sends **msgInit**, which developers DO need to handle.

Return Value

stsNewStructError The new struct was not properly initialized, it was used more than once, or it was overwritten.

stsBadParam Format of well-known UID was invalid.

stsWellKnownExists Well-known UID has already been created with a different key.

stsOSOutOfMem Too many objects have been created or system memory is exhausted.

stsProtectionViolation (**clsClass**) **objCapInherit** is disabled.

stsSizeLimit (**clsClass**) More than the maximum amount of instance data has been requested.

stsBadAncestor (**clsClass**) Ancestor is not a class.

msgNewWithDefaults

Creates an object with default values.

Takes new struct for object being created, returns STATUS. Category: class message.

```
#define msgNewWithDefaults  MakeMsg(clsObject, 5)
```

Comments — Self sends **msgNewDefaults** followed by **msgNew**. Useful when changes to the new struct are NOT required.

msgInit

Sent to the object immediately after it is created.

Takes new struct for object being created, returns STATUS.

```
#define msgInit MakeMsg(clsObject, 6)
```

Comments — When **msgInit** reach **clsObject** the capabilities and the key in the **newArgs** are set for the object. This means that, unlike most messages, developers must call their ancestor AFTER processing this one.

msgCreated

Sent to the object after it is fully created, i.e., after **msgInit**.

Takes new struct for object being created, returns STATUS.

```
#define msgCreated  MsgNoError(MakeMsg(clsObject, 46))
```

Comments — This message is only sent if **objCapCreateNotify** is enabled.

msgDestroy

Destroys the object.

Takes OBJ_KEY, returns STATUS.

```
#define msgDestroy  MakeMsg(clsObject, 28)
```

Comments — When **msgDestroy** is sent to the object, **clsObject** sends **msgFreeOK**, **msgFreeing** and **msgFree** to self. **msgFreePending** is sent to the observers. Only **clsObject** should handle **msgDestroy**. (That is, like **msgNew**, developers send **msgDestroy** but never handle it.)

Return Value — **stsProtectionViolation** objCapFree is disabled and the key does not open the object.

stsClassHasReferences (**clsClass**) Instances of the class object still exists. Only returned when the object being destroyed is a class.

msgFreeOK

Sent as the first of three messages to destroy the object.

Takes OBJ_KEY, returns STATUS.

```
#define msgFreeOK MsgNoError(MakeMsg(clsObject, 14))
```

Comments — There is no point in handling this message unless you have some reason to refuse to be freed, in which case return **stsVetoed**. Note that if the process that owns the object or the class of the object is destroyed, the object will be destroyed too, regardless of what it does with **msgFreeOK**. This is mainly useful for immortal system objects.

See Also — **msgDestroy**

Return Value

stsClassHasReferences (**clsClass**) Instances of the class object still exists. Only returned when the object being destroyed is a class.

msgFreeing

Sent as the second of three messages to destroy the object.

Takes OBJ_KEY, returns STATUS.

```
#define msgFreeing  MsgNoError(MakeMsg(clsObject, 90))
```

Comments

Most developers never handle this message either. If an object is part of a tangled web of other objects, all of which are supposed to be freed whenver any of them is freed, it's possible to get a loop where two objects respond to **msgFree** by trying to free each other. The first object that receives **msgFreeing** should extract itself from any other object that might try to free it. When it receives **msgFree**, it can then safely send **msgDestroy** to those other objects.

See Also

msgDestroy

msgFree

Sent as the last of three messages to destroy the object.

Takes OBJ_KEY, returns STATUS.

```
#define msgFree MakeMsg(clsObject, 8)
```

Comments

msgFree must succeed and error status should never be returned. Any validation should be done during **msgFreeOK**. (Like **msgInit**, developers handle this message but never send it.)

See Also

msgDestroy

msgFreePending

Sent to observers immediately before the object is freed.

Takes OBJECT, returns STATUS. Category: observer notification.

```
#define msgFreePending  MsgNoError(MakeMsg(clsObject, 70))
```

Comments

If an observer cares about the final state of the object, this is the last opportunity to send it a message.

See Also

msgDestroy

msgRestoreInstance

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

```
#define msgRestoreInstance  MakeMsg(clsObject, 80)
```

Message Arguments

```
typedef struct OBJ_RESTORE {
  OBJECT_NEW          object;        // In:  New defaults for restored object
  OBJECT              file;          // In:  File to restore object from
  RES_ID              resId;         // In:  Resource Id of root-level object
  OBJECT              root;          // In:  Uid of root-level object
  P_UNKNOWN           pEnv;          // In:  Saved environment
  U16                 sysVersion;    // In:  Sys version number of filed data
  U16                 appVersion;    // In:  App version number of filed data
  RES_SAVE_RESTORE_FLAGS sysFlags;   // In:  System flags
  U16                 appFlags;      // In:  App flags
  P_UNKNOWN           pFile;         // In:  StdIO FILE* bound to file above
  U32                 spare1;        // Unused (reserved)
  U32                 spare2;        // Unused (reserved)
} OBJ_RESTORE, * P_OBJ_RESTORE;
```

Comments

Creates an instance of the class and sends the new object **msgRestore**. If the new object is a class, **msgRestoreMsgTable** is sent after **msgRestore**.

Return Value

stsRequestNotSupported Instances of **clsClass** cannot be restored.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

```
#define msgRestore  MakeMsg(clsObject, 10)
```

Message Arguments

```
typedef struct OBJ_RESTORE {
  OBJECT_NEW        object;         // In:  New defaults for restored object
  OBJECT            file;           // In:  File to restore object from
  RES_ID            resId;          // In:  Resource Id of root-level object
  OBJECT            root;           // In:  Uid of root-level object
  P_UNKNOWN         pEnv;           // In:  Saved environment
  U16               sysVersion;     // In:  Sys version number of filed data
  U16               appVersion;     // In:  App version number of filed data
  RES_SAVE_RESTORE_FLAGS sysFlags;  // In:  System flags
  U16               appFlags;       // In:  App flags
  P_UNKNOWN         pFile;          // In:  StdIO FILE* bound to file above
  U32               spare1;         // Unused (reserved)
  U32               spare2;         // Unused (reserved)
} OBJ_RESTORE, * P_OBJ_RESTORE;
```

Comments

After a new object has been created with **msgRestoreInstance** it is sent **msgRestore**. The object reads its instance data from the object file.

msgRestoreMsgTable

Returns the message table for the class.

Takes PP_MSG, returns STATUS.

```
#define msgRestoreMsgTable  MakeMsg(clsObject, 116)
```

Comments

Because the address of a message table is dynamic the ancestor of the class must provide the message table address when the class is restored. The ancestor can store extra information needed to find the message table in the instance data or as a saved property.

msgSave

Causes the object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

```
#define msgSave MakeMsg(clsObject, 12)
```

Message Arguments

```
typedef struct OBJ_SAVE {
  OBJECT            file;           // In:  File to save object to
  RES_ID            resId;          // In:  Resource Id of root-level object
  OBJECT            root;           // In:  Uid of root-level object
  P_UNKNOWN         pEnv;           // In:  Environment to be saved
  U16               minSysVersion;  // In/Out: Min acceptable system version
  U16               minAppVersion;  // In/Out: Min acceptable app version
  RES_SAVE_RESTORE_FLAGS sysFlags;  // In:  System flags
  U16               appFlags;       // In:  App flags
  P_UNKNOWN         pFile;          // In:  StdIO FILE* bound to file above
  U32               spare1;         // Unused (reserved)
  U32               spare2;         // Unused (reserved)
} OBJ_SAVE, * P_OBJ_SAVE;
```

Comments

clsObject files the capabilities of the object and any property that has tag flag1 set. For example:

```
#define MY_PROP MakeTagWithFlags(clsFoo,tagNum,1)
```

Return Value **stsRequestNotSupported** (**clsClass**) Classes not do file.

msgCopy

Passes back a copy of the object.

Takes P_OBJ_COPY, returns STATUS.

```
#define msgCopy MakeMsg(clsObject, 54)
```

Arguments

```
typedef struct OBJ_COPY {
    OBJECT      requestor;      // In: Object to receive msgCopyRestore
    OBJECT      object;         // Out: UID of copied object
    U32         reserved[4];    // Reserved.
} OBJ_COPY, * P_OBJ_COPY;
```

Comments This message will pass back a copy of the object receiving the message. This object will be created by opening a temporary resource file, sending **msgSave** to the object, and then sending **msgCopyRestore** to the passed in requestor object. It will then close and destroy the temporary file. Note that the requestor object could be in a different task from the object receiving this message. In this situation, the copy of the object will exist in new task.

Return Value **stsFailed** Could not open temporary resource file.

See Also **msgCopyRestore**

msgCopyRestore

Restores the passed in object.

Takes P_OBJ_COPY_RESTORE, returns STATUS.

```
#define msgCopyRestore  MakeMsg(clsObject, 56)
// This struct is copied from fs.h
```

Arguments

```
typedef struct OBJ_FS_LOCATOR {
    OBJECT          uid;
    P_STRING        pPath;
} OBJ_FS_LOCATOR;
typedef struct OBJ_COPY_RESTORE {
    OBJ_FS_LOCATOR  locator;        // In: File locator that the object is in
    RES_ID          resId;          // In: Resource id of filed object
    OBJECT          object;         // Out: Uid of object to return
    U32             reserved[4];    // Reserved.
} OBJ_COPY_RESTORE, * P_OBJ_COPY_RESTORE;
```

Comments This message is sent to the object with an object resource Id, and a file locator (a resource file). This will result in **msgRestore** being sent to the appropriate object to read in the resource object. Sent to the requestor object when performing a **msgCopy**.

See Also **msgCopy**

msgDump

Causes each ancestor to print interesting debugging information.

Takes S32, returns STATUS.

```
#define msgDump MakeMsg(clsObject, 52)
```

Comments Each class should implement a **msgHandler** for **msgDump**. The **msgHandler** should print out interesting information for the object.

The parameter to **msgDump** is used to determine how much information to print.

Suggested values for **pArgs**:

0 Implementer's choice. Print whatever information is most useful.

1 Terse. One line only.

-1 Terse including embedded objects. One line of information plus one line for each embedded object, e.g., a menu would display information about each menu item.

maxS32 Verbose. All possible information about the object.

minS32 Verbose including embedded objects. The maximum amount of information.

other All other values are implementation dependent.

If the value of the parameter is in between two defined values the action should be based on the smaller value.

Suggested format:

```
"msgDump(yourClassName): yourDebuggingInformation"
```

clsObject defines **pArgs** as:

0 The object's capabilities and internal address.

1 Same as 0.

2 Same as 1 plus owner, number of observers, number of properties, the size of instance data and size of property list. **maxS32**: Same as 2 plus hex dump of instance data.

-1 Same as 0 plus **msgDump** to observers. ([Not implemented])

-2 Same as -1 plus owner, number of observers, number of properties, the size of instance data. ([Not implemented])

minS32 Same as -2 plus hex dump of instance data. ([Not implemented])

clsClass defines **pArgs** as:

0 The class capabilities, size of data for instances, the number of instances and subclasses of the class.

1 Same as 0.

2 Same as 1 plus ancestor and **newArgs** size.

maxS32 Same as 2. ([Not implemented])

msgException

Sent to observers of **theProcess**, an object within each process, when an exception occurs within that process.

Takes P_OBJ_EXCEPTION, returns STATUS. Category: observer notification.

```
#define msgException    MsgNoError(MakeMsg(clsObject, 100))
```

Arguments

```
typedef struct OBJ_EXCEPTION {
    OS_TASK_ERROR   errorCode;      // In: Type of exception
    OS_TASK_ID      task;           // In: Task that received the exception
    U32             spare;          // Unused (reserved)
} OBJ_EXCEPTION, *P_OBJ_EXCEPTION;
```

Comments

If a subtask is being terminated only objects owned by the subtask are notified.

msgTaskTerminated

Sent to observers of **theProcess**, an object within each process, after the task is terminated.

Takes P_OBJ_EXCEPTION, returns STATUS. Category: observer notification.

```
#define msgTaskTerminated   MsgNoError(MakeMsg(clsObject, 112))
```

Message Arguments

```
typedef struct OBJ_EXCEPTION {
    OS_TASK_ERROR   errorCode;      // In: Type of exception
    OS_TASK_ID      task;           // In: Task that received the exception
    U32             spare;          // Unused (reserved)
} OBJ_EXCEPTION, *P_OBJ_EXCEPTION;
```

msgScavenge

Sent to the object when a class has **objCapScavenge** set and the object's task is being terminated by request or because of an error.

Takes OS_TASK_ERROR, returns STATUS. Category: descendant responsibility.

```
#define msgScavenge MsgNoError(MakeMsg(clsObject, 102))
```

Comments

This message will only be executed by class that set **objCapScavenge**. Do not pass this message to your ancestor.

msgScavenged

Sent to the observers AFTER the object has been scavenged.

Takes OS_TASK_ERROR, returns STATUS. Category: observer notification.

```
#define msgScavenged    MsgNoError(MakeMsg(clsObject, 104))
```

msgFreeSubTask

Sent to **theProcess** to free a subtask.

Takes P_SUBTASK_FREE, returns STATUS.

```
#define msgFreeSubTask  MsgNoError(MakeMsg(clsObject, 104))
```

Arguments

```
typedef struct OBJ_SUBTASK_FREE {
  OS_TASK_ID        task;           // In:  Task to be terminated
  OS_TASK_ERROR     exitCode;       // In:  Exit code for task termination
} OBJ_SUBTASK_FREE, * P_OBJ_SUBTASK_FREE;
```

Comments

Useful for delayed termination when message is posted to **theProcess**.

Return Value

stsOSInvalidOperationForTask Task was not a subtask of this process.

msgHeap

Returns the preferred heap to use when allocating storage for this object.

Takes P_OS_HEAP_ID, returns STATUS.

```
#define msgHeap MakeMsg(clsObject, 96)
```

msgCan

Checks the object's capabilities.

Takes OBJ_CAPABILITY, returns STATUS.

```
#define msgCan  MakeMsg(clsObject, 36)
```

Message Arguments

```
Enum32(OBJ_CAPABILITY)                  // default for: OBJECT  CLASS
{                                       // ----------------------------
  objCapOwner       = flag1,            //              TRUE    FALSE
  objCapFree        = flag2,            //              TRUE    FALSE
  objCapSend        = flag3,            //              TRUE    FALSE
  objCapObservable  = flag4,            //              TRUE    TRUE
  objCapInherit     = flag6,            //              n/a     TRUE
  objCapScavenge    = flag7,            // enable only: n/a     FALSE
  objCapCreate      = flag8,            //              FALSE   FALSE
  objCapProp        = flag9,            //              TRUE    TRUE
  objCapMutate      = flag10,           //              TRUE    TRUE
  objCapCall        = flag15,           //              FALSE   TRUE
  objCapCreateNotify = flag16,          // create only: FALSE   FALSE
  objCapUnprotected = flag17,           // create only: n/a     FALSE
  objCapNonSwappable = flag18           // create only: FALSE   FALSE
};
```

Comments

If the capabilities in the parameter are all enabled, **msgCan** returns **stsOK** otherwise **stsProtectionViolation** is returned.

Return Value

stsProtectionViolation Capability disabled.

msgDisable

Disables some or all of the object's capabilities.

Takes P_OBJ_CAPABILITY_SET, returns STATUS.

```
#define msgDisable  MakeMsg(clsObject, 16)
```

Message Arguments

```
typedef struct OBJ_CAPABILITY_SET {
  OBJ_CAPABILITY            cap;    // In: Capabilities to enable/disable
  OBJ_KEY                   key;    // In: Unlocks object, e.g., objWKNKey
} OBJ_CAPABILITY_SET, * P_OBJ_CAPABILITY_SET;
```

Return Value

stsProtectionViolation Key does not open the object.

msgEnable

Enables some or all of the object's capabilities.

Takes P_OBJ_CAPABILITY_SET, returns STATUS.

```
#define msgEnable   MakeMsg(clsObject, 18)
```

Message Arguments

```
typedef struct OBJ_CAPABILITY_SET {
  OBJ_CAPABILITY            cap;    // In: Capabilities to enable/disable
  OBJ_KEY                   key;    // In: Unlocks object, e.g., objWKNKey
} OBJ_CAPABILITY_SET, * P_OBJ_CAPABILITY_SET;
```

Return Value

stsProtectionViolation Key does not open the object.

msgIsA

Tests if the object's class inherits from the class.

Takes CLASS, returns STATUS.

```
#define msgIsA  MakeMsg(clsObject, 30)
```

Return Value

stsOK Class is an ancestor of the object's class.

stsBadAncestor Class is not an ancestor of the object's class.

msgAncestorIsA

Tests if self inherits from the class.

Takes CLASS, returns STATUS.

```
#define msgAncestorIsA  MakeMsg(clsObject, 32)
```

Comments

This is a **clsClass** message and can only be sent to a class. Consider using **msgIsA** if the object is not a class.

Return Value

stsOK Class parameter is an ancestor.

stsBadObject Class parameter is not an object.

stsBadAncestor Class parameter is not an ancestor.

msgClass

Passes back the class of the object.

Takes P_CLASS, returns STATUS.

```
#define msgClass    MakeMsg(clsObject, 34)
```

msgAncestor

Passes back the ancestor of the class.

Takes P_CLASS, returns STATUS.

```
#define msgAncestor MakeMsg(clsObject, 20)
```

Comments

This is a **clsClass** message and can only be sent to a class. Consider using **msgClass** if the object is not a class.

msgSetLock

Sets or changes the key of the object.

Takes OBJ_LOCK_SET, returns STATUS.

```
#define msgSetLock  MakeMsg(clsObject, 106)
```

Arguments

```
typedef struct OBJ_LOCK_SET {
  OBJ_KEY           oldKey;         // In:  Required to set lock
  OBJ_KEY           newKey;         // In:  New key, if successful
} OBJ_LOCK_SET, * P_OBJ_LOCK_SET;
```

Return Value

stsProtectionViolation Old key does not open the object.

msgUnlocks

Tests if a key will unlock the object.

Takes OBJ_KEY, returns STATUS.

```
#define msgUnlocks  MakeMsg(clsObject, 38)
```

Return Value **stsProtectionViolation** Key does not open the object.

msgDuplicateLock

Locks the **pArgs** object with the same key as object.

Takes OBJECT, returns STATUS.

```
#define msgDuplicateLock    MakeMsg(clsObject, 40)
```

Return Value **stsBadObject** Parameter is not an object.

msgVersion

Returns the version of the object.

Takes **pNull**, returns STATUS.

```
#define msgVersion  MakeMsg(clsObject, 82)
```

Return Value **stsScopeViolation** Object was dynamic, request is nonsense.

msgNewArgsSize

Returns the size of the new struct required to create an instance of this class.

Takes **pNull**, returns STATUS.

```
#define msgNewArgsSize  MakeMsg(clsObject, 92)
```

Comments This is a **clsClass** message and can only be sent to a class.

msgOwner

Passes back the task that owns this object.

Takes P_OS_TASK_ID, returns STATUS.

```
#define msgOwner    MakeMsg(clsObject, 22)
```

msgSetOwner

Changes the owner task.

Takes P_OBJ_OWNER, returns STATUS.

```
#define msgSetOwner MakeMsg(clsObject, 24)
```

Message Arguments

```
typedef struct OBJ_OWNER {
  OS_TASK_ID        task;          // In:  [msgSetOwner] New owner
                                   // Out: [msgObjectOwner] Current owner
  OBJECT            object;        // In:  [msgObjectOwner] Source object
  OBJ_KEY           key;           // In:  [msgSetOwner] If required by caps
} OBJ_OWNER, * P_OBJ_OWNER;
```

Return Value **stsProtectionViolation** Key does not open the object.

msgProp

Passes back the value of a property for the object.

Takes P_OBJ_PROP, returns STATUS.

```
#define msgProp MakeMsg(clsObject, 108)
```

Message Arguments

```
typedef struct OBJ_PROP {
  TAG               propId;         // In:  [msgProp] Name of property
  P_IDATA           pData;          // In:  [msgProp] Pointer to data
                                    // In:  [msgSetProp] Data to copy to prop
  SIZEOF            length;         // In:  [msgProp] # of bytes to copy
                                    // Out: [msgProp] Length of data in bytes
                                    // In:  [msgSetProp] # of bytes to write
  OBJ_KEY           key;            // In:  [msgSetProp] If required by cap
} OBJ_PROP, * P_OBJ_PROP;
```

Return Value

stsBadPropTag Tag value was not in the proper range.

msgSetProp

Sets a property on the object.

Takes P_OBJ_PROP, returns STATUS.

```
#define msgSetProp  MakeMsg(clsObject, 110)
```

Message Arguments

```
typedef struct OBJ_PROP {
  TAG               propId;         // In:  [msgProp] Name of property
  P_IDATA           pData;          // In:  [msgProp] Pointer to data
                                    // In:  [msgSetProp] Data to copy to prop
  SIZEOF            length;         // In:  [msgProp] # of bytes to copy
                                    // Out: [msgProp] Length of data in bytes
                                    // In:  [msgSetProp] # of bytes to write
  OBJ_KEY           key;            // In:  [msgSetProp] If required by cap
} OBJ_PROP, * P_OBJ_PROP;
```

Comments

clsObject files any property that has tag flag 1 turned on. For example:

```
#define MY_PROP MakeTagWithFlags(clsFoo,tagNum,1)
```

Return Value

stsBadPropTag Tag value was not in the proper range.

stsProtectionViolation Key does not open the object.

msgObjectXXX

These **msgObjectXXX** messages can be used with ObjectCall() to get information about all objects, regardless of their task. Functionally they are equivalent to **msgXXX**, when applicable.

msgObjectIsA

Using the object and the class in the **pArgs**. Tests if the object's class inherits from the class.

Takes P_OBJ_IS_A, returns STATUS.

```
#define msgObjectIsA    MakeMsg(clsObject, 84)
```

Arguments

```
typedef struct OBJ_IS_A {
  OBJECT            object;         // In:  Source object
  CLASS             objClass;       // In:  Ancestor of source object's class
} OBJ_IS_A, * P_OBJ_IS_A;
```

Return Value

stsBadObject Parameter is not an object.

stsBadAncestor Class is not an ancestor of the object's class.

msgObjectAncestorIsA

Tests if the descendant class inherits from the ancestor.

Takes P_OBJ_ANCESTOR_IS_A, returns STATUS.

```
#define msgObjectAncestorIsA    MakeMsg(clsObject, 86)
```

Arguments

```
typedef struct OBJ_ANCESTOR_IS_A {
  CLASS             descendant;     // In:  Source class (always a class)
  CLASS             ancestor;       // In:  Ancestor of the descendant
} OBJ_ANCESTOR_IS_A, * P_OBJ_ANCESTOR_IS_A;
```

Comments

This is a **clsClass** message and can only be sent to a class.

Return Value

stsBadObject One of the parameters is not a class.

stsBadAncestor Ancestor parameter is not an ancestor.

msgObjectClass

Passes back the class for the object in **pArgs**.

Takes P_OBJ_CLASS, returns STATUS.

```
#define msgObjectClass  MakeMsg(clsObject, 88)
```

Arguments

```
typedef struct OBJ_CLASS {
  OBJECT            object;         // In:  Source object
  CLASS             objClass;       // Out: Class of source object
} OBJ_CLASS, * P_OBJ_CLASS;
```

Return Value

stsBadObject Object or class parameters are not objects.

msgObjectOwner

Passes back the owning task for the object in **pArgs**.

Takes P_OBJ_OWNER, returns STATUS.

```
#define msgObjectOwner  MakeMsg(clsObject, 26)
```

Message Arguments

```
typedef struct OBJ_OWNER {
  OS_TASK_ID        task;           // In:  [msgSetOwner] New owner
                                    // Out: [msgObjectOwner] Current owner
  OBJECT            object;         // In:  [msgObjectOwner] Source object
  OBJ_KEY           key;            // In:  [msgSetOwner] If required by caps
} OBJ_OWNER, * P_OBJ_OWNER;
```

Return Value

stsBadObject Parameter is not an object.

msgObjectValid

Tests that the object in **pArgs** exists.

Takes OBJECT, returns STATUS.

```
#define msgObjectValid  MakeMsg(clsObject, 42)
```

Return Value

stsBadObject Parameter is not an object.

stsBadAncestor Invalid ancestor.

msgObjectVersion

Returns the version of the object in **pArgs**.

Takes OBJECT, returns STATUS.

```
#define msgObjectVersion    MakeMsg(clsObject, 44)
```

Return Value

stsBadObject Parameter is not an object.

stsScopeViolation Parameter was dynamic, request is nonsense.

msgObjectNew

Creates a new object in the same context as the object that receives this message.

Takes **newArgs**, returns STATUS.

```
#define msgObjectNew    MakeMsg(clsObject, 98)
```

Return Value

stsProtectionViolation objCapCreate is disabled.

stsScopeViolation Must be executed in the owner task of the receiving object.

msgTrace

Turn tracing on for classes and objects. Return value is **stsTraceOn** if tracing was on and **stsTraceOff** if tracing was off.

Takes TAG, returns STATUS.

```
#define msgTrace    MakeMsg(clsObject, 48)
#define objTraceOn  (P_ARGS)stsTraceOn
#define objTraceOff (P_ARGS)stsTraceOff
```

Comments

When tracing is turned on for the object, every ObjectCall() to the object causes a 3-line message to be printed. The format of the output is:

```
C> Trace ObjectCall: @ cls="ancestor name"                task="task"
C> object="object name"                                   depth="D"
C> msg="message name", pArgs="address", pData="address"
```

On return from the ObjectCall() a 2-line message is printed. The format of the output is:

```
C> Trace ObjectCall: returns="status value"               task="task"
C> object="object name"                                   depth="D/C"
```

where task is the task id in hex, depth is the number of recursive dispatch loops. All names are printed symbolically when symbols are available.

ObjectCallAncestor() calls are traced for objects if tracing is on for the object and the debug flag /DC1000 is set.

When tracing is turned on for a class, the class is traced as an object. In addition, all ObjectCallAncestor() calls that pass through the class are traced.

msgMutate

Changes the ancestor of the object to be the **newAncestor** class.

Takes P_OBJ_MUTATE, returns STATUS.

```
#define msgMutate   MakeMsg(clsObject, 46)
```

Arguments

```
typedef struct OBJ_MUTATE {
  CLASS             newClass;       // In:  Object's new class
  OBJ_KEY           key;            // In:  If required by caps
} OBJ_MUTATE, * P_OBJ_MUTATE;
```

Comments

The total size of the instance data for the new and old ancestors must be equal, this is the sum for all the ancestors up to **clsObject**. This message is NOT intended for general use. Use it when the behavior of an existing object needs to be overridden.

Return Value

stsBadAncestor The **newAncestor** class is not a valid class.

stsSizeLimit The sizes of new and old instance data don't match.

msgAddObserver

Adds an observer to the end of the object's observer list.

Takes OBJECT, returns STATUS.

```
#define msgAddObserver  MakeMsg(clsObject, 58)
```

Return Value

stsBadObject Parameter is not an object.

stsProtectionViolation objCapObservable is disabled.

stsScopeViolation Observer is local and has a different owner than the observed object or the observed object is callable.

stsAlreadyAdded The same observer has been added twice. This is only a warning, the observers are ref counted. Two adds require two removes.

msgAddObserverAt

Adds an observer at the specified position in the observer list.

Takes P_OBJ_OBSERVER_POS, returns STATUS.

```
#define msgAddObserverAt    MakeMsg(clsObject, 78)
```

Message Arguments

```
typedef struct OBJ_OBSERVER_POS {
  OBJECT            observer;       // In:  [msgAddObserverAt] New observer
                                    // Out: [msgGetObserver] Observer at pos
  U16               position;       // In:  Position in observer list
} OBJ_OBSERVER_POS, * P_OBJ_OBSERVER_POS;
```

Return Value

stsBadObject Parameter is not an object.

stsProtectionViolation objCapObservable is disabled.

stsScopeViolation Observer is local and has a different owner than the observed object or the observed object is callable.

stsAlreadyAdded The same observer has been added twice. This is only a warning, the observers are ref counted. Two adds require two removes.

msgRemoveObserver

Removes an observer from the object's observer list.

Takes OBJECT, returns STATUS.

```
#define msgRemoveObserver   MakeMsg(clsObject, 60)
```

Comments **msgRemoved** is sent to the observer after it is removed.

Return Value **stsProtectionViolation** objCapObservable disabled.

stsAlreadyRemoved Observer was not on the list.

msgNotifyObservers

Sends a message to the observers.

Takes P_OBJ_NOTIFY_OBSERVERS, returns STATUS.

```
#define msgNotifyObservers  MakeMsg(clsObject, 62)
```

Message Arguments

```
typedef struct OBJ_NOTIFY_OBSERVERS {
  MESSAGE           msg;            // In:  Message to send/post observers
  P_ARGS            pArgs;          // In:  Args for message
  SIZEOF            lenSend;        // In:  Length of Args
} OBJ_NOTIFY_OBSERVERS, * P_OBJ_NOTIFY_OBSERVERS;
```

Comments Any observer that returns **stsBadObject** is removed from the observer list.

msgPostObservers

Posts a message to the observers.

Takes P_OBJ_NOTIFY_OBSERVERS, returns STATUS.

```
#define msgPostObservers    MakeMsg(clsObject, 94)
```

Message Arguments

```
typedef struct OBJ_NOTIFY_OBSERVERS {
  MESSAGE           msg;            // In:  Message to send/post observers
  P_ARGS            pArgs;          // In:  Args for message
  SIZEOF            lenSend;        // In:  Length of Args
} OBJ_NOTIFY_OBSERVERS, * P_OBJ_NOTIFY_OBSERVERS;
```

Comments Any observer that returns **stsBadObject** is removed from the observer list.

msgEnumObservers

Passes back the observer list.

Takes P_OBJ_ENUM_OBSERVERS, returns STATUS.

```
#define msgEnumObservers    MakeMsg(clsObject, 64)
```

Arguments

```
typedef struct OBJ_ENUM_OBSERVERS {
  U16               max,        // In:  Size of pObservers[]
                    count;      // In:  # to pass back in pObservers[].
                                //      If count > max memory may be allocated
                                // Out: # of valid entries in pObservers[]
  P_OBJECT          pObservers; // In:  ptr to array
                                // Out: If memory was allocated
                                //      client should free the memory
  U16               next;       // In:  Set to 0 for the first call
                                // Out: Next available entry
} OBJ_ENUM_OBSERVERS, * P_OBJ_ENUM_OBSERVERS;
```

Return Value **stsEndOfData** The size of the array is greater than or equal to the number of observer.

msgGetObserver

Passes back the observer at the specified position in the observer list.

Takes P_OBJ_OBSERVER_POS, returns STATUS.

```
#define msgGetObserver  MakeMsg(clsObject, 74)
```

Message Arguments

```
typedef struct OBJ_OBSERVER_POS {
  OBJECT            observer;       // In:  [msgAddObserverAt] New observer
                                    // Out: [msgGetObserver] Observer at pos
  U16               position;       // In:  Position in observer list
} OBJ_OBSERVER_POS, * P_OBJ_OBSERVER_POS;
```

Comments **objNull** is returned if the position is not in the observer list.

msgNumObservers

Passes back the number of observers for this object.

Takes P_U16, returns STATUS.

```
#define msgNumObservers MakeMsg(clsObject, 72)
```

msgAdded

Sent to the observer when it is added to an object's observer list.

Takes OBJECT, returns STATUS. Category: observer notification.

```
#define msgAdded    MsgNoError(MakeMsg(clsObject, 66))
```

msgRemoved

Sent to the observer when it is removed from an object's observer list.

Takes OBJECT, returns STATUS. Category: observer notification.

```
#define msgRemoved  MsgNoError(MakeMsg(clsObject, 68))
```

msgChanged

Generic message that can be used to notify observers that a change has occurred.

Takes OBJECT, returns STATUS. Category: observer notification.

```
#define msgChanged  MsgNoError(MakeMsg(clsObject, 76))
```

msgNotUnderstood

Sent by **clsObject** when an unrecognized message is received.

Takes P_MSG_NOT_UNDERSTOOD, returns STATUS.

```
#define msgNotUnderstood    MakeMsg(clsObject, 50)
```

Arguments

```
typedef struct MSG_NOT_UNDERSTOOD {
  MESSAGE           msg;            // In:  Message not understood
  P_ARGS            pArgs;          // In:  Args of message
} MSG_NOT_UNDERSTOOD, * P_MSG_NOT_UNDERSTOOD;
```

Return Value **stsNotUnderstood** Always returned by **clsObject** when this message reaches **clsObject**.

Message wild cards

Used to define a class wild card and as a table wild card.

```
#define objWildCard -1
```

Wild card for **clsObject**.

```
#define clsObjWildCard      MakeMsg(clsObject, objWildCard)
```

Wild card for **clsClass**.

```
#define clsClsWildCard      MakeMsg(clsClass, objWildCard)
```

Functions

ObjectCall

Maps the message to the object's method (MsgHandler) and calls it with **pArgs**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCall(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs
);
```

Return Value

stsBadObject Object was invalid.

stsScopeViolation Object owned by a different task and does not have **objCapCall** set.

ObjectCallAncestorCtx

Calls the next ancestor in the class chain.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCallAncestorCtx(
    CONTEXT     ctx
);
```

Comments

Developers usually can avoid calling this explicitly by specifying **objCallAncestorBefore** or (for a few messages) **objCallAncestorAfter** in the method table. Occasionally, you need to call your ancestor in the middle of things, and this is the call you do it with.

See Also

ObjectCallAncestor

Return Value

stsBadContext if ctx parameter is bad.

ObjectCallAncestor

Calls the ancestor with the parameters supplied.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCallAncestor(
    MESSAGE     msg,
    OBJECT      self,
    P_ARGS      pArgs,
    CONTEXT     ctx
);
```

Comments

In general you should use ObjectCallAncestorCtx().

Return Value

stsBadContext if ctx parameter is bad.

ObjectSend

Generalized version of ObjectCall() that works across tasks boundaries.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectSend(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,          // In only: Not updated
    SIZEOF      lenArgs
);
```

Comments

The **pArgs** block is copied into the address space of the task that owns the object and an ObjectCall() is executed in that task's context. If **lenArgs** equals 0, **pArgs** block is not copied and the pointer is passed directly. In this case, **pArgs** must point to global storage.

While the current task is waiting for ObjectSend() to return, the task will continue to dispatch messages sent to objects owned by the task. This allows sending to an object in another task, which in turns sends to an object owned by the current task, without deadlock.

Return Value

stsProtectionViolation objCapSend is disabled.

stsSendTaskInvalid Object's owning task is invalid.

stsTaskTerminated While waiting for a reply the object's task died.

ObjectSendUpdate

Same as ObjectSend(), additionally the **pArgs** block is copied back to the current task.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectSendUpdate(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,          // In/Out: Updated
    SIZEOF      lenArgs
);
```

ObjectSendU32

Same as ObjectSend() without the length arg, **lenArgs** = 0.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectSendU32(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs           // In only: Not updated
);
```

ObjectSendTask

Same as ObjectSend() except the task is specified explicitly.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectSendTask(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,          // In only: Not updated
    SIZEOF      lenArgs,
    OS_TASK_ID  task
);
```

Comments

For experts only: Use this routine with care, the task of the object is ignored. ObjectSendTask() allows sending to well-known process-globals from outside the process, such as, **theProcess**. You might use this to communicate with **theUndoManager** in an embedded application.

ObjectSendUpdateTask

Same as ObjectSendTask(), additionally the **pArgs** are updated.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectSendUpdateTask(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,          // In/Out: Updated
    SIZEOF      lenArgs,
    OS_TASK_ID  task
);
```

Comments

Experts only, use this routine with care.

ObjectPost

Posts a message to the object via the system input queue.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPost(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs
);
```

Comments

ObjectPost() is similar to ObjectSend() but the message delivery is deferred and the current task continues to run. Because the current task does not wait, it is not possible to return a status value or **pArgs**.

The most common use of ObjectPost() is to delay the effect of a **msgDestroy**. For example, if a button sends you a message when it is pressed, and you want to destroy the button at that point, you cannot use ObjectCall() to send **msgDestroy** to it until after you have returned from processing the message the button sent. If you ObjectPost() the **msgDestroy**, this guarantees the button won't receive it until you have returned.

ObjectPost() is synchronized with respect to the input system. A posted message is placed in the system input queue. When the message reaches the head of the queue it is sent to the object in the context of the task that owns the object. A posted message is typically dispatched by a task's top-level dispatch loop. If the task is already processing a message or waiting for a reply to a sent message the posted message is queued. The one exception is when the input system is running system modal, in this case the posted messages are delivered to any dispatch loop. Dispatch loops are created whenever an ObjectSend() is waiting for a reply. The side effect is that any task that is running concurrently may receive a posted message at any time.

ObjectPostU32

Same as ObjectPost() without the length arg, **lenArgs** = 0.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostU32(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs
);
```

ObjectPostTask

Same as ObjectPost() except the task is specified explicitly.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostTask(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task
);
```

Comments

For experts only: Use this routine with care, the owning task of the object is ignored. ObjectPostTask() allows posting to WKN process-globals from outside the process, such as, **theProcess**.

ObjectPostAsync

Similar to ObjectPost() but not synchronized with the input system.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostAsync(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs
);
```

Comments

This call causes concurrency and all the difficulties associated with it.

One of these difficulties, described in detail under ObjectPost, is the handling of posted messages when the input system is running system modal.

ObjectPostAsyncTask

Same as ObjectPostAsync() except the task is specified explicitly.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostAsyncTask(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task
);
```

Comments

This call causes concurrency and all the difficulties associated with it.

For experts only: Use this routine with care, the owning task of the object is ignored. ObjectPostAsyncTask() allows posting to WKN process-globals from outside the process, such as, **theProcess**.

ObjectPostDirect

Similar to ObjectPostAsync() but can be dispatched by any dispatch loop.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostDirect(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs
);
```

Comments

This call causes concurrency and all the difficulties associated with it.

One of these difficulties, described in detail under ObjectPost, is the handling of posted messages when the input system is running system modal.

ObjectPostDirectTask

Same as ObjectPostDirect() except the task is specified explicitly.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostDirectTask(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task
);
```

Comments

This call causes concurrency and all the difficulties associated with it.

For experts only: Use this routine with care, the owning task of the object is ignored. ObjectPostDirectTask() allows posting to WKN process-globals from outside the process, such as, **theProcess**.

ObjectWrite

Writes the instance data for self in a protected area.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED0 ObjectWrite(
    OBJECT      self,
    CONTEXT     ctx,
    P_UNKNOWN   pData
);
```

Return Value

stsBadContext Invalid context.

ObjectWritePartial

Updates part of the instance data for self in a protected area.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED0 ObjectWritePartial(
    OBJECT      self,
    CONTEXT     ctx,
    P_UNKNOWN   pData,
    SIZEOF      offset,
    SIZEOF      length
);
```

Return Value

stsBadContext Invalid context.

ObjectRead

Copies the instance data from protected storage into **pBuf**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectRead(
    OBJECT      self,
    CONTEXT     ctx,
    P_UNKNOWN   pBuf
);
```

Comments

The **pData** pointer passed into the MsgHandler is a faster way to read the protected data.

ObjectPoke

Writes the object's instance data.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED0 ObjectPoke(
    OBJECT      object,
    P_MSG       classMsgTable,      // Address of the class's table
    OBJ_KEY     key,                // Key for the class
    P_UNKNOWN   pBuf
);
```

Comments

Copies **pBuf** into the instance data block for the class specified.

Return Value

stsBadAncestor ClassMsgTable did not correspond to an ancestor.

stsProtectionViolation Key does not open the object.

ObjectPeek

Reads the object's instance data.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPeek(
    OBJECT      object,
    P_MSG       classMsgTable,
    OBJ_KEY     key,
    P_UNKNOWN   pBuf
);
```

Comments

Copies the instance data block for the class specified into **pBuf**.

Return Value

stsBadAncestor ClassMsgTable did not correspond to an ancestor.

stsProtectionViolation Key does not open the object.

ObjectOwner

Returns the object's owner.

Returns STATUS.

Function Prototype
```
OS_TASK_ID EXPORTED ObjectOwner(
    OBJECT      object
);
```

ObjectValid

Returns **stsOK** if the object is validate, otherwise an error is returned.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED ObjectValid(
    OBJECT      object
);
```

Default MsgHandlers

Default MsgHandler that always returns **stsOK.**

Function Prototype
```
MsgHandler(StsOKMsgHandler);
```

Default MsgHandler that always returns **stsFailed.**

Function Prototype
```
MsgHandler(StsFailedMsgHandler);
```

Default MsgHandler that always returns **stsReqNotSupported.**

Function Prototype
```
MsgHandler(StsReqNotSupportedMsgHandler);
```

Default MsgHandler that always returns **stsNotYetImplemented.**

Function Prototype
```
MsgHandler(StsNotYetImplemented);
```

Default MsgHandler that always returns **stsMessageIgnored.**

Function Prototype
```
MsgHandler(StsMessageIgnoredMsgHandler);
```

Functions for Generating Symbolic Names

These routines are very useful for debugging. It is MUCH more useful to be able to print "stsBadParameter" instead of some 32-bit hex number.

ClsStsToString

Takes a STATUS and returns its symbolic name or [wkn=num:sts=num].

Returns P_STRING.

Function Prototype
```
P_STRING EXPORTED ClsStsToString(
    STATUS sts,
    P_STRING pStr
);
```

Comments

Returns either an internal pointer to a symbolic name or the **pArgs** buffer. If a symbolic name is not found, a string [wkn=num:sts=num] is constructed in the **pArgs** buffer.

Symbolic names are added via ClsMgrSymbolsInit().

ClsMsgToString

Takes a message and returns its symbolic name or [wkn=num:msg=num].

Returns P_STRING.

Function Prototype

```
P_STRING EXPORTED ClsMsgToString(
    MESSAGE     msg,
    P_STRING    pStr
);
```

Comments

Returns either an internal pointer to a symbolic name or the **pArgs** buffer. If a symbolic name is not found, a string [wkn=num:msg=num] is constructed in the **pArgs** buffer.

Symbolic names are added via ClsMgrSymbolsInit().

ClsTagToString

Takes a message and returns its symbolic name or [wkn=num:tag=num].

Returns P_STRING.

Function Prototype

```
P_STRING EXPORTED ClsTagToString(
    TAG         tag,
    P_STRING    pStr
);
```

Comments

Returns either an internal pointer to a symbolic name or the **pArgs** buffer. If a symbolic name is not found, a string [wkn=num:tag=num] is constructed in the **pArgs** buffer.

Currently, TAGs and MSGs are kept in the same list. If a TAG and MSG have the same value then first one found will be displayed. This may change in the future.

Symbolic names are added via ClsMgrSymbolsInit().

ClsObjToString

Takes an OBJECT and returns its symbolic name or [type:num:num].

Returns P_STRING.

Function Prototype

```
P_STRING EXPORTED ClsObjToString(
    OBJECT      object,
    P_STRING    pStr
);
```

Comments

Returns either an internal pointer to a symbolic name or the **pArgs** buffer. If a symbolic name is not found, a string [type=num:num] is constructed in the **pArgs** buffer.

Symbolic names are added via ClsMgrSymbolsInit().

ObjectInfoString

Takes an OBJECT and returns its symbolic name and additional information.

Returns P_STRING.

Function Prototype

```
P_STRING EXPORTED ObjectInfoString(
    OBJECT      object,
    P_STRING    pStr
);
```

Comments

Formats is the first if the name is found, and the second if not:

```
name (cls=name or [type=num:num])
[type=num:num] (cls=name or [type=num:num])
```

Return Value **stsBadObject** Parameter is not an object.

ClsStringToSts

Takes a symbolic name as a string and returns the corresponding STATUS.

Returns STATUS.

Function Prototype
```
STATUS   EXPORTED ClsStringToSts(
    P_STRING    sts
);
```

ClsStringToMsg

Takes a symbolic name as a string and returns the corresponding message.

Returns MESSAGE.

Function Prototype
```
MESSAGE  EXPORTED ClsStringToMsg(
    P_STRING    msg
);
```

ClsStringToTag

Takes a symbolic name as a string and returns the corresponding tag.

Returns TAG.

Function Prototype
```
MESSAGE  EXPORTED ClsStringToTag(
    P_STRING    tag
);
```

Comments Currently, TAGs and MSGs are kept in the same list. If a TAG and MSG have the same value then first one found will be displayed. This may change in the future.

ClsStringToObj

Takes a symbolic name as a string and returns the corresponding OBJECT.

Returns OBJECT.

Function Prototype
```
OBJECT   EXPORTED ClsStringToObj(
    P_STRING    object
);
```

ClsSymbolsInit

Adds three arrays of symbolic names (OBJECT, MSG, STATUS) to the database.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED0 ClsSymbolsInit(
  P_STRING          type,
  P_CLS_SYM_OBJ     objSymbols,
  P_CLS_SYM_MSG     msgSymbols,
  P_CLS_SYM_STS     stsSymbols
);
```

Comments Each group of arrays is labelled with a tag. If two groups have the same tag, the last group to be added replaces the earlier group. The arrays must be in shared, user visible memory.

Return Value **stsBadParam** symbols were not in shared, user visible memory

Low-Level Task Dispatch Routines

ObjectMsgLoop

Receives and dispatches object messages forever.

Returns STATUS.

```
#define ObjectMsgLoop() ObjectMsgDispatch(pNull)
```

Comments If you create a sub-task with OSSubTaskCreate(), and you want that subtask to be able to receive messages, then you have to make it call this routine. ObjectMsgLoop() never returns. It just sits there waiting for messages generated by input events or sent from other processes and calling the appropriate local message handler for each one in turn. Even if you never use this directly, knowing that it exists makes it much easier to understand the difference between ObjectCall, ObjectPost, and ObjectSend.

Return Value **stsBadParam** Bad ITMSG_INFO parameter.

ObjectMsgDispatch

Dispatches object message received by OSITMsgReceive().

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectMsgDispatch(P_OS_ITMSG_INFO pITMsg);
```

Return Value **stsBadParam** Bad ITMSG_INFO parameter. ITMsg type must be one of **osClsmgrSend** or **osClsmgrPost.**

ObjectMsgDispatchInfo

Passes back information on the current ObjectMsgDispatch frame.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectMsgDispatchInfo(
  P_OS_ITMSG_INFO   pInfo,          // Out: ITMSG_INFO for requested frame
  P_U32             pLevel          // In/Out: requested frame
                                    // In: requested dispatch frame,
                                    //     maxU32 = current, 1 = top level
                                    // Out: actual level of dispatch frame.
);
Enum32(SEND_TYPE)           // (.asm)
{
    objSendNoUpdate = flag0,
    objSendUpdate   = flag1,
    objPostAsync    = flag2,
    objPostDirect   = flag3,
    objSendMax      = flag10
};
```

Used by ObjectMsgExtract() and ObjectmsgAlter(). All fields are out parameters for ObjectMsgExtract and in parameters of ObjectMsgAlter. The token field is currently not used and not settable by ObjectMsgAlter.

```
typedef struct OBJ_DISPATCH_INFO {
  MESSAGE           msg;
  OBJECT            object;
  P_ARGS            pArgs;
  U32               length;
  U32               token;
  SEND_TYPE         type;
} OBJ_DISPATCH_INFO, *P_OBJ_DISPATCH_INFO;
```

Return Value **stsBadParam** Bad ITMSG_INFO parameter.

stsFailed Not inside a dispatch loop or invalid frame number

ObjectMsgExtract

Extracts the interesting ObjectSend fields from the ITMsg packet.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectMsgExtract(
  P_OS_ITMSG_INFO       pITMsg,
  P_OBJ_DISPATCH_INFO   pInfo
);
```

Return Value **stsBadParam** Bad ITMSG_INFO parameter.

ObjectMsgAlter

Alters the ObjectSend fields of the ITMsg packet.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectMsgAlter(
  P_OS_ITMSG_INFO       pITMsg,
  P_OBJ_DISPATCH_INFO   pInfo
);
```

These structs are used by the method compiler, outside of Penpoint.

```
Enum16(MSG_HANDLER_FLAGS) {
    objCallAncestorBefore   = flag0,    // Call ancestor before this handler
    objCallAncestorAfter    = flag1,    // Call ancestor after this handler
    objDerefIData           = flag2,    // No-op
    objInheritMethod        = flag3,    // No-op
    objClassMessage         = flag4,    // Handle messages sent to a class
    objSaveSpace            = flag5,    // Optimize for space
    objSaveTime             = flag6     // Optimize for time
};
typedef struct MSG_INFO {
    MESSAGE             msg;
    P_U8                functionName;
    MSG_HANDLER_FLAGS   flags;
} MSG_INFO, * P_MSG_INFO;
typedef struct CLASS_INFO {
    P_U8            tableName;          // name to use for compiled table
    P_MSG_INFO      msgTable;           // message table to compile
    U32             flags;              // no flags, must be set to zero
} CLASS_INFO, * P_CLASS_INFO;
```

Return Value **stsBadParam** Bad ITMSG_INFO parameter.

Debugging Support

ObjectCallNoDebug

Same as ObjectCall() but prevents tracing (i.e., no debug output for /DC1)

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCallNoDebug(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs
);
#define objMaxCallsDepth    10
typedef struct OBJ_STATISTICS {
    U32 numObjReads;
    U32 numObjWrites;
    U32 numObjPeeks;
    U32 numObjPokes;
    U32 numObjCalls;
    U32 numObjSends;
    U32 numObjPosts;
    U32 depthObjCalls[objMaxCallsDepth];
    U32 numObjMaxDepth;
} OBJ_STATISTICS, *P_OBJ_STATISTICS;
```

ClsClearStatistics

Zeros the statistics gathering counters.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ClsClearStatistics(void);
```

ClsDumpStatistics

Prints the current value of the statistics.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ClsDumpStatistics(void);
```

ClsStatistics

Passes back the current value of the statistics in stats parameter.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ClsStatistics(P_OBJ_STATISTICS stats);
```

ClsSetStatistics

Resets the value of the statistics to stats parameter.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ClsSetStatistics(P_OBJ_STATISTICS stats);
```

Comments

By calling ClsStatistics() at the beginning of a routine and ClsSetStatistics() at the end selected routines can be exempted from statistics gathering.

Debugging Macros

The debugging macros are short-hand for a call to the appropriate function followed by a conditional test and action. All the message passing functions have macros that: return if there is an error (Ret), jump to a label on an error (Jmp) and test for an error and return the value (OK). ObjectCall and ObjectCallAncestor have two additional macros, Failed and Chk.

Standard GO error recovery is done by using the Ret() form as long as there's nothing to clean up and then using the Jmp() form to jump to a label at the bottom of the routine that knows how to clean up. Note that both Ret() and Jmp() forms use Warn() forms of their respective calls, so any sts < **stsOK** generates an error message if DEBUG is set.

ObjectCall

```
#define ObjCallRet(m,o,p,s) \
    if (((s) = ObjCallWarn(m,o,p)) < stsOK) return s; else
#define ObjCallJmp(m,o,p,s,x) \
    if (((s) = ObjCallWarn(m,o,p)) < stsOK) goto x; else
#define ObjCallOK(m,o,p,s) ((s = ObjCallWarn(m,o,p)) >= stsOK)
#define ObjCallFailed(m,o,p,s) ((s = ObjCallWarn(m,o,p)) < stsOK)
#define ObjCallChk(m,o,p,s) ((s = ObjectCall(m,o,p)) < stsOK)
```

ObjectCallAncestor

```
#define ObjCallAncestorRet(m,o,p,c,s) \
    if (((s) = ObjCallAncestorWarn(m,o,p,c)) < stsOK) return s; else
#define ObjCallAncestorJmp(m,o,p,c,s,x) \
    if (((s) = ObjCallAncestorWarn(m,o,p,c)) < stsOK) goto x; else
#define ObjCallAncestorOK(m,o,p,c,s) \
    ((s = ObjCallAncestorWarn(m,o,p,c)) >= stsOK)
#define ObjCallAncestorFailed(m,o,p,c,s) \
    ((s = ObjCallAncestorWarn(m,o,p,c)) < stsOK)
#define ObjCallAncestorChk(m,o,p,c,s) \
    ((s = ObjectCallAncestor(m,o,p,c)) < stsOK)
#define ObjCallAncestorCtxRet(c,s) \
    if (((s) = ObjCallAncestorCtxWarn(c)) < stsOK) return s; else
#define ObjCallAncestorCtxJmp(c,s,x) \
    if (((s) = ObjCallAncestorCtxWarn(c)) < stsOK) goto x; else
#define ObjCallAncestorCtxOK(c,s) \
    ((s = ObjCallAncestorCtxWarn(c)) >= stsOK)
```

ObjectSend

```
#define ObjSendRet(m,o,p,l,s) \
    if (((s) = ObjSendWarn(m,o,p,l)) < stsOK) return s; else
#define ObjSendJmp(m,o,p,l,s,x) \
    if (((s) = ObjSendWarn(m,o,p,l)) < stsOK) goto x; else
#define ObjSendOK(m,o,p,l,s) ((s = ObjSendWarn(m,o,p,l)) >= stsOK)
```

ObjectSendUpdate

```
#define ObjSendUpdateRet(m,o,p,l,s) \
    if (((s) = ObjSendUpdateWarn(m,o,p,l)) < stsOK) return s; else
#define ObjSendUpdateJmp(m,o,p,l,s,x) \
    if (((s) = ObjSendUpdateWarn(m,o,p,l)) < stsOK) goto x; else
#define ObjSendUpdateOK(m,o,p,l,s) ((s = ObjSendUpdateWarn(m,o,p,l)) >= stsOK)
```

ObjectSendTask

```
#define ObjSendTaskRet(m,o,p,l,t,s) \
    if (((s) = ObjSendTaskWarn(m,o,p,l,t)) < stsOK) return s; else
```

```
#define ObjSendTaskJmp(m,o,p,l,t,s,x) \
    if (((s) = ObjSendTaskWarn(m,o,p,l,t)) < stsOK) goto x; else
#define ObjSendTaskOK(m,o,p,l,t,s) ((s = ObjSendTaskWarn(m,o,p,l,t)) >= stsOK)
```

ObjectSendUpdateTask

```
#define ObjSendUpdateTaskRet(m,o,p,l,t,s) \
    if (((s) = ObjSendUpdateTaskWarn(m,o,p,l,t)) < stsOK) return s; else
#define ObjSendUpdateTaskJmp(m,o,p,l,t,s,x) \
    if (((s) = ObjSendUpdateTaskWarn(m,o,p,l,t)) < stsOK) goto x; else
#define ObjSendUpdateTaskOK(m,o,p,l,t,s) \
    ((s = ObjSendUpdateTaskWarn(m,o,p,l,t)) >= stsOK)
```

ObjectSendU32

```
#define ObjSendU32Ret(m,o,p,s) \
    if (((s) = ObjSendU32Warn(m,o,p)) < stsOK) return s; else
#define ObjSendU32Jmp(m,o,p,s,x) \
    if (((s) = ObjSendU32Warn(m,o,p)) < stsOK) goto x; else
#define ObjSendU32OK(m,o,p,s) ((s = ObjSendU32Warn(m,o,p)) >= stsOK)
```

ObjectPost

```
#define ObjPostRet(m,o,p,l,s) \
    if (((s) = ObjPostWarn(m,o,p,l)) < stsOK) return s; else
#define ObjPostJmp(m,o,p,l,s,x) \
    if (((s) = ObjPostWarn(m,o,p,l)) < stsOK) goto x; else
#define ObjPostOK(m,o,p,l,s) ((s = ObjPostWarn(m,o,p,l)) >= stsOK)
```

ObjectPostAsync

```
#define ObjPostAsyncRet(m,o,p,l,s) \
    if (((s) = ObjPostAsyncWarn(m,o,p,l)) < stsOK) return s; else
#define ObjPostAsyncJmp(m,o,p,l,s,x) \
    if (((s) = ObjPostAsyncWarn(m,o,p,l)) < stsOK) goto x; else
#define ObjPostAsyncOK(m,o,p,l,s) ((s = ObjPostAsyncWarn(m,o,p,l)) >= stsOK)
```

ObjectPostDirect

```
#define ObjPostDirectRet(m,o,p,l,s) \
    if (((s) = ObjPostDirectWarn(m,o,p,l)) < stsOK) return s; else
#define ObjPostDirectJmp(m,o,p,l,s,x) \
    if (((s) = ObjPostDirectWarn(m,o,p,l)) < stsOK) goto x; else
#define ObjPostDirectOK(m,o,p,l,s) ((s = ObjPostDirectWarn(m,o,p,l)) >= stsOK)
```

ObjectPostU32

```
#define ObjPostU32Ret(m,o,p,s) \
    if (((s) = ObjPostU32Warn(m,o,p)) < stsOK) return s; else
#define ObjPostU32Jmp(m,o,p,s,x) \
    if (((s) = ObjPostU32Warn(m,o,p)) < stsOK) goto x; else
#define ObjPostU32OK(m,o,p,s) ((s = ObjPostU32Warn(m,o,p)) >= stsOK)
```

Debugging Helper Functions (with /DDEBUG)

```
#if defined DEBUG || defined CLSMGR_COMPILE
```

ObjectCallWarning

Same as ObjectCall(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCallWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjCallWarn macro should be used to call this routine.

ObjectCallNoDebugWarning

Same as ObjectCallNoDebug(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCallNoDebugWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjCallNoDebugWarn macro should be used to call this routine.

ObjectCallAncestorCtxWarning

Same as ObjectCallAncestorCtx(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCallAncestorCtxWarning(
    CONTEXT     ctx,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjCallAncestorCtxWarn macro should be used.

ObjectCallAncestorWarning

Same as ObjectCallAncestor(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectCallAncestorWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    CONTEXT     ctx,
    P_STRING    fn,
    U16         ln
);
```

Comments In general, ObjCallAncestorWarn macro should be used.

ObjectSendWarning

Same as ObjectSend(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED ObjectSendWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    P_STRING    fn,
    U16         ln
);
```

Comments In general, ObjectSendWarn macro should be used.

ObjectSendUpdateWarning

Same as ObjectSendUpdate(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED ObjectSendUpdateWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    P_STRING    fn,
    U16         ln
);
```

Comments In general, ObjectSendUpdateWarn macro should be used.

ObjectSendTaskWarning

Same as ObjectSendTask(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED ObjectSendTaskWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task,
    P_STRING    fn,
    U16         ln
);
```

Comments In general, ObjectSendTaskWarn macro should be used.

ObjectSendUpdateTaskWarning

Same as ObjectSendUpdateTask(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectSendUpdateTaskWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjectSendUpdateTaskWarn macro should be used.

ObjectPostWarning

Same as ObjectPost(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjectPostWarn macro should be used.

ObjectPostAsyncWarning

Same as ObjectPostAsync(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostAsyncWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjectPostAsyncWarn macro should be used.

ObjectPostDirectWarning

Same as ObjectPostDirect(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostDirectWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjectPostDirectWarn macro should be used.

ObjectPostTaskWarning

Same as ObjectPostTask(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostTaskWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjectPostTaskWarn macro should be used.

ObjectPostAsyncTaskWarning

Same as ObjectPostAsyncTask(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostAsyncTaskWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjectPostAsyncTaskWarn macro should be used.

ObjectPostDirectTaskWarning

Same as ObjectPostDirectTask(), additionally prints a debugging message if status less than **stsOK**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED ObjectPostDirectTaskWarning(
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    SIZEOF      lenArgs,
    OS_TASK_ID  task,
    P_STRING    fn,
    U16         ln
);
```

Comments

In general, ObjectPostDirectTaskWarn macro should be used.

ObjectWarning

Prints object warning message. Low-level routine.

Returns nothing.

Function Prototype

```
void EXPORTED ObjectWarning(
    P_STRING    label,
    MESSAGE     msg,
    OBJECT      object,
    P_ARGS      pArgs,
    STATUS      sts,
    P_STRING    fn,
    U16         ln
);
```

Debugging Helper Macros (with /DDEBUG)

Conditional macros. Under /DDEBUG generates indirect calls via debugging functions, without /DDEBUG generates direct calls.

The only difference between the Warn() form and the plain form of these calls is that Warn() prints an error message if sts < **stsOK** AND the module was compiled for DEBUG. Use of the Warn() form is strongly encouraged.

ObjectCall

```
#define ObjCallWarn(m,o,p)  ObjectCallWarning(m,o,p,__FILE__,__LINE__)
#define ObjCallNoDebugWarn(m,o,p) \
    ObjectCallNoDebugWarning(m,o,p,__FILE__,__LINE__)
#define ObjCallAncestorCtxWarn(c) \
    ObjectCallAncestorCtxWarning(c,__FILE__,__LINE__)
#define ObjCallAncestorWarn(m,o,p,c) \
    ObjectCallAncestorWarning(m,o,p,c,__FILE__,__LINE__)
```

ObjectSend

```
#define ObjSendWarn(m,o,p,l) ObjectSendWarning(m,o,p,l,__FILE__,__LINE__)
#define ObjSendUpdateWarn(m,o,p,l) \
    ObjectSendUpdateWarning(m,o,p,l,__FILE__,__LINE__)
#define ObjSendTaskWarn(m,o,p,l,t) \
    ObjectSendTaskWarning(m,o,p,l,t,__FILE__,__LINE__)
#define ObjSendUpdateTaskWarn(m,o,p,l,t) \
    ObjectSendUpdateTaskWarning(m,o,p,l,t,__FILE__,__LINE__)
#define ObjSendU32Warn(m,o,p) ObjectSendWarning(m,o,p,0L,__FILE__,__LINE__)
```

ObjectPost

```
#define ObjPostWarn(m,o,p,l) ObjectPostWarning(m,o,p,l,__FILE__,__LINE__)
#define ObjPostAsyncWarn(m,o,p,l) \
    ObjectPostAsyncWarning(m,o,p,l,__FILE__,__LINE__)
#define ObjPostDirectWarn(m,o,p,l) \
    ObjectPostDirectWarning(m,o,p,l,__FILE__,__LINE__)
#define ObjPostTaskWarn(m,o,p,l,t) \
    ObjectPostTaskWarning(m,o,p,l,t,__FILE__,__LINE__)
#define ObjPostAsyncTaskWarn(m,o,p,l,t) \
    ObjectPostAsyncTaskWarning(m,o,p,l,t,__FILE__,__LINE__)
#define ObjPostDirectTaskWarn(m,o,p,l,t) \
    ObjectPostDirectTaskWarning(m,o,p,l,t,__FILE__,__LINE__)
#define ObjPostU32Warn(m,o,p) ObjectPostWarning(m,o,p,0L,__FILE__,__LINE__)
#else // DEBUG
```

Debugging Helper Macros (without /DDEBUG)

ObjectCall

```
#define ObjCallWarn(m,o,p) ObjectCall(m,o,p)
#define ObjCallNoDebugWarn(m,o,p) ObjectCall(m,o,p)
#define ObjCallAncestorCtxWarn(c) ObjectCallAncestorCtx(c)
#define ObjCallAncestorWarn(m,o,p,c) ObjectCallAncestor(m,o,p,c)
```

ObjectSend

```
#define ObjSendWarn(m,o,p,l) ObjectSend(m,o,p,l)
#define ObjSendUpdateWarn(m,o,p,l) ObjectSendUpdate(m,o,p,l)
#define ObjSendTaskWarn(m,o,p,l,t) ObjectSendTask(m,o,p,l,t)
#define ObjSendUpdateTaskWarn(m,o,p,l,t) ObjectSendUpdateTask(m,o,p,l,t)
#define ObjSendU32Warn(m,o,p) ObjectSendU32(m,o,p)
```

ObjectPost

```
#define ObjPostWarn(m,o,p,l) ObjectPost(m,o,p,l)
#define ObjPostAsyncWarn(m,o,p,l) ObjectPostAsync(m,o,p,l)
#define ObjPostDirectWarn(m,o,p,l) ObjectPostDirect(m,o,p,l)
#define ObjPostTaskWarn(m,o,p,l,t) ObjectPostTask(m,o,p,l,t)
#define ObjPostAsyncTaskWarn(m,o,p,l,t) ObjectPostAsyncTask(m,o,p,l,t)
#define ObjPostDirectTaskWarn(m,o,p,l,t) ObjectPostDirectTask(m,o,p,l,t)
#define ObjPostU32Warn(m,o,p) ObjectPost(m,o,p,0L)
#endif // DEBUG
#endif
```

DEBUG.H

This file contains the definitions of some of PenPoint's debugging support.

The functions described in this file are contained in PENPOINT.LIB.

Introduction.

This file contains the definitions of some of PenPoint's debugging support.

One of the most important characteristics of this package is that many of the macros compile into nothing unless the pre-processor variable DEBUG is defined during compilation.

Debugging Flags.

As part of its debugging support, PenPoint includes a collection of debugging flags which allow developers to control the runtime behavior of their programs.

For convenience, the debugging flags are broken into "sets" of 32 one bit flags. In PenPoint 1.0, there are 255 sets; future versions of PenPoint may have more sets. Some sets are reserved for use by PenPoint itself; all other sets are available for use by other developers. The allocation of sets is documented elsewhere in this file.

Setting and Examining Debug Flags.

The debugging flags can be set via the DebugSet environment variable in PenPoint's environ.ini file. The debugging flags can also be set with the "fs" command in the MiniDebugger and DB. (The debugging flags can be examined with the "fl" command.) Both the environ.ini file and the PenPoint debuggers allow the flag sets to be identified with either a or an 8 bit hexadecimal number. See the PenPoint developer's documentation for more information.

Example.

The debugging output in the following fragment appears only if the code was compiled with DEBUG defined and the debug flag is on.

As illustrated in this example, most debugging code should surrounded by some sort of conditional compilation that causes the debugging code to "disappear" when compiled appropriately.

```
if (someCondition) {
    DbgFlag(0x80, 0x1, Debugf("someCondition is TRUE");)
    ...
} else {
    DbgFlag(0x80, 0x1, Debugf("someCondition is FALSE");)
    ...
}
```

Here's an example of setting debugging flags in PenPoint's environ.ini file:

```
...
DebugSet=/DD8000 /DB800
...
```

```
#ifndef DEBUG_INCLUDED
#define DEBUG_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
```

Exported Macros

DbgFlag

Executes an expression under control of a debug flag IF the source is compiled with DEBUG defined.

Returns void..

```
#ifdef DEBUG
#define DbgFlag(f,v,e) if (DbgFlagGet(f, v)) e
#else
#define DbgFlag(f,v,e)
#endif
```

Comments The DbgFlag() macro is used to execute an expression if (1) the source module was compiled with DEBUG defined and (2) if the appropriate debugging flag is turned on at runtime.

Dbg

Used to control the compile-time inclusion of debugging code.

Returns void..

```
#ifdef DEBUG
#define Dbg(x) x
#else
#define Dbg(x)
#endif
```

Comments The Dbg() macro is used to comment out code when the DEBUG flags is undefined. For example, the following code is present if the source file is compiled with DEBUG defined but "disappears" if DEBUG is not defined.

```
Dbg(Debugf("Only shows up in DEBUG version");)
```

ASSERT

Used to verify that some runtime condition is true.

Returns void..

```
#ifdef DEBUG
#define ASSERT(cond, str)    ((void)(!(cond) ? \
        (Debugf("==> ERROR, File: %s, Line: %d ==> %s\n", \
                __FILE__, __LINE__, str)),1: 0))
#else
#define ASSERT(cond, str)
#endif
```

Comments The ASSERT() macro is used to test for conditions and print out a warning if the condition is violated. The code "disappears" if the module is compiled without DEBUG being defined.

See Also assert.h

Exported Functions

Debugf

Prints a formatted string on the debug output device, followed by a newline.

Returns void.

```
void CDECL
Debugf(char* str, ...);
```

Comments Debugf is very similar to the standard C runtime library function printf() except that (1) Debugf directs it output to PenPoint's debug output device and (2) Debugf prints a newline at the end of its output.

Unless surrounded by something Dbg() or DbgFlag(), Debugf does not disappear, even if compiled without DEBUG defined.

Use DPrintf to avoid having the trailing newline printed.

See Also DPrintf

DPrintf

Prints a formatted string on the debug output device.

Returns void.

```
void CDECL
DPrintf(char* str, ...);
```

Comments DPrintf is very similar to the standard C runtime library function printf() except that DPrintf directs it output to PenPoint's debug output device.

Unless surrounded by something Dbg() or DbgFlag(), DPrintf does not disappear, even if compiled without DEBUG defined.

See Also Debugf

DbgFlagSet

Sets the specified flag set to the value of the new flags.

Returns void.

```
void EXPORTED
```

Function Prototype

```
DbgFlagSet(
    U16 set,
    U32 flags);
```

set flag set selector in the range 0..255, inclusive. (Defined as a U16 to allow for possible future expansion.)

flags new values for the flag set.

It is unusual for a program to call this function; most developers should set the value of debugging flags using the techniques described in the introduction of this file rather than executing this function.

Unless surrounded by something Dbg() or DbgFlag(), DbgFlagSet does not disappear, even if compiled without DEBUG defined.

DbgFlagGet

Returns the state of the indicated flag set ANDed with the flags mask.

Returns void.

```
U32 EXPORTED
```

Function Prototype

```
DbgFlagGet(
    U16 set,
    U32 flags);
```

set flag set selector in the range 0..255, inclusive. (Defined as a U16 to allow for possible future expansion.)

flags flags mask

Unless surrounded by something Dbg() or DbgFlag(), DbgFlagGet does not disappear, even if compiled without DEBUG defined.

Debugging Flag Set Allocations

```
Not to be used by anyone (interferes with parsing process):
   0x00
   0x09
   0x0A
   0x0D
   0x1A
   0x20

Reserved for use outside of GO:
   Lower case alphabet, except f, h, i, s, and z.
   0x30 .. 0x39  digits
   0x80 .. 0xBF  half of the upper range

Reserved for use by GO
   'f'
   'h'
   'i'
   'q'
   's'
   'z'
   everything else

Here are the allocations within GO's range. See other header files for
more information on the interpretation of these flags. Most flags only
have effect if you load the debug versions of DLLs.

   'f':  GO Application Developer's Course

   'h':  Hwxtool and Insertion Pads

   'q':  Quick Help

   's':  Hwxtool

   'z':  Xlate

   'A':  Misc. system use.

       A0001:  Print loader information while loading

   'B':  System
```

```
    B0001:  Turns uuid cache tracing on
    B0002:  Enables OEM app/service installation after warm-boot This
            should only be turned on for tablet hardware; never on the
            SDK!
    B0800:  Enables theSelectedVolume disk viewing in Connections

'C':  ClsMgr

'D':  Debug system

    D0001:      disables all DebugStr output
    D0002:      disables StringPrint output
    D0004:      disables System Log output
    D0008:      disables System Log Non Error output
    D0010:      disables System Log App Error output
    D0020:      disables System Log System Error output
    D8000:      writes output to PENPOINT.LOG, file flushed every n chars
                based on the environment variable DebugLogFlushCount.
    D10000:     disables mini-debugger in production version of Penpoint
    D20000:     disables memory statistics gestures (M,N,T) on Bookshelf
    D40000:     disables ^C entering the mini-debugger
    D80000000:  allows logging to log file even if in file system code
                (This may cause deadlocks and is for internal use only).

'E':  Environment flags

'F':  Application Developer's Course

'G':  Kernel

'H':  Service and Service Manager

    H0001:  turns on message tracing in clsService
    H0002:  turns on message tracing in clsServiceMgr
    H8000:  run sanity test in service.dll

'I':  Installers (see instlmgr.h)

'J':  Notebook

'K':  UI Toolkit

'L':  PicSegs and TIFF images

    L0001:  dumps the TIFF image tags.

'M':  misc.lib

    M0001:  tracing in OrderedSetDelete
    M0002:  tracing in OrderedSetFindMinMax & MaxMin
    M0004:  tracing in OrderedSetInsertn
    M0008:  tracing in OrderedSetSearch
    M0100:  write/read debug header&trailer when filing ByteArray

'N':  MiniText

'O':  Outbox (obxserv and oboxsect)

    O0001:  enable automatic activate of outbox Notebook

'P':  Printing

'Q':  text.dll

'R':  Application Framework
```

```
'S':  Spelling, Proof, and XTemplate systems

    S0001:  low-level Spell/Proof debugs
    S0002:  medium-level Spell/Proof debugs
    S0004:  high-level Spell/Proof debugs
    S0010:  XTemplate display inputs
    S0020:  XTemplate display outputs

'T':  text.dll

'U':  undo.dll

'V':  text.dll

'W':  Window system

'X':  xfer.lib

'Y':  TOPS

'Z':  Handwriting

'@':  Bookshelf

'=':  MiniNote/NotePaper

'#':  GWin

'!':  Test Manager

'$':  File System

'%':  UI Toolkit

'*':  Heap Manager

0xC0:  Fax Project

0xC1:  Input

0xC2:  VKey

0xC3:  System Log trace flag

0xC4:  2.0 tools

0xF0:  Memory Tests // Internal use only

0xF1:  Memory Tests // Internal use only

0xFF:  C Runtime Library
```

GO.H

This file contains PenPoint's standard #defines, types and intrinsics. Essentially all PenPoint source files must include this file.

The functions described in this file are contained in PENPOINT.LIB.

```
#ifndef GO_INCLUDED
#define GO_INCLUDED
```

Standard Definitions

Static Declarations

Functions declared STATIC (rather than static) will, when compiled with DEBUG defined, appear in map files.

```
#ifndef DEBUG
  #define STATIC        static
#else
  #define STATIC
#endif
```

Function Scope Definitions

- LOCAL: Scope is module wide
- GLOBAL: Scope is subsystem wide
- EXPORTED: Scope is ring wide (either ring0 OR ring3)
- EXPORTED0: Scope is system wide. For public ring0 functions.
- RINGCHELPER: Scope is system wide. For private ring0 functions.

```
#define LOCAL           STATIC PASCAL
#define GLOBAL          PASCAL
#define EXPORTED        PASCAL
#define EXPORTED0       PASCAL
#define RINGCHELPER     PASCAL
```

Null values

```
#ifndef M_I86           // 32 bit compiler
 #define NULL   0
#else                   // 16 bit compiler
 #define NULL   0L
#endif
#define null            0
#define pNull           ((P_UNKNOWN)0)
#define ppNull          ((PP_UNKNOWN)0)
#define Nil(type)       ((type)0)
```

Boolean operators

```
#define AND             &&
#define OR              ||
#define NOT             !
#define MOD             %
```

Bit flags.

These flags can be used with FlagOn, FlagOff, FlagSet, and FlagClr.

```
#define flag0           (0x0001)
#define flag1           (0x0002)
#define flag2           (0x0004)
#define flag3           (0x0008)
#define flag4           (0x0010)
#define flag5           (0x0020)
#define flag6           (0x0040)
#define flag7           (0x0080)
#define flag8           (0x0100)
#define flag9           (0x0200)
#define flag10          (0x0400)
#define flag11          (0x0800)
#define flag12          (0x1000)
#define flag13          (0x2000)
#define flag14          (0x4000)
#define flag15          (0x8000)
#define flag16          (0x00010000L)
#define flag17          (0x00020000L)
#define flag18          (0x00040000L)
#define flag19          (0x00080000L)
#define flag20          (0x00100000L)
#define flag21          (0x00200000L)
#define flag22          (0x00400000L)
#define flag23          (0x00800000L)
#define flag24          (0x01000000L)
#define flag25          (0x02000000L)
#define flag26          (0x04000000L)
#define flag27          (0x08000000L)
#define flag28          (0x10000000L)
#define flag29          (0x20000000L)
#define flag30          (0x40000000L)
#define flag31          (0x80000000L)
```

Limits

```
#define maxU8           ((U8)0xFF)
#define minS8           ((S8)0x80)
#define maxS8           ((S8)0x7F)
#define maxU16          ((U16)0xFFFF)
#define minS16          ((S16)0x8000)
#define maxS16          ((S16)0x7FFF)
#define maxU32          ((U32)0xFFFFFFFF)
#define minS32          ((S32)0x80000000)
#define maxS32          ((S32)0x7FFFFFFF)
```

Name limits

```
#define maxNameLength   32
#define nameBufLength   (maxNameLength+1)
```

Enums

Different compilers allocate different amounts of space for an enum. To avoid portability problems, use the Enum16 and Enum32 macros. They guarantee that the enum is 16 bits or 32 bits, respectively. Example:

```
Enum16(PRIMARY_COLOR) {
    red,
    green,
    blue
}
```

```
#define Enum16(name) typedef S16 name, * P_##name; enum name
#define Enum32(name) typedef S32 name, * P_##name; enum name
```

Calling Conventions

```
#if defined __WATCOMC__
 #define PASCAL          __pascal
 #define CDECL           __cdecl
 #define Unused(x)       (void)(x)
 #define FunctionPtr(fn) (PASCAL * fn)
 #define CFunctionPtr(fn) (CDECL * fn)
 #if defined __386__
 #pragma aux pascal "^" parm routine []\
   value struct float struct caller [eax] modify [eax ecx edx gs];
 #pragma aux cdecl "_*" parm caller []\
   value struct float struct caller [eax] modify [eax ecx edx gs];
 #endif
#elif defined __HIGHC__
 #define PASCAL          _CC(_REVERSE_PARMS|_CALLEE_POPS_STACK)
 #define CDECL           // Default for the compiler
 #define Unused(x)
 #define FunctionPtr(fn) PASCAL (* fn)
 #define CFunctionPtr(fn) CDECL (* fn)
#else
 #define PASCAL          pascal
 #define CDECL           cdecl
 #define Unused(x)       (void)(x)
 #define FunctionPtr(fn) (* PASCAL fn)
 #define CFunctionPtr(fn) (* CDECL fn)
#endif
```

Typedefs

Unsigned integers

```
typedef unsigned char   U8,  * P_U8,  ** PP_U8;     //  8-bit unsigned
typedef unsigned short  U16, * P_U16, ** PP_U16;    // 16-bit unsigned
#ifndef M_I86           // 32 bit compiler
 typedef unsigned int   U32, * P_U32, ** PP_U32;    // 32-bit unsigned
#else                   // 16 bit compiler
 typedef unsigned long  U32, * P_U32, ** PP_U32;    // 32-bit unsigned
#endif
```

Signed integers

```
typedef signed char     S8,  * P_S8,  ** PP_S8;     //  8-bit signed
typedef signed short    S16, * P_S16, ** PP_S16;    // 16-bit signed
#ifndef M_I86           // 32 bit compiler
 typedef signed int     S32, * P_S32, ** PP_S32;    // 32-bit signed
#else                   // 16 bit compiler
 typedef signed long    S32, * P_S32, ** PP_S32;    // 32-bit signed
#endif
```

Wide characters. In PenPoint 1.0 these are 8 bit values. In PenPoint 2.0 and forward they are 16 bit values.

```
typedef U8              CHAR;
typedef P_U8            P_CHAR;
typedef P_CHAR*         PP_CHAR;
```

8 bit Characters

```
typedef U8              CHAR8;    // These are guaranteed to stay 8-bit
typedef P_U8            P_CHAR8;
typedef P_CHAR8*        PP_CHAR8;
```

16 bit Characters

```
typedef U16             CHAR16;   // These are guaranteed to stay 16-bit
typedef P_U16           P_CHAR16;
typedef P_CHAR16*       PP_CHAR16;
```

Strings

```
typedef U8              STRING;
typedef P_U8            P_STRING;
typedef P_STRING*       PP_STRING;
```

SIZEOF is the type returned by the SizeOf. It is guaranteed to be 32 bits.

```
typedef U32             SIZEOF, * P_SIZEOF;
```

Pointer to an opaque entity

```
typedef void*           P_UNKNOWN;
typedef P_UNKNOWN*      PP_UNKNOWN;
```

Generic pointer to procedure

```
typedef P_UNKNOWN FunctionPtr(P_PROC)();
```

True/False values

```
Enum16(BOOLEAN) {
    FALSE = 0,
    TRUE  = 1,
    False = 0,
    True  = 1,
    false = 0,
    true  = 1
};
```

Intrinsics

```
#define Abs(v)          ((v)<0?(-(v)):(v))
#define Max(a,b)        ((a)>(b)?(a):(b))
#define Min(a,b)        ((a)<(b)?(a):(b))
#define Odd(v)          ((v)&1)
#define Even(v)         (!Odd(v))
#define LowU16(dw)      ((U16)(U32)(dw))
#define HighU16(dw)     ((U16)((U32)(dw)>>16))
#define LowU8(w)        ((U8)(w))
#define HighU8(w)       ((U8)((U16)(w)>>8))
#define MakeU16(lb,hb)  (((U16)(hb)<<8)|(U16)(lb))
#define MakeU32(lw,hw)  (((U32)(hw)<<16)|(U32)(lw))
#define FlagOn(f,v)     (!FlagOff(f,v))
#define FlagOff(f,v)    (!((v)&(f)))
#define FlagSet(f,v)    ((v)|(f))
#define FlagClr(f,v)    ((v)&(~(f)))
#define OutRange(v,l,h) ((v)<(l)||(v)>(h))
#define InRange(v,l,h)  ((v)>=(l)&&(v)<=(h))
#define SizeOf(t)       ((SIZEOF)sizeof(t))
```

Commonly Used Class Manager Types

A variable of type OBJECT identifies an object. The type UID is interchangeable with OBJECT.

A variable of type TAG identifies one of the following:

- Tag
- Message
- Error status (values less than 0)
- Warning status (values greater than or equal to 0)

Well-known UID Structure

A UID is constructed as:

- Version: 7 bits
- Admin: 20 or 19 bits
- Scope: 1 or 2 bits
- Layout:

```
          00000000001111111111222222222233
          01234567890123456789012345678901
          --------------------------------
Name:     0|  Ver | 0|    Admin+Scope
          +-------+-------+-------+-------+
Size:     1|   7   | 3|    20+1 or 19+2
          --------------------------------
```

```
typedef P_UNKNOWN   UID, * P_UID;
typedef UID         OBJECT, * P_OBJECT, ** PP_OBJECT;
```

Well-known UID Macros

Create a well-known UID

```
#define MakeWKN(admin,version,scope) \
    ((UID)((U32)(0x7F&(version))<<24|(U32)(admin)<<1+(scope&1)|scope))
```

Create a well-known UID

```
#define MakeGlobalWKN(admin,version)     MakeWKN(admin,version,wknGlobal)
```

Create a process-global well-known UID

```
#define MakeProcessGlobalWKN(admin,version) \
    MakeWKN(admin,version,wknProcessGlobal)
```

Create a private well-known UID

```
#define MakePrivateWKN(admin,version)    MakeWKN(admin,version,wknPrivate)
```

Extract the admin number plus the scope information

```
#define WKNValue(wkn)    (0x1FFFFF&(U32)wkn)
```

Extract the admin number

```
#define WKNAdmin(wkn)    (WKNValue(wkn)>>1+((U32)wkn&1))
```

Extract the version number

```
#define WKNVer(wkn)      ((U32)(wkn)>>24)
```

Extract the scope

```
#define WKNScope(wkn)    ((U32)(wkn)&-((U32)(wkn)&1)&3)
```

Magic constants

```
#define wknGlobal           0
#define wknProcessGlobal    1
#define wknPrivate          3
```

Tag Structure

Tags are created using a well-known Administered value and a tag number in the range 0-255.

- X: 1 bit. 0 for tag or Warning Status; 1 for an Error Status.
- TagNum: 8 bits
- Flags: 2 bits
- Admin: 20 or 19 bits
- Scope: 1 or 2 bits
- Layout:

```
          00000000001111111111222222222233
          01234567890123456789012345678901
          --------------------------------
   Name:  X| tagNum|F|    Admin+Scope
          +-------+-------+-------+-------+
   Size:  1|   8   |2|    20+1 or 19+2
          --------------------------------
```

```
typedef S32         TAG, * P_TAG;           // Tags are always positive
typedef S32         STATUS, * P_STATUS;
```

Tag Macros

Create a tag

```
#define MakeTag(wkn,tagNum) (((TAG)(tagNum)&0xFF)<<23|WKNValue(wkn))
```

Create a tag with flags

```
#define MakeTagWithFlags(wkn,i,f) (MakeTag(wkn,i)|((U32)(f)&3)<<21)
```

Extract the tag num

```
#define TagNum(tag)      ((U32)(tag)<<1>>24)
#define Tag(tag)         TagNum(tag)
```

Extract the tag num and flags together

```
#define TagAndFlags(tag) ((U32)(tag)<<1>>22)
```

Extract only the tag flags

```
#define TagFlags(tag)    (TagAndFlags(tag)&3)
```

Extract the tag admin

```
#define TagAdmin(tag)    WKNAdmin(tag)
```

Status Macros

Create an error status

```
#define MakeStatus(wkn,sts) ((STATUS)(0x80000000|MakeTag(wkn,sts)))
```

Create a warning status

```
#define MakeWarning(wkn,sts)     ((STATUS)MakeTag(wkn,sts))
```

Extract the status num from a STATUS

```
#define Sts(sts)         Tag(sts)
```

Debugging Macros

```
#define StsRet(se,s)     if (((s) = StsWarn(se)) < stsOK) return s; else
#define StsJmp(se,s,x)   if (((s) = StsWarn(se)) < stsOK) goto x; else
#define StsOK(se,s)      (((s) = StsWarn(se)) >= stsOK)
#define StsFailed(se,s)  (((s) = StsWarn(se)) < stsOK)
#define StsChk(se,s)     (((s) = (se)) < stsOK)
```

Status Printing Macros

StsWarn

Prints status warning message.

Returns nothing.

```
#if defined DEBUG || defined CLSMGR_COMPILE
#define StsWarn(se)      StsWarning(se,__FILE__,__LINE__)
#else // if not DEBUG
#define StsWarn(se)      (se)
#endif // DEBUG
```

Comments — When DEBUG is defined during compilation, the StsWarn macro prints a status warning message if the status is less than **stsOK** (an error). When DEBUG is not defined during compilation, StsWarn simply evaluates its expression.

See Also — StsPrint

StsPrint

Prints status warning message.

Returns nothing.

```
#if defined DEBUG || defined CLSMGR_COMPILE
#define StsPrint(s)      StatusWarning(s,__FILE__,__LINE__)
#else // if not DEBUG
#define StsPrint(s)
#endif // DEBUG
```

Comments — When DEBUG is defined during compilation, the StsPrint macro prints a status warning message regardless of the value of the status. When DEBUG is not defined during compilation, StsPrint does nothing.

See Also — StsWarn

Status Values

```
// Next up: 11
```

Classes used to create generic status values (see uid.h)

```
#define clsGO                   MakeWKN(14,1,wknGlobal)
#define clsOS                   MakeWKN(16,1,wknGlobal)
#define clsGOMath               MakeWKN(162,1,wknGlobal)
```

Values

```
#define stsBadParam             MakeStatus(clsGO, 1)
#define stsNoMatch              MakeStatus(clsGO, 2)
#define stsEndOfData            MakeStatus(clsGO, 3)
#define stsFailed               MakeStatus(clsGO, 4)
#define stsTimeOut              MakeStatus(clsGO, 5)
#define stsRequestNotSupported  MakeStatus(clsGO, 6)
#define stsReadOnly             MakeStatus(clsGO, 7)
#define stsIncompatibleVersion  MakeStatus(clsGO, 8)
#define stsNotYetImplemented    MakeStatus(clsGO, 9)
#define stsOutOfMem             MakeStatus(clsGO, 10)
```

Non-Error Status Values

```
// Next up: 4
#define stsOK               MakeWarning(0, 0)
#define stsRequestDenied    MakeWarning(clsGO, 1)
#define stsRequestForward   MakeWarning(clsGO, 2)   // also stsMessageIgnored
#define stsTruncatedData    MakeWarning(clsGO, 3)
```

GO Math Support

Conceptually these declarations should be in gomath.h. They are defined here instead to ease the load on the compiler symbol tables.

```
typedef S32         FIXED;
typedef FIXED*      P_FIXED;
FIXED PASCAL        FxMakeFixed(S16 whole, U16 frac);
```

MAIN.H

Prototype for main().

```
#ifndef MAIN_INCLUDED
#define MAIN_INCLUDED
#ifndef GO_INCLUDED
  #include <go.h>
#endif
```

Standard main()

Function Prototype

```
U32 CDECL main(S32 argc, CHAR* argv[], U32 instance);
```

UID.H

This contains well-known uids for PenPoint.

```
#ifndef UID_INCLUDED
#define UID_INCLUDED
```

Available for Testing (wknGlobals)

```
#define wknGDTa                 MakeWKN(3,1,wknGlobal)
#define wknGDTb                 MakeWKN(4,1,wknGlobal)
#define wknGDTc                 MakeWKN(5,1,wknGlobal)
#define wknGDTd                 MakeWKN(6,1,wknGlobal)
#define wknGDTe                 MakeWKN(7,1,wknGlobal)
#define wknGDTf                 MakeWKN(8,1,wknGlobal)
#define wknGDTg                 MakeWKN(9,1,wknGlobal)
#define wknGDTh                 MakeWKN(32,1,wknGlobal)
#define wknGDTi                 MakeWKN(45,1,wknGlobal)
#define wknGDTj                 MakeWKN(47,1,wknGlobal)
#define wknGDTk                 MakeWKN(73,1,wknGlobal)
```

Available for Testing (wknProcessGlobals)

```
#define wknLDTa                 MakeWKN(3,1,wknProcessGlobal)
#define wknLDTb                 MakeWKN(4,1,wknProcessGlobal)
#define wknLDTc                 MakeWKN(5,1,wknProcessGlobal)
#define wknLDTd                 MakeWKN(6,1,wknProcessGlobal)
#define wknLDTe                 MakeWKN(7,1,wknProcessGlobal)
#define wknLDTf                 MakeWKN(8,1,wknProcessGlobal)
#define wknLDTg                 MakeWKN(9,1,wknProcessGlobal)
```

Well-known Objects

```
#define objNull                 MakeWKN(0,0,0)

#define clsProcess              MakeWKN(0,1,wknGlobal)
#define clsObject               MakeWKN(1,1,wknGlobal)
#define clsClass                MakeWKN(2,1,wknGlobal)

#define theProcess              MakeWKN(0,1,wknProcessGlobal)

#define clsGO                   MakeWKN(14,1,wknGlobal)
#define clsOS                   MakeWKN(16,1,wknGlobal)
#define clsGOMath               MakeWKN(162,1,wknGlobal)
#define clsMisc                 MakeWKN(112,1,wknGlobal)

#define clsSystem               MakeWKN(174,1,wknGlobal)
#define theSystem               MakeWKN(174,1,wknGlobal)

#define clsInitTask             MakeWKN(433,1,wknGlobal)
#define theSystemInitTask       MakeWKN(431,1,wknGlobal)
#define theThirdPartyInitTask   MakeWKN(432,1,wknGlobal)

#define theBookshelf            MakeWKN(127,1,wknGlobal)
#define theSystemResFile        MakeWKN(172,1,wknGlobal)
#define theMILResFile           MakeWKN(414,1,wknGlobal)

#define theDesktop              MakeWKN(127,1,wknGlobal)    // obsolete
```

Application Framework

```
#define clsApp                  MakeWKN(13,1,wknGlobal)
#define clsAppMgr               MakeWKN(69,1,wknGlobal)
#define clsAppDir               MakeWKN(157,1,wknGlobal)
#define clsAppWin               MakeWKN(159,1,wknGlobal)
#define clsAppWinIcon           MakeWKN(153,1,wknGlobal)
#define clsContainerApp         MakeWKN(121,1,wknGlobal)
#define clsRootContainerApp     MakeWKN(218,1,wknGlobal)
#define clsList                 MakeWKN(10,1,wknGlobal)
#define clsView                 MakeWKN(15,1,wknGlobal)
#define clsEmbeddedWin          MakeWKN(11,1,wknGlobal)
#define clsIconWin              MakeWKN(80,1,wknGlobal)
#define clsGotoButton           MakeWKN(183,1,wknGlobal)
#define clsPowerButtonUI        MakeWKN(458,1,wknGlobal)
#define clsCorkBoardWin         MakeWKN(148,1,wknGlobal)
#define clsMemoryCop            MakeWKN(443,1,wknGlobal)
#define theMemoryCop            MakeWKN(457,1,wknGlobal)
```

Bookshelf

```
#define clsBSApp                MakeWKN(168,1,wknGlobal) // PenPoint internal
#define clsBSMainWin            MakeWKN(167,1,wknGlobal) // PenPoint internal
#define clsBSWin                MakeWKN(359,1,wknGlobal) // PenPoint internal
#define clsBSZTWin              MakeWKN(164,1,wknGlobal) // PenPoint internal
```

Notebook

```
#define clsNBApp                MakeWKN(44,1,wknGlobal)
#define clsNBToc                MakeWKN(136,1,wknGlobal)
#define clsSectApp              MakeWKN(145,1,wknGlobal)
#define clsNBFrame              MakeWKN(92,1,wknGlobal)  // PenPoint internal
#define clsBookmark             MakeWKN(184,1,wknGlobal) // PenPoint internal
#define clsPageControl          MakeWKN(156,1,wknGlobal) // PenPoint internal
#define clsPageWin              MakeWKN(161,1,wknGlobal) // PenPoint internal
#define clsSectMenu             MakeWKN(226,1,wknGlobal) // PenPoint internal
#define clsNBSApp               MakeWKN(284,1,wknGlobal) // PenPoint internal
#define clsNBSMenu              MakeWKN(83,1,wknGlobal)  // PenPoint internal
```

Input

```
#define theInputManager         MakeWKN(17,1,wknGlobal)
#define clsInput                MakeWKN(17,1,wknGlobal)
#define thePen                  MakeWKN(18,1,wknGlobal)
#define clsPen                  MakeWKN(18,1,wknGlobal)
#define theKeyboard             MakeWKN(19,1,wknGlobal)
#define clsKey                  MakeWKN(19,1,wknGlobal)
#define clsAcetateAlign         MakeWKN(90,1,wknGlobal)
```

Hwx Tools

```
#define clsScribble             MakeWKN(20,1,wknGlobal)
#define clsSPaper               MakeWKN(21,1,wknGlobal)
#define clsIP                   MakeWKN(77,1,wknGlobal)
#define clsIPButton             MakeWKN(79,1,wknGlobal)
#define clsGWin                 MakeWKN(219,1,wknGlobal)
#define clsField                MakeWKN(22,1,wknGlobal)
```

Virtual Keyboard

```
#define clsKeyCap               MakeWKN(96,1,wknGlobal)
#define clsKeyboard             MakeWKN(97,1,wknGlobal)
#define theVirtualKeyboard      MakeWKN(199,1,wknGlobal)
#define clsVKeyApp              MakeWKN(198,1,wknGlobal)
#define clsVKeyWin              MakeWKN(132,1,wknGlobal)
```

The System Log Application

```
#define theSystemLog            MakeWKN(46,1,wknGlobal)
#define clsSystemLog            MakeWKN(78,1,wknGlobal)
#define clsSysLogApp            MakeWKN(330,1,wknGlobal)
#define clsTextOut              MakeWKN(39,1,wknGlobal)  // PenPoint internal
```

Quick Help

```
#define theQuickHelpManager     MakeWKN(85,1,wknGlobal)
#ifndef NO_GRANDFATHER
#define theQuickHelp            theQuickHelpManager
#endif
#define clsQuickHelp            MakeWKN(85,1,wknGlobal)
#define clsQHWin                MakeWKN(154,1,wknGlobal)
```

Printing

```
#define clsPrFrame              MakeWKN(279,1,wknGlobal)
#define clsPrint                MakeWKN(280,1,wknGlobal)
#define thePrintManager         MakeWKN(281,1,wknGlobal)
#define clsPrMgr                MakeWKN(281,1,wknGlobal)
#define clsPrintManager         MakeWKN(379,1,wknGlobal)
#define clsPrMargin             MakeWKN(283,1,wknGlobal)
#define clsPrLayout             MakeWKN(397,1,wknGlobal)
```

Battery

```
#define theBatteries            MakeWKN(354,1,wknGlobal)
#define theBattery              MakeWKN(282,1,wknGlobal)
```

HWX

```
#define clsXlate                MakeWKN(23,1,wknGlobal)
#define clsXtract               MakeWKN(98,1,wknGlobal)
#define clsXText                MakeWKN(99,1,wknGlobal)
#define clsXWord                MakeWKN(101,1,wknGlobal)
#define clsXGesture             MakeWKN(102,1,wknGlobal)
#define clsXNumber              MakeWKN(103,1,wknGlobal)
#define clsXGeometric           MakeWKN(104,1,wknGlobal)
#define theHWXProtos            MakeWKN(105,1,wknGlobal)
#define clsHWXProto             MakeWKN(105,1,wknGlobal)
#define clsXTeach               MakeWKN(100,1,wknGlobal)
#define clsXShape               MakeWKN(251,1,wknGlobal)
#define clsGOShape              MakeWKN(252,1,wknGlobal)
#define clsGOShapeService       MakeWKN(253,1,wknGlobal)
#define clsCTShape              MakeWKN(254,1,wknGlobal)
#define clsCTShapeService       MakeWKN(255,1,wknGlobal)
```

File System, etc

```
#define theFileSystem           MakeWKN(62,1,wknGlobal)
#define clsFileSystem           MakeWKN(62,1,wknGlobal)
#define clsDirHandle            MakeWKN(28,1,wknGlobal)
#define clsFileHandle           MakeWKN(29,1,wknGlobal)
#define theVolSearcher          MakeWKN(143,1,wknGlobal)
#define clsVolSearch            MakeWKN(143,1,wknGlobal)
#define clsVolume               MakeWKN(30,1,wknGlobal)
#define clsVolRAM               MakeWKN(49,1,wknGlobal)
#define clsVolMSDisk            MakeWKN(61,1,wknGlobal)
#define clsVolTOPS              MakeWKN(120,1,wknGlobal)
#define theBlockDeviceManager   MakeWKN(412,1,wknGlobal)
#define clsBlockDeviceManager   MakeWKN(412,1,wknGlobal)
#define clsBlockDevice          MakeWKN(413,1,wknGlobal)
#define theSCSIDriver           MakeWKN(31,1,wknGlobal)
#define clsSCSI                 MakeWKN(31,1,wknGlobal)
#define clsSCSISenseCodes       MakeWKN(299,1,wknGlobal)
#define clsATBiosDisk           MakeWKN(302,1,wknGlobal)
#define clsResFile              MakeWKN(285,1,wknGlobal)
#define clsResList              MakeWKN(286,1,wknGlobal)
#define theProcessResList       MakeWKN(12,1,wknProcessGlobal)
#define theBootVolume           MakeWKN(138,1,wknGlobal)
#define theSelectedVolume       MakeWKN(125,1,wknGlobal)
#define theWorkingDir           MakeWKN(10,1,wknProcessGlobal)
#define clsFileHandleAppendOnly MakeWKN(494,1,wknGlobal)
```

Disk Viewer

```
#define clsDiskViewWin          MakeWKN(384,1,wknGlobal)
#define clsDiskInstaller        MakeWKN(385,1,wknGlobal)
#define clsDVBookshelf          MakeWKN(188,1,wknGlobal)
#define clsDiskViewApp          MakeWKN(243,1,wknGlobal) // Penpoint internal
#define clsDVBrowBar            MakeWKN(141,1,wknGlobal) // PenPoint internal
#define clsDVTabButton          MakeWKN(134,1,wknGlobal) // PenPoint internal
#define clsDVIcon               MakeWKN(137,1,wknGlobal) // PenPoint internal
#define clsDVForward            MakeWKN(140,1,wknGlobal) // PenPoint internal
#define clsDVBrowser            MakeWKN(171,1,wknGlobal) // PenPoint internal
#define clsDVIconWin            MakeWKN(144,1,wknGlobal) // PenPoint internal
#define clsDynamicTableMgr      MakeWKN(128,1,wknGlobal)
```

Configuration Notebook

```
#define clsConfigurationApp     MakeWKN(197,1,wknGlobal)
#define theConfigurationBook    MakeWKN(206,1,wknGlobal)
```

Settings NB

```
#define clsSettingsNB           MakeWKN(239,1,wknGlobal)
#define clsSettingsNBAppWin     MakeWKN(150,1,wknGlobal) // PenPoint internal
#define clsInstallUISheet       MakeWKN(117,1,wknGlobal)
#define clsInstallUICard        MakeWKN(256,1,wknGlobal) // PenPoint internal
#define clsInstallUIButton      MakeWKN(209,1,wknGlobal) // PenPoint internal
#define clsInstallUIBrowser     MakeWKN(387,1,wknGlobal) // PenPoint internal
#define clsQuickInstallUI       MakeWKN(142,1,wknGlobal) // PenPoint internal
```

Install Manager classes

```
#define clsInstallMgr           MakeWKN(249,1,wknGlobal)
#define clsCodeInstallMgr       MakeWKN(193,1,wknGlobal)
#define clsAppInstallMgr        MakeWKN(260,1,wknGlobal)
#define clsFontInstallMgr       MakeWKN(268,1,wknGlobal)
#define clsHWXProtoInstallMgr   MakeWKN(177,1,wknGlobal)
#define clsPDictInstallMgr      MakeWKN(428,1,wknGlobal)
#define clsUpgradeApp           MakeWKN(291,1,wknGlobal)
#define clsUpgradeAppMonitor    MakeWKN(292,1,wknGlobal)
```

Install Manager well-known instances

```
#define theInstallManagers      MakeWKN(236,1,wknGlobal)
#define theInstalledHWXProtos   MakeWKN(250,1,wknGlobal)
#define theInstalledGestures    MakeWKN(409,1,wknGlobal)
#define theInstalledApps        MakeWKN(208,1,wknGlobal)
#define theInstalledPDicts      MakeWKN(331,1,wknGlobal)
#define theInstalledPrefs       MakeWKN(332,1,wknGlobal)
#define theInstalledServices    MakeWKN(288,1,wknGlobal)
#define theInstalledFonts       MakeWKN(211,1,wknGlobal)
```

Application Monitor

```
#define clsAppMonitor           MakeWKN(278,1,wknGlobal)
```

Auxilliary Notebook Manager

```
#define clsAuxNotebookMgr       MakeWKN(314,1,wknGlobal)
#define theAuxNotebookMgr       MakeWKN(313,1,wknGlobal)
#define clsIniFileHandler       MakeWKN(398,1,wknGlobal)
#define clsStationeryMenu       MakeWKN(93,1,wknGlobal)  // PenPoint internal
#define theStationeryMenu       MakeWKN(93,1,wknGlobal)  // PenPoint internal
```

Auxilliary Notebooks

```
#define clsHelpNB               MakeWKN(335,1,wknGlobal)
#define clsStationeryNB         MakeWKN(333,1,wknGlobal)
#define clsStationeryBrowWin    MakeWKN(160,1,wknGlobal) // PenPoint internal
#define clsInboxNB              MakeWKN(388,1,wknGlobal)
#define clsOutboxNB             MakeWKN(389,1,wknGlobal)
```

Accessory Pallette

```
#define clsAccessoryPallette    MakeWKN(391,1,wknGlobal)
#define clsAccessoryWin         MakeWKN(396,1,wknGlobal)
#define clsAccessoryAppWin      MakeWKN(440,1,wknGlobal)
```

Service Classes

```
#define clsService              MakeWKN(349,1,wknGlobal)
#define clsMILService           MakeWKN(434,1,wknGlobal)
#define clsServiceMgr           MakeWKN(350,1,wknGlobal)
#define clsServiceInstallMgr    MakeWKN(240,1,wknGlobal)
#define clsPrintSpoolSvc        MakeWKN(363,1,wknGlobal)
#define clsSendableService      MakeWKN(169,1,wknGlobal)
#define clsHWXEngineService     MakeWKN(180,1,wknGlobal)
#define clsOpenServiceObject    MakeWKN(176,1,wknGlobal)
#define clsMILConflictGroupMgr  MakeWKN(415,1,wknGlobal)
#define theServiceResList       MakeWKN(189,1,wknGlobal)
#define theServiceManagers      MakeWKN(237,1,wknGlobal)
```

Service Managers

```
#define theMILDevices              MakeWKN(383,1,wknGlobal)
#define theParallelDevices         MakeWKN(152,1,wknGlobal)
#define theAppleTalkDevices        MakeWKN(308,1,wknGlobal)
#define theSerialDevices           MakeWKN(309,1,wknGlobal)
#define thePrinterDevices          MakeWKN(310,1,wknGlobal)
#define thePrinters                MakeWKN(210,1,wknGlobal)
#define theSendableServices        MakeWKN(24,1,wknGlobal)
#define theTransportHandlers       MakeWKN(25,1,wknGlobal)
#define theLinkHandlers            MakeWKN(26,1,wknGlobal)
#define theHWXEngines              MakeWKN(175,1,wknGlobal)
#define theModems                  MakeWKN(194,1,wknGlobal)
#define theHighSpeedPacketHandlers MakeWKN(439,1,wknGlobal)
#define theFaxIOServices           MakeWKN(217,1,wknGlobal)
```

Service Sample Code

```
#define clsBasicService            MakeWKN(460,1,wknGlobal)
#define clsTestService             MakeWKN(186,1,wknGlobal)
#define clsTestOpenObject          MakeWKN(207,1,wknGlobal)
#define clsTestMILService          MakeWKN(459,1,wknGlobal)
```

Modem Component

```
#define clsModem                   MakeWKN(151,1,wknGlobal)
```

Parallel Port Component

```
#define clsParallelPort            MakeWKN(196,1,wknGlobal)
```

Text Component

```
#define clsText                    MakeWKN(35,1,wknGlobal)
#define clsTextView                MakeWKN(36,1,wknGlobal)
#define clsTextChar                MakeWKN(33,1,wknGlobal)
#define clsTextMarkStore           MakeWKN(34,1,wknGlobal)
#define clsTextBlock               clsText
#define clsTextIP                  MakeWKN(355,1,wknGlobal)
```

Undo Manager

```
#define clsUndo                    MakeWKN(235,1,wknGlobal)
#define theUndoCoordinater         MakeWKN(126,1,wknGlobal)
#define theUndoManager             MakeWKN(11,1,wknProcessGlobal)
```

Windows and Graphics

```
#define clsDrwCtx                  MakeWKN(37,1,wknGlobal)
#define clsSysDrwCtx               MakeWKN(38,1,wknGlobal)
#define clsPixDev                  MakeWKN(40,1,wknGlobal)
#define clsImgDev                  MakeWKN(41,1,wknGlobal)
#define clsWinDev                  MakeWKN(42,1,wknGlobal)
#define clsWin                     MakeWKN(43,1,wknGlobal)
#define theScreen                  MakeWKN(50,1,wknGlobal)
#define theRootWindow              MakeWKN(67,1,wknGlobal)
#define clsBitmap                  MakeWKN(378,1,wknGlobal)
#define clsPicSeg                  MakeWKN(82,1,wknGlobal)
#define clsTiff                    MakeWKN(66,1,wknGlobal)
```

Layout and Tracking

```
#define clsBorder                MakeWKN(135,1,wknGlobal)
#define clsLayout                MakeWKN(53,1,wknGlobal)
#define clsTableLayout           MakeWKN(55,1,wknGlobal)
#define clsCustomLayout          MakeWKN(54,1,wknGlobal)
#define clsTrack                 MakeWKN(12,1,wknGlobal)
```

Toolkit

```
#define clsImageWin              MakeWKN(182,1,wknGlobal)
#define clsFrame                 MakeWKN(56,1,wknGlobal)
#define clsFrameBorder           MakeWKN(337,1,wknGlobal)
#define clsScrollWin             MakeWKN(155,1,wknGlobal)
#define clsScrollWinInnerWin     MakeWKN(338,1,wknGlobal)
#define clsControl               MakeWKN(48,1,wknGlobal)
#define clsCloseBox              MakeWKN(71,1,wknGlobal)
#define clsGrabBox               MakeWKN(266,1,wknGlobal)
#define clsScrollbar             MakeWKN(58,1,wknGlobal)
#define clsLabel                 MakeWKN(75,1,wknGlobal)
#define clsButton                MakeWKN(52,1,wknGlobal)
#define clsMenuButton            MakeWKN(72,1,wknGlobal)
#define clsContentsButton        MakeWKN(192,1,wknGlobal)
#define clsIcon                  MakeWKN(360,1,wknGlobal)
#define clsIconToggle            MakeWKN(124,1,wknGlobal)
#define clsMoveCopyIcon          MakeWKN(361,1,wknGlobal)
#define clsTitleBar              MakeWKN(163,1,wknGlobal)
#define clsTkTable               MakeWKN(68,1,wknGlobal)
#define clsOptionTable           MakeWKN(298,1,wknGlobal)
#define clsContentsTable         MakeWKN(190,1,wknGlobal)
#define clsMenu                  MakeWKN(57,1,wknGlobal)
#define clsShadow                MakeWKN(181,1,wknGlobal)
#define clsPageNum               MakeWKN(74,1,wknGlobal)
#define clsTabBar                MakeWKN(70,1,wknGlobal)
#define clsTabButton             MakeWKN(60,1,wknGlobal)
#define clsOption                MakeWKN(224,1,wknGlobal)
#define clsOptionBook            MakeWKN(191,1,wknGlobal)
#define clsCommandBar            MakeWKN(228,1,wknGlobal)
#define clsCounter               MakeWKN(110,1,wknGlobal)
```

TK Comp

```
#define clsChoice                MakeWKN(59,1,wknGlobal)
#define clsPopupChoice           MakeWKN(297,1,wknGlobal)
#define clsToggleTable           MakeWKN(76,1,wknGlobal)
#define clsIconChoice            MakeWKN(320,1,wknGlobal)
#define clsIconTable             MakeWKN(321,1,wknGlobal)
#define clsListBox               MakeWKN(94,1,wknGlobal)
#define clsListBoxDisplay        MakeWKN(275,1,wknGlobal)
#define clsManager               MakeWKN(244,1,wknGlobal)
#define clsChoiceMgr             MakeWKN(241,1,wknGlobal)
#define clsSelChoiceMgr          MakeWKN(246,1,wknGlobal)
#define clsTextField             MakeWKN(95,1,wknGlobal)
#define clsIntegerField          MakeWKN(294,1,wknGlobal)
#define clsFixedField            MakeWKN(295,1,wknGlobal)
#define clsDateField             MakeWKN(296,1,wknGlobal)
#define theBusyManager           MakeWKN(242,1,wknGlobal)
#define clsBusy                  MakeWKN(242,1,wknGlobal)
#define clsModalFilter           MakeWKN(311,1,wknGlobal)
#define clsNote                  MakeWKN(312,1,wknGlobal)
#define clsNoteBorder            MakeWKN(195,1,wknGlobal)
#define clsStringListBox         MakeWKN(343,1,wknGlobal)
#define clsFontListBox           MakeWKN(344,1,wknGlobal)
#define clsProgressBar           MakeWKN(187,1,wknGlobal)
```

Import/Export

```
#define clsImport               MakeWKN(289,1,wknGlobal)
#define clsExport               MakeWKN(290,1,wknGlobal)
#define theExportManager        MakeWKN(84,1,wknGlobal)
#define clsExportManager        MakeWKN(106,1,wknGlobal)
```

Browser

```
#define clsBrowser              MakeWKN(87,1,wknGlobal)
#define clsBrowWin              MakeWKN(178,1,wknGlobal)
#define clsBrowApp              MakeWKN(179,1,wknGlobal)
#define clsBrowFrame            MakeWKN(221,1,wknGlobal)
#define clsBrowMenu             MakeWKN(261,1,wknGlobal)
#define clsBrowExport           MakeWKN(300,1,wknGlobal)
#define clsBrqwImport           MakeWKN(303,1,wknGlobal)
#define clsBrowRename           MakeWKN(326,1,wknGlobal)
#define clsLuke                 MakeWKN(222,1,wknGlobal) // PenPoint internal
```

Communications

```
#define clsStream               MakeWKN(64,1,wknGlobal)
#define clsSccSio               MakeWKN(351,1,wknGlobal)
#define clsLSio                 MakeWKN(381,1,wknGlobal)
#define clsSioUI                MakeWKN(122,1,wknGlobal)
#define clsFLAP                 MakeWKN(392,1,wknGlobal)
#define clsALAPSerial           MakeWKN(393,1,wknGlobal)
#define clsIconCache            MakeWKN(107,1,wknGlobal)
#define theIconCache            MakeWKN(442,1,wknGlobal)
#define clsWSio                 MakeWKN(123,1,wknGlobal)
#define clsSioTest              MakeWKN(158,1,wknGlobal)
```

Fax Send/Receive Page Service

```
#define clsFaxIOSvc             MakeWKN(271,1,wknGlobal)
```

Search and Replace

```
#define clsSR                   MakeWKN(293,1,wknGlobal)
#define clsSF                   MakeWKN(382,1,wknGlobal) // search frame
#define theSearchManager        MakeWKN(27,1,wknGlobal)
```

Traverse

```
#define clsMark                 MakeWKN(257,1,wknGlobal)
```

Textedit Application

```
#define clsTexteditApp          MakeWKN(356,1,wknGlobal)
#define clsTexteditAppMonitor   MakeWKN(357,1,wknGlobal)
```

Networking

```
#define clsTransport            MakeWKN(88,1,wknGlobal)
#define clsLink                 MakeWKN(394,1,wknGlobal)
#define clsHighSpeedPacket      MakeWKN(438,1,wknGlobal)
#define clsALAPHighSpeed        MakeWKN(417,1,wknGlobal)
#define clsATP                  MakeWKN(89,1,wknGlobal)
#define clsATPHandle            MakeWKN(318,1,wknGlobal)
#define theATPDriver            MakeWKN(319,1,wknGlobal)
#define clsSoftTalk             MakeWKN(119,1,wknGlobal)
```

```
#define theSoftTalkDriver       MakeWKN(86,1,wknGlobal)
#define clsTopsMounter          MakeWKN(116,1,wknGlobal)
#define theTopsMounter          MakeWKN(118,1,wknGlobal)
#define theTopsService          MakeWKN(345,1,wknGlobal)
#define clsTOPS                 MakeWKN(400,1,wknGlobal)
#define theTopsVolumes          MakeWKN(401,1,wknGlobal)
#define theTopsPrinters         MakeWKN(402,1,wknGlobal)
#define theRemoteServices       MakeWKN(403,1,wknGlobal)
```

Selection and Data Transfer

```
#define theSelectionManager     MakeWKN(111,1,wknGlobal)
#define clsSelection            MakeWKN(111,1,wknGlobal)
#define clsXfer                 MakeWKN(139,1,wknGlobal)
#define clsXferList             MakeWKN(322,1,wknGlobal)
#define clsPipe                 MakeWKN(63,1,wknGlobal)  // PenPoint internal
```

Timer

```
#define theTimer                MakeWKN(109,1,wknGlobal)
#define clsTimer                MakeWKN(109,1,wknGlobal)
```

Preferences

```
#define theSystemPreferences    MakeWKN(324,1,wknGlobal)
#define clsPreferences          MakeWKN(323,1,wknGlobal)
#define clsPrefApp              MakeWKN(115,1,wknGlobal)
#define clsPrefSheet            MakeWKN(216,1,wknGlobal)
```

Power Management

```
#define clsPowerButton          MakeWKN(348,1,wknGlobal)
#define thePowerButton          MakeWKN(348,1,wknGlobal)
#define clsPowerMgr             MakeWKN(416,1,wknGlobal)
#define thePowerMgr             MakeWKN(416,1,wknGlobal)
```

Send and Address Book Managers

```
#define clsAddressBook          MakeWKN(346,1,wknGlobal)
#define theAddressBookMgr       MakeWKN(342,1,wknGlobal)
#define theSendManager          MakeWKN(341,1,wknGlobal)
```

Spell Manager

```
#define theSpellManager         MakeWKN(380,1,wknGlobal)
#define clsSpellManager         MakeWKN(200,1,wknGlobal)
#define clsSpellField           MakeWKN(386,1,wknGlobal)
#define theProcessSpellManager  MakeWKN(2,1,wknProcessGlobal)
```

Personal Dictionary

```
#define clsPDict                MakeWKN(328,1,wknGlobal)
#define thePersonalDictionary   MakeWKN(329,1,wknGlobal)
#define clsPDApp                MakeWKN(336,1,wknGlobal) // obsolete
#define clsPDUI                 MakeWKN(336,1,wknGlobal) // Replaces clsPDApp
```

Printer Drivers

```
#define clsPrn                  MakeWKN(201,1,wknGlobal)
#define clsBndPrn               MakeWKN(202,1,wknGlobal)
#define clsEpson                MakeWKN(203,1,wknGlobal)
#define clsPcl                  MakeWKN(204,1,wknGlobal)
#define clsPscript              MakeWKN(205,1,wknGlobal)
#define clsFaxPrn               MakeWKN(245,1,wknGlobal)
#define clsPrnUI                MakeWKN(91,1,wknGlobal)
#define clsRemora               MakeWKN(364,1,wknGlobal)
```

Handwriting Customization

```
#define clsHWCustomFrame        MakeWKN(316,1,wknGlobal)
#define clsPlatoHomeWin         MakeWKN(347,1,wknGlobal)
#define clsPlato26Win           MakeWKN(334,1,wknGlobal)
#define clsPlato26WinKbd        MakeWKN(339,1,wknGlobal)
#define clsPlatoCustomStat      MakeWKN(362,1,wknGlobal)
#define clsPlatoBox             MakeWKN(232,1,wknGlobal)
```

Letter & Gesture Practice

```
#define clsHWLetterFrame        MakeWKN(146,1,wknGlobal)
#define clsHWLetterWin          MakeWKN(170,1,wknGlobal)
#define clsHWLetterKbd          MakeWKN(390,1,wknGlobal)
#define clsHWLetterBkgr         MakeWKN(404,1,wknGlobal)
#define clsHWGestFrame          MakeWKN(147,1,wknGlobal)
#define clsHWGestWin            MakeWKN(410,1,wknGlobal)
#define clsHWGestPracWin        MakeWKN(411,1,wknGlobal)
```

Animator

```
#define clsAnimSPaper           MakeWKN(234,1,wknGlobal)
#define clsAnimSysDc            MakeWKN( 81,1,wknGlobal)
```

Inbox / Outbox /Wrapper

```
#define clsOutboxSectApp        MakeWKN(272,1,wknGlobal)
#define clsOBXService           MakeWKN(352,1,wknGlobal)
#define clsOBXWin               MakeWKN(399,1,wknGlobal)
#define clsIOBXService          MakeWKN(353,1,wknGlobal)
#define clsOBXWrapperApp        MakeWKN(273,1,wknGlobal)
#define clsPrintWrapperApp      MakeWKN(274,1,wknGlobal)
#define clsPrnInstlApp          MakeWKN(395,1,wknGlobal)
#define clsINBXSectApp          MakeWKN(113,1,wknGlobal)
#define clsINBXService          MakeWKN(114,1,wknGlobal)
#define clsINBXWin              MakeWKN(133,1,wknGlobal)
#define clsTPSPSvc              MakeWKN(129,1,wknGlobal)
#define clsTPrnMgr              MakeWKN(130,1,wknGlobal)
#define theTopsPSPManager       MakeWKN(131,1,wknGlobal)
#define clsOBXBrowWin           MakeWKN(149,1,wknGlobal)
#define clsINBOXBrowWin         MakeWKN(173,1,wknGlobal)
#define clsIOBXStatusWin        MakeWKN(212,1,wknGlobal)
#define theOutboxServices       MakeWKN(429,1,wknGlobal)
#define theInboxServices        MakeWKN(430,1,wknGlobal)
```

Mask App

```
#define clsMaskApp              MakeWKN(327,1,wknGlobal)
#define clsMaskAppMonitor       MakeWKN(325,1,wknGlobal)
```

Clock App

```
#define clsClockApp             MakeWKN(165,1,wknGlobal)
#define clsClockLabel           MakeWKN(220,1,wknGlobal)
#define clsClockWin             MakeWKN(223,1,wknGlobal)
```

Note Icon Window (used in Clock App)

```
#define clsNoteIconWin          MakeWKN(166,1,wknGlobal)
```

Miscellaneous

```
#define clsString               MakeWKN(108,1,wknGlobal)
#define clsByteBuf              MakeWKN(185,1,wknGlobal)
```

Test Support

```
#define clsTestNB               MakeWKN(65,1,wknGlobal)
```

The MIL

```
#define theMIL                  MakeWKN(213, 1, wknGlobal)
#define theMILMachineType       MakeWKN(215, 1, wknGlobal)
#define theMILUnitTag           MakeWKN(227, 1, wknGlobal)
```

MIL device ids, and the classes of the MIL services for these devices.

```
#define clsMILBaseDevice        MakeWKN(214, 1, wknGlobal)
#define clsMILInitDevice        MakeWKN(229, 1, wknGlobal)
#define clsMILPowerDevice       MakeWKN(230, 1, wknGlobal)
#define clsMILTimerDevice       MakeWKN(231, 1, wknGlobal)
#define clsMILRealTimeClockDevice   MakeWKN(233, 1, wknGlobal)
#define clsMILInterruptDevice   MakeWKN(238, 1, wknGlobal)
#define clsMILScreenDevice      MakeWKN(247, 1, wknGlobal)
#define clsMILStylusDevice      MakeWKN(248, 1, wknGlobal)
#define clsMILNMIDevice         MakeWKN(258, 1, wknGlobal)
#define clsMILSoundDevice       MakeWKN(259, 1, wknGlobal)
#define clsMILKeyboardDevice    MakeWKN(262, 1, wknGlobal)
#define clsMILAsyncSIODevice    MakeWKN(263, 1, wknGlobal)
#define clsMILParallelPortDevice    MakeWKN(264, 1, wknGlobal)
#define clsMILAppleLAPDevice    MakeWKN(265, 1, wknGlobal)
#define clsMILNVMemDevice       MakeWKN(267, 1, wknGlobal)
#define clsMILSCSIDevice        MakeWKN(269, 1, wknGlobal)
#define clsMILFlashDevice       MakeWKN(270, 1, wknGlobal)
#define clsMILCompressionDevice MakeWKN(276, 1, wknGlobal)
#define clsMILDebugDevice       MakeWKN(277, 1, wknGlobal)
#define clsMILBlockDevice       MakeWKN(287, 1, wknGlobal)
#define clsMILFDiskDevice       MakeWKN(301, 1, wknGlobal)
#define clsMILDisketteDevice    MakeWKN(304, 1, wknGlobal)
#define clsMILFlashDiskDevice   MakeWKN(305, 1, wknGlobal)
#define clsMILMemoryCardDevice  MakeWKN(306, 1, wknGlobal)
#define clsMILHSPacketDevice    MakeWKN(435, 1, wknGlobal)
```

These device Ids may be used for temporary testing of new device types. Code using these device types SHOULD NEVER BE RELEASED.

```
#define clsMILTest1Device       MakeWKN(307, 1, wknGlobal)
#define clsMILTest2Device       MakeWKN(315, 1, wknGlobal)
#define clsMILTest3Device       MakeWKN(317, 1, wknGlobal)
```

Predefined conflict group uids.

```
#define theMILConflictGroup1    MakeWKN(418, 1, wknGlobal)
#define theMILConflictGroup2    MakeWKN(419, 1, wknGlobal)
#define theMILConflictGroup3    MakeWKN(420, 1, wknGlobal)
#define theMILConflictGroup4    MakeWKN(421, 1, wknGlobal)
#define theMILConflictGroup5    MakeWKN(422, 1, wknGlobal)
#define theMILConflictGroup6    MakeWKN(423, 1, wknGlobal)
#define theMILConflictGroup7    MakeWKN(424, 1, wknGlobal)
#define theMILConflictGroup8    MakeWKN(425, 1, wknGlobal)
#define theMILConflictGroup9    MakeWKN(426, 1, wknGlobal)
#define theMILConflictGroup10   MakeWKN(427, 1, wknGlobal)
```

The Connections Notebook

```
#define clsConnectionsUI        MakeWKN ( 365, 1, wknGlobal )
#define clsCNBSheet             MakeWKN ( 366, 1, wknGlobal )
#define clsConnections          MakeWKN ( 367, 1, wknGlobal )
#define clsPrinterView          MakeWKN ( 368, 1, wknGlobal )
#define clsPrinterViewCV        MakeWKN ( 495, 1, wknGlobal )
#define clsColumnView           MakeWKN ( 369, 1, wknGlobal )
#define theConnections          MakeWKN ( 370, 1, wknGlobal )
#define theVolumeServices       MakeWKN ( 371, 1, wknGlobal )
#define thePrinterServices      MakeWKN ( 372, 1, wknGlobal )
#define theConnectionsMenu      MakeWKN ( 441, 1, wknGlobal )
#define clsNetView              MakeWKN ( 373, 1, wknGlobal )
#define clsNetVolumeView        MakeWKN ( 374, 1, wknGlobal )
#define clsNetPrinterView       MakeWKN ( 375, 1, wknGlobal )
#define clsTOPSUI               MakeWKN ( 376, 1, wknGlobal )
#define clsConnectionsUIAppWin  MakeWKN ( 377, 1, wknGlobal )
```

The Databases World

```
#define theDatabases            MakeWKN ( 405, 1, wknGlobal )
#define clsDbService            MakeWKN ( 406, 1, wknGlobal )
#define clsDBConnections        MakeWKN ( 407, 1, wknGlobal )
#define clsDatabasesView        MakeWKN ( 408, 1, wknGlobal )
#define clsDatabasesViewCV      MakeWKN ( 496, 1, wknGlobal )
#define clsTechGnosis           MakeWKN ( 437, 1, wknGlobal )
```

The Hard Disk Installer

```
#define clsHardinst             MakeWKN ( 225, 1, wknGlobal )
#define theHardinst             MakeWKN ( 436, 1, wknGlobal )
```

The Symbolic Debugger

```
#define theDebugger             MakeWKN ( 358, 1, wknGlobal )
#define clsDebugger             MakeWKN ( 358, 1, wknGlobal )
```

The ASP/AFP & AppleTalk Related Defines

```
#define clsASP                      MakeWKN(444,1,wknGlobal)
#define clsASPClient                MakeWKN(445,1,wknGlobal)
#define clsASPServer                MakeWKN(446,1,wknGlobal)
#define clsASPServerSessionHandler  MakeWKN(447,1,wknGlobal)
#define clsVolAFP                   MakeWKN(448,1,wknGlobal)
#define clsAFP                      MakeWKN(449,1,wknGlobal)
#define clsAfpMounter               MakeWKN(450,1,wknGlobal)
#define theAfpMounter               MakeWKN(451,1,wknGlobal)
```

```
#define theSessionHandlers          MakeWKN(452,1,wknGlobal)
#define clsASPClientService         MakeWKN(453,1,wknGlobal)
#define clsASPServerService         MakeWKN(454,1,wknGlobal)
#define theAfpService               MakeWKN(455,1,wknGlobal)
#define theAfpVolumes               MakeWKN(456,1,wknGlobal)
#define clsAFPUI                    MakeWKN(493,1,wknGlobal)
#define clsPcTest                   MakeWKN(497, 1, wknGlobal )
#define thePcTest                   MakeWKN(498, 1, wknGlobal )
#define thePublicFileTypes    MakeWKN(499, 1, wknGlobal )
```

Part 2 / PenPoint Application Framework

APP.H

This file contains the API definition for **clsApp**. The functions described in this file are contained in APP.LIB.

clsApp inherits from **clsObject.**

Provides the standard behavior for a PenPoint application.

Introduction

PenPoint applications rely on **clsApp** to create and display their main window, save state, terminate the application instance, and so on. Every application developer needs to create a descendant of **clsApp** and have the descendant handle a few important messages. See **clsTemplateApp** in \penpoint\sdk\sample\templtap for an example of those messages an application typically must handle.

When the user turns to a document in the notebook, the PenPoint Application Framework creates an application instance to manage that document. Throughout this header file and the rest of our documentation, we use the term "document" to refer to an instance of an application class.

```
#ifndef APP_INCLUDED
#define APP_INCLUDED
#ifndef FS_INCLUDED
#include <fs.h>
#endif
```

Common #defines and typedefs

```
typedef OBJECT APP, *P_APP;
#define AppDebug(v, e) DbgFlag('R', v, e)
```

Well-known Filenames

The Application Framework looks for information and stores document data in a series of well-known filenames. One of these is:

- appResFileName, the application's resource file for its icons, quick help, user interface strings, and so on.

Each document in the Notebook has its own directory, containing a collection of files for the document's data and subdirectories for any embedded documents. These are:

- appDocStateFileName, the resource file for any objects that the document saves. In general, this is called the document's resource file
- appDocResFileName, a resource file for preferences, including print metrics (once they are changed from the defaults) and comments that the user wrote in the "Comments" option sheet
- appDocLinkFileName, the document's saved Reference Buttons and descriptors for what they are linked to

- appActiveDocLinkFileName, a working document of newly created (but not yet saved) Reference Buttons
- appCorkboardDirName, the name of the subdirectory for documents embedded on the document's corkboard
- subdirectories for any other embedded documents.

```
#define appResFileName              "APP.RES"
#define appDocStateFileName         "DOCSTATE.RES"
#define appDocResFileName           "DOC.RES"
#define appDocLinkFileName          "DOC.LNK"
#define appActiveDocLinkFileName    "ACTDOC.LNK"
#define appCorkboardDirName         "CORKBD"
```

Status Codes

These are the status codes returned by **clsApp**.

```
#define stsAppRefused                   MakeStatus(clsApp, 1)
#define stsAppMoveRCAppToCApp           MakeStatus(clsApp, 2)
#define stsAppMoveCAppToInvalid         MakeStatus(clsApp, 3)
#define stsAppCopyRCAppToCApp           MakeStatus(clsApp, 13)
#define stsAppCopyCAppToInvalid         MakeStatus(clsApp, 14)
#define stsAppNotMovable                MakeStatus(clsApp, 4)
#define stsAppNotCopyable               MakeStatus(clsApp, 5)
#define stsAppNotDeletable              MakeStatus(clsApp, 6)
#define stsAppDuplicateName             MakeStatus(clsApp, 7)
#define stsAppBadName                   MakeStatus(clsApp, 17)
#define stsAppNotFound                  MakeStatus(clsApp, 8)
#define stsAppOpened                    MakeStatus(clsApp, 9)
#define stsAppNoSelection               MakeStatus(clsApp, 10)
#define stsAppSelRequestNotSupported    MakeStatus(clsApp, 11)
#define stsAppOutOfMemory               MakeStatus(clsApp, 15)
#define stsAppCrashed                   MakeStatus(clsApp, 16)
#define stsAppOpenFailedSupressError    MakeStatus(clsApp, 18)
#define stsAppErrorStartingDoc          MakeStatus(clsApp, 19)
#define stsAppErrorEmbedPrintApply      MakeStatus(clsApp, 20)
#define stsAppErrorLeftPrintMargin      MakeStatus(clsApp, 21)
#define stsAppErrorRightPrintMargin     MakeStatus(clsApp, 22)
#define stsAppErrorTopPrintMargin       MakeStatus(clsApp, 23)
#define stsAppErrorBottomPrintMargin    MakeStatus(clsApp, 24)
#define stsAppErrorHeaderPrintMargin    MakeStatus(clsApp, 25)
#define stsAppErrorFooterPrintMargin    MakeStatus(clsApp, 26)
```

Document States

A document can be in one of three states. When the user opens a document, its state becomes **appOpened**. Once the user closes it, the document's state can be either **appTerminated** or **appActivated**.

There are conditions when, after the user closes a document, the document's objects needs to stay around (and not be freed). Such conditions include when the document's access speed is set to accelerated (a.k.a., "hot mode") and when the document owns the selection. If a document is closed but needs to stay active, its state is set to **appActivated**. If there is no reason to keep a document around after it has been closed, its state becomes **appTerminated** (and the document is freed soon thereafter).

You can specify additional conditions for keeping a closed document active by handling **msgAppTerminateOK**. See the description of this message for further details.

```
#define appTerminated       0   // closed doc, on its way to being freed
#define appActivated        1   // closed doc, with a reason to stay active
#define appOpened           2   // opened doc
```

App toggle

These are toggles used as parameters to various messages.

```
#define appOff          0
#define appOn           1
#define appToggle       2
```

Printing Flags

The Application Framework uses these flags when opening a document to print it and its embedded documents. The typical application developer does not need to use these flags. However, if you open your own embedded documents, you should never pass on **appPrintingTopLevel** to them (even if you were opened with **appPrintingTopLevel** set).

```
#define appPrinting         ((U16)flag0)
#define appPrintingTopLevel ((U16)flag1)
```

App Flags

This structure defines the application flags. They include the state of the document (see Document States above) and other common booleans. This structure is used in APP_METRICS and by APP_DIR_FLAGS (defined in appdir.h).

```
typedef struct APP_FLAGS {
    U16     state           : 2;    // Document state.
    U16     hotMode         : 1;    // True = app is in hot mode.
    U16     floating        : 1;    // True = app is floating.
    U16     printing        : 1;    // True = app is printing.
    U16     topLevel        : 1;    // True = app is printing as top level.
    U16     reserved1       : 10;   // Reserved.
    U16     reserved2       : 16;   // Reserved.
} APP_FLAGS, *P_APP_FLAGS;
```

App Metrics

This structure defines the public instance data for **clsApp**. You get a copy of this structure when you send **msgAppGetMetrics** to an application object. The fields of APP_METRICS are as follows:

uuid: The document's uuid. It is stamped as an attribute on the document directory (see appdir.h). You can pass a document's uuid to **clsDirHandle** or **clsAppDir** in **msgNew** to create a handle to the document directory.

dir: An instance of **clsAppDir**. It is the handle to the filesystem directory for a document.

parent: An instance of **clsApp**. A document's parent is the document that activated it (see appmgr.h - **msgAppMgrActivate**). If the user opens a document from the Notebook, the Notebook is the parent. If the opened document is embedded within another document, its parent is the embeddor.

children: An instance of **clsObject**. This represents a list of the documents that this document activated. There is often a one-to-one correspondence between a document's children and its embedded documents.

mainWin: The document's main window. If this field is **objNull** when a document receives **msgAppInit**, the document self sends **msgAppProvideMainWin** to create one.

floatingWins: An instance of **clsList**. It is the list of subordinate windows that are floating above a document (e.g., option sheets). See **msgAppAddFloatingWin** and **msgAppRemoveFloatingWin** for more info.

childAppParentWin: The preferred parent window for embedded documents.

resList: An instance of **clsResList**. It is list of **clsResFile** objects. The default list consists of (1) a document resource file, (2) an application resource file, (3) a preference resource file, and (4) the system resource file. See resfile.h for more details.

resFile: The document's resource file (the same one as in the **resList**).

flags: Various flags for the document. See the discussion of APP_FLAGS given above.

```
typedef struct APP_METRICS {
    UUID        uuid;                   // App uuid.
    OBJECT      dir;                    // App directory.
    OBJECT      parent;                 // Parent app.
    OBJECT      children;               // Child apps observe this object.
    OBJECT      mainWin;                // App main window.
    OBJECT      floatingWins;           // List of floating windows.
    OBJECT      childAppParentWin;      // Root of child app window tree.
    OBJECT      resList;                // Resource file list.
    OBJECT      resFile;                // Document resource file.
    U32         reserved[2];            // Reserved.
    APP_FLAGS   flags;                  // Flags.
} APP_METRICS, *P_APP_METRICS;
```

Enabling and Disabling SAMs

In its handler for **msgAppCreateMenuBar**, **clsApp** creates several menus and menu items that are part of PenPoint's standard user interface. These menus and items are known collectively as PenPoint's Standard Application Menus," or "SAMs" for short. The SAMs are identified by tags in apptag.h and are described in the PenPoint User Interface Design Reference.

In many cases, descendants of **clsApp** should be involved in deciding when the SAM menu items should be enabled or disabled. Sometimes a descendant should completely remove an item from the SAM.

To enable and disable the SAM items, **clsApp** handles **msgControlProvideEnable** (see control.h for a description this message). Specifically, **clsApp**:

- Always enables:

  ```
  tagAppMenuPrintSetup
  tagAppMenuAbout
  tagAppMenuCheckpoint
  tagAppMenuRevert
  tagAppMenuSearch
  tagAppMenuSpell
  ```

- Enables this if **theUndoManager** has transactions to undo (see undo.h):

  ```
  tagAppMenuUndo
  ```

- Asks the appropriate mananger to enable or disable:

  ```
  tagAppMenuPrint
  tagAppMenuSend
  ```

- Always disables:

  ```
  tagAppMenuSelectAll
  any unrecognized tag
  ```

Here are some examples of how descendants might want to modify the SAMs or respond to **msgControlProvideEnable**:

- Most applications should support all of the features in the SAMs. (That's why they're part of PenPoint's standard UI.) But for a variety of reasons, some applications won't support some

standard PenPoint features. These applications should remove the menu item from the SAMs in their handler for **msgAppCreateMenuBar**. (See **msgAppCreateMenuBar** below.) Menu items that might not be supported include:

```
tagAppMenuPrintSetup
tagAppMenuSearch
tagAppMenuSpell
tagAppMenuUndo
tagAppMenuPrint
tagAppMenuSend
```

- Applications should handle **msgControlProvideEnable** and return false if there's no data in the application, true otherwise, for:

```
tagAppMenuSelectAll
```

Selection owners should respond to **msgControlProvideEnable** for **tagAppMenuMove**, **tagAppMenuCopy** and **tagAppMenuDelete**. Here are some notes on the proper response.

- If there is no data selected, then all three items should be disabled.
- If the application data is read-only, Move and Delete should be disabled.
- In most other cases, the item should be enabled.

Messages

msgNew

Creates and initializes a new document.

Takes P_APP_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct APP_NEW_ONLY {
    FS_LOCATOR  locator;        // Document's location in the filesystem.
    OBJECT      winDev;         // Window device.
    BOOLEAN     appMonitor;     // True if app monitor instance.
    U16         reserved1;      // Reserved.
    U32         reserved2[4];   // Reserved.
} APP_NEW_ONLY, *P_APP_NEW_ONLY;
#define appNewFields    \
    objectNewFields     \
    APP_NEW_ONLY        app;
typedef struct APP_NEW {
    appNewFields
} APP_NEW, *P_APP_NEW;
```

Comments

clsApp initializes the new document's instance data to default values.

You should never send **msgNew** directly to **clsApp** or its descendants. Sending **msgNew** is not sufficient to create a viable document. The document must have its own process and directory, which **msgNew** does not create. To create a viable document, send **msgAppMgrCreate** (or **msgAppMgrCopy**) followed by **msgAppMgrActivate** to the app's application manager. (Remember that the application manager's uid is the well-known uid for the application class.)

Descendants: You should never handle **msgNew** directly. Instead, handle **msgInit** by initializing your instance data. The ancestor must be called before your **msgInit** handler.

msgNewDefaults

Initializes an APP_NEW structure to default values.

Takes P_APP_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct APP_NEW {
    appNewFields
} APP_NEW, *P_APP_NEW;
```

Comments

Zeroes out **pArgs**->app.

Descendants: You should handle **msgNewDefaults** by initializing your _NEW structure to default values. The ancestor must be called before your handler.

msgFree

Destroys a document.

Takes nothing, returns STATUS.

Comments

The document frees its instance data, its children, its main window, and any option sheets it has created. Its final step is to kill its process, which means that flow of control never returns from this message handler.

Descendants: You should handle **msgFree** by destroying all objects and resources you have created. The ancestor must be called after your handler.

msgFreeOK

Checks to see if a document and its children are willing to be freed.

Takes nothing, returns STATUS.

Comments

This message is self sent as a result of **msgDestroy** being sent to the document.

A document can be freed if it can be terminated (see above description of Document States). To determine if it can be terminated, the document self sends **msgAppTerminateOK**; if this message returns **stsOK**, the document then sends **msgFreeOK** to each active child document (those on the metrics.children list). If all of the children return **stsOK**, then the document can be terminated.

Descendants: You normally do not handle this message. Instead, handle **msgAppTerminateOK**.

Return Value

stsOK If the document can be terminated.

stsAppRefused If the document should not be terminated.

msgAppActivate

Activates a document and its children.

Takes nothing, returns STATUS.

```
#define msgAppActivate                  MakeMsg(clsApp, 1)
```

Comments

This message prepares an application to receive such requests as becoming available to the user (**msgAppOpen**) and searching for some data (**msgAppSearch**).

Descendants: You normally do not handle this message.

msgAppInit

Creates a document's default data file and main window.

Takes DIR_HANDLE, returns STATUS.

```
#define msgAppInit                    MakeMsg(clsApp, 2)
```

Comments This message is sent the first time a document is activated. It performs one-time initializations.

If the main window is **objNull**, the document creates the main window by self sending **msgAppProvideMainWin**. If **childAppParentWin** is **objNull**, the document sets it to be the main window. The document also sets the main window title by self sending **msgAppGetName**, followed by **msgAppSetName**.

Descendants: You should handle this message by performing one-time initializations. This typically means creating any stateful objects that will be filed. The ancestor should be called before your handler.

msgAppRestore

Restores a document from its saved instance data.

Takes nothing, returns STATUS.

```
#define msgAppRestore                 MakeMsg(clsApp, 3)
```

Comments The document opens its resource file (**appDocStateFileName**), reads its instance data, and closes the file. When it receives **msgRestore**, the document reads its main window from the file.

Descendants: You normally do not handle this message. Instead, you should handle **msgRestore** (which is sent as a result of this message).

msgAppRestoreFrom

Restores a document from a specified directory.

Takes DIR_HANDLE, returns STATUS.

```
#define msgAppRestoreFrom             MakeMsg(clsApp, 4)
```

Comments This message is just like **msgAppRestore**, except the document opens the resource file (**appDocStateFileName**) located in DIR_HANDLE.

Descendants: You normally do not handle this message. Instead, you should handle **msgRestore** (which is sent as a result of this message).

msgAppSave

Saves a document to its working directory.

Takes nothing, returns STATUS.

```
#define msgAppSave                    MakeMsg(clsApp, 5)
```

Comments The document self sends **msgAppSaveChildren** to save its children. Next, the document opens its resource file (**appDocStateFileName**), writes its instance data, and closes the file. The document also saves its link file. When it receives **msgSave**, the document writes its main window to the file.

Descendants: You normally do not handle this message. Instead, you should handle **msgSave** to save your instance data.

msgAppSaveTo

Saves a document to a specified directory.

Takes DIR_HANDLE, returns STATUS.

```
#define msgAppSaveTo                    MakeMsg(clsApp, 6)
```

Comments

This message is just like **msgAppSave**, except the document opens the resource file (**appDocStateFileName**) located in DIR_HANDLE.

Descendants: You normally do not handle this message. Instead, you should handle **msgSave** to save your instance data.

msgAppSaveChildren

Saves a document's children.

Takes nothing, returns STATUS.

```
#define msgAppSaveChildren              MakeMsg(clsApp, 7)
```

Comments

The document self sends **msgAppSaveChild** to save each child document.

Descendants: You normally do not handle this message.

msgAppSaveChild

Saves the specified child document.

Takes APP, returns STATUS.

```
#define msgAppSaveChild                 MakeMsg(clsApp, 97)
```

Comments

The document sends **msgAppSave** to APP.

Descendants: You normally do not handle this message.

msgAppOpen

Opens a document's main window.

Takes P_APP_OPEN, returns STATUS.

```
#define msgAppOpen                      MakeMsg(clsApp, 8)
```

Arguments

```
typedef struct APP_OPEN {
    OBJECT      parentWin;          // Document's parent window.
    OBJECT      childAppParentWin;  // out: Parent window for child apps.
    U16         printing;           // in:  See printing flags.
} APP_OPEN, *P_APP_OPEN;
```

Comments

If the document's main window has not been sized, the document sets it to the default size. It also updates the 'parentWin' and 'childAppParentWin' fields in the application metrics. The document then sets its state to **appOpened** and self sends **msgAppOpenChildren** to open its child documents.

This message is sent to the document when it is to be made available to the user for direct interaction.

Descendants: You should handle this message by creating any non-stateful objects that are necessary to display the document's UI. You should also fill in 'childAppParentWin' - normally with the document's client window.

You typically create the menu bar in response to this message. Self send **msgAppCreateMenuBar** to create the menu bar, and then send **msgFrameSetMetrics** to your main window to insert the menu bar in the window.

If you can't open the document, you should return **stsFailed**. However, if you have already displayed an error message to the user, then return **stsAppOpenFailedSupressError**.

The ancestor should be called after your handler.

msgAppClose

Closes a document's main window.

Takes nothing, returns STATUS.

```
#define msgAppClose                    MakeMsg(clsApp, 9)
```

Comments

The document extracts its main window from the window tree. It then sets the 'parentWin' field in the application metrics to **objNull** and sets its state to **appActivated**. To close its children, it self sends **msgAppCloseChildren**.

Descendants: You should handle this message by destroying any objects that you created in **msgAppOpen**. If you created the menu bar in your **msgAppOpen** handler, then you should send **msgFrameDestroyMenuBar** to your main window. The ancestor should be called before your handler.

This message is not an indication to terminate the document; it may be followed by other requests for services such as searching or re-opening.

msgAppSetMainWin

Specifies a document's main window.

Takes WIN, returns STATUS.

```
#define msgAppSetMainWin               MakeMsg(clsApp, 10)
```

Comments

The document updates its metrics.**mainWin** field to point to **pArgs**. It does not destroy the existing **mainWin**.

Descendants: You normally do not handle this message.

msgAppSetChildAppParentWin

Specifies the window that is used as the parent window for child documents.

Takes WIN, returns STATUS.

```
#define msgAppSetChildAppParentWin     MakeMsg(clsApp, 11)
```

Comments

Descendants: You normally do not handle this message.

msgAppGetMetrics

Passes back a copy of the application metrics.

Takes P_APP_METRICS, returns STATUS.

```
#define msgAppGetMetrics               MakeMsg(clsApp, 12)
```

Message Arguments

```
typedef struct APP_METRICS {
    UUID        uuid;                  // App uuid.
    OBJECT      dir;                   // App directory.
    OBJECT      parent;                // Parent app.
```

```
    OBJECT      children;               // Child apps observe this object.
    OBJECT      mainWin;                // App main window.
    OBJECT      floatingWins;           // List of floating windows.
    OBJECT      childAppParentWin;      // Root of child app window tree.
    OBJECT      resList;                // Resource file list.
    OBJECT      resFile;                // Document resource file.
    U32         reserved[2];            // Reserved.
    APP_FLAGS   flags;                  // Flags.
} APP_METRICS, *P_APP_METRICS;
```

Comments

Descendants: You normally do not handle this message.

msgAppDispatch

Starts message dispatching.

Takes nothing, returns STATUS.

```
#define msgAppDispatch                  MakeMsg(clsApp, 13)
```

Comments

Descendants: You normally do not handle this message.

msgAppRename

Renames a document.

Takes P_STRING, returns STATUS.

```
#define msgAppRename                    MakeMsg(clsApp, 14)
```

Comments

After **msgAppRename** is sent to the document, the Application Framework sends **msgAppSetName** to change the document's window title.

Descendants: You normally do not handle this message. Instead, you might want to handle **msgAppSetName**.

msgAppSetName

Specifies a document's displayed name (in its main window title).

Takes P_STRING, returns STATUS.

```
#define msgAppSetName                   MakeMsg(clsApp, 15)
```

Comments

This message does not actually rename the document; it only sets the title of the document's main window. This message is sent to a document after it receives **msgAppRename**, which does rename the document.

Descendants: You can handle this message by changing or adding to the string passed in. The ancestor will take the new string and display it in the document's title. The ancestor must be called after your handler.

msgAppGetName

Passes back a document's name.

Takes P_STRING, returns STATUS.

```
#define msgAppGetName                   MakeMsg(clsApp, 16)
```

Comments

The document passes back its name (not its main window's title). Note that P_STRING must be **nameBufLength** long.

Descendants: You normally do not handle this message.

msgAppDelete

Deletes a document from the system.

Takes nothing, returns STATUS.

```
#define msgAppDelete                    MakeMsg(clsApp, 17)
```

Comments

The document deletes its **appWin** from its embeddor and sends **msgAppMgrDelete** to the document's class.

Descendants: You normally do not handle this message.

Return Value

stsAppRefused If metrics.flags.deletable is false.

msgAppActivateChildren

Activates a document's embedded documents.

Takes nothing, returns STATUS.

```
#define msgAppActivateChildren          MakeMsg(clsApp, 18)
```

Comments

The document first activates the embedded documents that are stored in subdirectories of metrics.dir by self sending **msgAppActivateChild** for each child. It then self sends **msgAppActivateCorkMarginChildren** to activate the embedded documents that appear in the cork margin.

Descendants: You normally do not handle this message.

msgAppActivateCorkMarginChildren

Activates embedded documents that are in a document's cork margin.

Takes nothing, returns STATUS.

```
#define msgAppActivateCorkMarginChildren    MakeMsg(clsApp, 96)
```

Comments

The document self sends **msgAppActivateChild** for each embedded document in the cork margin.

Descendants: You normally do not handle this message.

msgAppActivateChild

Instantiates and activates an embedded document.

Takes P_APP_ACTIVATE_CHILD, returns STATUS.

```
#define msgAppActivateChild             MakeMsg(clsApp, 19)
```

Arguments

```
typedef struct APP_ACTIVATE_CHILD {
    P_STRING    pPath;          // Path of child relative to self.
    APP         uid;            // out: Child app uid.
} APP_ACTIVATE_CHILD, *P_APP_ACTIVATE_CHILD;
```

Comments

This message sends **msgAppMgrActivate** to activate the specified embedded document.

Descendants: You normally do not handle this message.

Return Value

stsAppRefused If the child **appDir.attrs.flags.disabled** is true (see appdir.h).

msgAppAddFloatingWin

Adds a window to a document's list of floating windows.

Takes WIN, returns STATUS.

```
#define msgAppAddFloatingWin            MakeMsg(clsApp, 20)
```

Comments

Descendants: You normally do not handle this message.

msgAppRemoveFloatingWin

Removes a window from a document's list of floating windows.

Takes WIN, returns STATUS.

```
#define msgAppRemoveFloatingWin         MakeMsg(clsApp, 21)
```

Comments

Descendants: You normally do not handle this message.

msgAppFindFloatingWin

Finds the floating window on a document's list of floating windows that matches the specified tag.

Takes P_APP_FIND_FLOATING_WIN, returns STATUS.

```
#define msgAppFindFloatingWin           MakeMsg(clsApp, 22)
```

Arguments

```
typedef struct APP_FIND_FLOATING_WIN {
    TAG         tag;    // in: tag to find.
    OBJECT      win;    // out: matching window, or objNull if not found.
} APP_FIND_FLOATING_WIN, *P_APP_FIND_FLOATING_WIN;
```

Comments

Descendants: You normally do not handle this message.

Return Value

stsOK If the floating window is found

stsNoMatch If the floating window cannot be found

msgAppGetRoot

Passes back a document's root document (which is typically the Notebook).

Takes P_APP, returns STATUS.

```
#define msgAppGetRoot                   MakeMsg(clsApp, 23)
```

Comments

Descendants: You normally do not handle this message.

msgAppSetParent

Specifies a document's parent document.

Takes APP, returns STATUS.

```
#define msgAppSetParent                 MakeMsg(clsApp, 24)
```

Comments

Descendants: You normally do not handle this message.

msgAppSetHotMode

Turns hot mode on or off for a document.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSetHotMode                MakeMsg(clsApp, 25)
```

Comments Descendants: You normally do not handle this message.

msgAppSetReadOnly

Specifies a docuement's read only flag.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSetReadOnly               MakeMsg(clsApp, 26)
```

Comments Descendants: You normally do not handle this message.

msgAppSetDeletable

Specifies a document's deletable flag.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSetDeletable              MakeMsg(clsApp, 27)
```

Comments Descendants: You normally do not handle this message.

msgAppSetMovable

Specifies a document's movable flag. Not implemented.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSetMovable                MakeMsg(clsApp, 28)
```

See Also **msgAppDirSetFlags**

msgAppSetCopyable

Specifies a document's copyable flag. Not implemented.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSetCopyable               MakeMsg(clsApp, 29)
```

See Also **msgAppDirSetFlags**

msgAppTerminate

Terminates a document.

Takes BOOLEAN, returns STATUS.

```
#define msgAppTerminate                 MakeMsg(clsApp, 30)
```

Comments If true is passed in, the document is given the chance to veto the termination. It does this by self sending **msgFreeOK** to see if it is okay to free the document. If it is okay, the document saves itself by self sending **msgAppSave**, and then frees itself by self sending **msgDestroy**.

If false is passed in, the document is not given the chance to veto. The document terminates itself and all of its children unconditionally.

Descendants: You normally do not handle this message. This message is a request, not a command, to terminate. It may be sent ANY number of times while a document is active. If you need to free objects when a document is terminated, you should handle **msgFree**. Furthermore, if you want to add conditions under which a document should not be terminated, handle **msgAppTerminateOK**.

msgAppOpenChildren

Opens all of the documents on a document's metrics.children list.

Takes BOOLEAN, returns STATUS.

```
#define msgAppOpenChildren              MakeMsg(clsApp, 31)
```

Comments

If false is passed in, the document opens its child documents on screen by self sending **msgAppOpenChild** for each child.

If true is passed in, it opens its child documents for printing as embedded documents.

Descendants: You normally do not handle this message.

msgAppOpenChild

Opens a specific child of a document.

Takes APP_OPEN_CHILD, returns STATUS.

```
#define msgAppOpenChild                 MakeMsg(clsApp, 32)
```

Arguments

```
typedef struct APP_OPEN_CHILD {
    OBJECT      app;                // Document to open.
    U16         printing;           // See printing flags.
} APP_OPEN_CHILD, *P_APP_OPEN_CHILD;
```

Comments

Opens the specified child document by creating a window for it and then sending it **msgAppOpen**.

Descendants: You normally do not handle this message.

msgAppCloseChildren

Closes a document's children.

Takes nothing, returns STATUS.

```
#define msgAppCloseChildren             MakeMsg(clsApp, 89)
```

Comments

The document self sends **msgAppCloseChild** for each of its child documents.

Descendants: You normally do not handle this message.

msgAppCloseChild

Closes a specific child of a document.

Takes APP, returns STATUS.

```
#define msgAppCloseChild                MakeMsg(clsApp, 90)
```

Comments

The document closes the specified child document by sending it **msgAppClose**.

Descendants: You normally do not handle this message.

msgAppGetEmbeddor

Passes back a document's direct parent in the file system heirarchy.

Takes P_APP, returns STATUS.

```
#define msgAppGetEmbeddor                MakeMsg(clsApp, 33)
```

Comments

The document finds its direct parent in the filesystem and passes back a pointer to it in P_APP. If the parent is not active, P_APP is set to null.

Descendants: You normally do not handle this message.

msgAppTerminateOK

Checks if a document is willing to terminate.

Takes nothing, returns STATUS.

```
#define msgAppTerminateOK                MakeMsg(clsApp, 34)
```

Comments

The document self sends this message as a result of **msgAppTerminate**(true). The document refuses if: (1) the document is opened, (2) the document is in hot mode, or (3) the document or any object in the document owns the selection.

Descendants: You should handle this message if you have your own conditions under which to veto document termination. Typically you call the ancestor first. If the ancestor returns **stsAppRefused**, then you also return this value. However, if your ancestor returns **stsOK**, you check for your veto conditions and return either **stsOK** or **stsAppRefused**.

Return Value

stsOK If the document can be terminated.

stsAppRefused If the document should not be terminated.

msgAppGetEmbeddedWin

Finds the specified **clsEmbeddedWin** object within a document.

Takes P_APP_GET_EMBEDDED_WIN, returns STATUS.

```
#define msgAppGetEmbeddedWin             MakeMsg(clsApp, 35)
```

Arguments

```
typedef struct APP_GET_EMBEDDED_WIN {
    UUID    uuid;       // in: embedded win's uuid.
    OBJECT  win;        // out: embedded win. Set to objNull if no match.
} APP_GET_EMBEDDED_WIN, *P_APP_GET_EMBEDDED_WIN;
```

Comments

The document recursively enumerates its children, searching for a **clsEmbeddedWin** object with a matching **embeddedWinMetrics.uuid** (see embedwin.h).

Descendants: You should handle this message only if you are managing embedded windows that are not in the main window's window tree. Typically you call the ancestor first. If the ancestor passes back a non-null win, then you don't need to do anything. However, if the ancestor passes back **objNull** for the win, you should check for a **clsEmbeddedWin** with a matching uuid.

msgAppGetAppWin

Finds a **clsAppWin** object within a document.

Takes P_APP_GET_APP_WIN, returns STATUS.

```
#define msgAppGetAppWin                  MakeMsg(clsApp, 36)
```

Arguments

```
typedef struct APP_GET_APP_WIN {
    UUID    uuid;       // in: app win's uuid.
    OBJECT  win;        // out: app win. Set to objNull if no match.
} APP_GET_APP_WIN, *P_APP_GET_APP_WIN;
```

Comments

The document recursively enumerates its children, searching for a **clsAppWin** object with a matching **appWinMetrics.appUUID** (see appwin.h).

Descendants: You should handle this message only if you are managing embedded windows that are not in the main window's window tree. Typically you call the ancestor first. If the ancestor passes back a non-null win, then you don't need to do anything. However, if the ancestor passes back **objNull** for the win, you should check for a **clsAppWin** with a matching uuid.

msgAppOwnsSelection

Tests if any object in a document owns the selection.

Takes P_APP_OWNS_SELECTION, returns STATUS.

```
#define msgAppOwnsSelection             MakeMsg(clsApp, 37)
```

Arguments

```
typedef struct APP_OWNS_SELECTION {
    BOOLEAN     checkChildren;  // in: check child documents, too?
    BOOLEAN     ownSelection;   // out: true if doc(s) own the selection.
} APP_OWNS_SELECTION, *P_APP_OWNS_SELECTION;
```

Comments

The document sets **ownSelection** to true if the selection belongs to itself or one of its children (if **checkChildren** is true).

Descendants: You normally do not handle this message.

msgAppOpenTo

Opens a document to a specific state.

Takes U32, returns STATUS.

```
#define msgAppOpenTo                    MakeMsg(clsApp, 38)
// States to pass to msgAppOpenTo
#define appOpenToNormal     0   // Open a doc in place.
#define appOpenToFloating   1   // Open a doc to floating.
#define appOpenToNextState  2   // Goto next state. Not Implemented.
```

Comments

If **appOpenToNormal** is passed in, the document sends **msgAppOpenChild** to its parent to open itself. If **appOpenToFloating** is passed in, the document self sends **msgAppFloat** to open itself.

Descendants: You normally do not handle this message.

msgAppCloseTo

Closes a document to a specific state.

Takes U32, returns STATUS.

```
#define msgAppCloseTo                   MakeMsg(clsApp, 39)
// States to pass to msgAppCloseTo
#define appCloseToNormal    0   // Close to icon.
#define appCloseToNextState 1   // Close to next state.
```

Comments

Short description: you probably don't need to worry about this message.

Long description: When the user taps on an embedded document icon, the document opens. If the user then double taps on the embedded document's title bar, the embedded document floats above its parent (allowing the user to resize it, without changing the layout of the parent). When the user closes the

floating document, it "closes" to its next state (i.e., open, but not floating). Closing it again closes the embedded document down to its icon.

When the user closes an embedded document, the Application Framework sends the document **msgAppCloseTo**, passing it **appCloseToNextState**. However, the Application Framework needs a mechanism to close an embedded document all the way down to its icon (e.g., when the user closes the parent document). In such cases, the Application Framework sends **msgAppCloseTo** to the document, passing **appCloseToNormal**.

Descendants: You normally do not handle this message.

msgAppHide

Hides an open document.

Takes nothing, returns STATUS.

```
#define msgAppHide                    MakeMsg(clsApp, 40)
```

Comments

This message is used to get a document and all its associated windows off the screen as quickly as possible. It is usually followed (via ObjectPost) by **msgAppClose**, which is a heavier-weight message.

The document (1) sends **msgWinExtract** to all windows in metrics.**floatingWins**, (2) sends **msgWinExtract** to metrics.**mainWin**, and (3) recursively sends **msgAppHide** to all documents on metrics.children.

Descendants: You should handle this message if you have visible windows that are not children of the main window or in the floating window list. The ancestor should be called after your handler.

msgAppSetFloatingRect

Specifies a document's floating size and position.

Takes P_RECT32, returns STATUS.

```
#define msgAppSetFloatingRect         MakeMsg(clsApp, 41)
```

Comments

Descendants: You normally do not handle this message.

msgAppSetOpenRect

Specifies a document's open size and position.

Takes P_RECT32, returns STATUS.

```
#define msgAppSetOpenRect             MakeMsg(clsApp, 42)
```

Comments

Descendants: You normally do not handle this message.

msgAppGetOptionSheet

Passes back the requested option sheet of a document.

Takes P_APP_GET_OPTION_SHEET, returns STATUS.

```
#define msgAppGetOptionSheet          MakeMsg(clsApp, 91)
```

Arguments

```
typedef struct APP_GET_OPTION_SHEET {
    TAG     sheetTag;    // in: tag of option sheet.
    OBJECT  sheet;       // out: sheet uid.
} APP_GET_OPTION_SHEET, *P_APP_GET_OPTION_SHEET;
```

Comments

If the requested option sheet has already been created, the document just passes back its uid. Otherwise, it creates the sheet by self sending **msgOptionCreateSheet**. If the requested **sheetTag** is not **tagAppDocOptSheet**, the document self sends **msgOptionAddCards** to let descendants add option cards to the newly created sheet.

Descendants: You normally do not handle this message. If you want to add other cards to the document's option sheets, you can handle **msgAppAddCards**.

msgAppGetDocOptionSheetClient

Passes back the client for a document's option sheets.

Takes P_OBJECT, returns STATUS.

```
#define msgAppGetDocOptionSheetClient   MakeMsg(clsApp, 93)
```

Comments

The document passes back its main window's client window.

Descendants: You normally do not handle this message.

msgAppAddCards

Adds cards to the specified option sheet of a document.

Takes P_OPTION_TAG, returns STATUS.

```
#define msgAppAddCards                  MakeMsg(clsApp, 100)
```

Comments

If the specified sheet is **tagAppAboutOptSheet**, the document adds the "About Document" and "About Application" option cards to the sheet. If the sheet is **tagAppDocOptSheet**, the document adds the "Controls," "Access" and "Comments" cards. If the sheet is **tagAppPrintSetupOptSheet**, the document adds the "Print Layout" card.

Descendants: You tend not to handle this message. However, you can handle it if you want to add cards to any of the document's option sheets.

msgAppShowOptionSheet

Shows or hides a document's option sheet.

Takes P_APP_SHOW_OPTION_SHEET, returns STATUS.

```
#define msgAppShowOptionSheet           MakeMsg(clsApp, 92)
```

Arguments

```
typedef struct APP_SHOW_OPTION_SHEET {
    TAG         sheetTag;   // In: Option sheet tag.
    TAG         cardTag;    // In: Option card tag to initially show, or
                            // null to show the top card.
    BOOLEAN     show;       // In: true = show, false = hide.
    OBJECT      sheet;      // Out: option sheet.
} APP_SHOW_OPTION_SHEET, *P_APP_SHOW_OPTION_SHEET;
```

Comments

The Application Framework sends this message to show (or hide) any of a document's option sheets. It is sent when, for example, the user picks any of the option cards from the SAMs or draws the check gesture on a document's title, over a selection, or over an embedded document icon.

If show is true, the document self sends **msgAppGetOptionSheet** to get the requested option sheet. To display the sheet, the document sends **msgOptionGetCards** and **msgOptionShowCardAndSheet** to the sheet.

If show is false, the document self sends **msgAppFindFloatingWin** and **msgAppRemoveFloatingWin** to find and then hide the requested option sheet.

Descendants: You normally do not handle this message.

msgAppApplyEmbeddeeProps

Applies Embedded Printing option card values to first level embeddees.

Takes OBJECT, returns STATUS.

```
#define msgAppApplyEmbeddeeProps    MakeMsg(clsApp, 98)
```

Comments Descendants: You normally do not handle this message.

msgAppGetBorderMetrics

Passes back a document's border metrics.

Takes P_APP_BORDER_METRICS, returns STATUS.

```
#define msgAppGetBorderMetrics          MakeMsg(clsApp, 94)
// Border styles
#define appBorderNone       0
#define appBorderSingle     1
#define appBorderDouble     2
#define appBorderDashed     3
```

Arguments

```
typedef struct APP_BORDER_METRICS {
    U16     controls        : 1;    // Out: true/false.
    U16     titleLine       : 1;    // Out: true/false.
    U16     menuLine        : 1;    // Out: true/false.
    U16     corkMargin      : 1;    // Out: true/false.
    U16     scrollMargins   : 1;    // Out: true/false.
    U16     borderStyle     : 4;    // Out: Border style.
    U16     reserved        : 7;
} APP_BORDER_METRICS, *P_APP_BORDER_METRICS;
```

Comments Descendants: You normally do not handle this message.

msgAppSetControls

Turns a document's controls on or off.

Takes U32, returns STATUS.

```
#define msgAppSetControls               MakeMsg(clsApp, 47)
```

Comments If **appOff** is passed in, the document turns its controls off. If **appOn** is passed in, the controls are turned on. If **appToggle** is passed in, the document will toggle the state of the controls.

Descendants: You normally do not handle this message.

msgAppSetPrintControls

Turns a document's screen decorations off for printing.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSetPrintControls          MakeMsg(clsApp, 99)
```

Comments The document turns its controls off so that it can be printed. It leaves user-set borders on only if the document is printing itself as an embedded document (**pArgs** = false).

Descendants: You normally do not handle this message.

msgAppSetTitleLine

Turns a document's title line on or off.

Takes U32, returns STATUS.

```
#define msgAppSetTitleLine              MakeMsg(clsApp, 44)
```

Comments

If **appOff** is passed in, the document hides its title line. If **appOn** is passed in, the title line is displayed. If **appToggle** is passed in, the document toggles whether the title line is displayed.

Descendants: You normally do not handle this message.

msgAppSetMenuLine

Turns a document's menu bar on or off.

Takes U32, returns STATUS.

```
#define msgAppSetMenuLine               MakeMsg(clsApp, 45)
```

Comments

If **appOff** is passed in, the document hides its menu bar. If **appOn** is passed in, the menu bar is displayed. If **appToggle** is passed in, the document toggles whether the menu bar is displayed.

Descendants: You normally do not handle this message.

msgAppSetCorkMargin

Turns a document's cork margin on or off.

Takes U32, returns STATUS.

```
#define msgAppSetCorkMargin             MakeMsg(clsApp, 48)
```

Comments

If **appOff** is passed in, the document hides its cork margin. If **appOn** is passed in, the cork margin is created (if it doesn't exist) and displayed. If **appToggle** is passed in, the document toggles whether the cork margin is displayed.

Descendants: You normally do not handle this message.

msgAppSetScrollBars

Turns a document's scroll bars on or off.

Takes U32, returns STATUS.

```
#define msgAppSetScrollBars             MakeMsg(clsApp, 46)
```

Comments

If **appOff** is passed in, the document hides its scroll bars. If **appOn** is passed in, the scroll bars are displayed. If **appToggle** is passed in, the document toggles whether the scroll bars are displayed.

Descendants: You normally do not handle this message.

msgAppSetBorderStyle

Specifies the border style.

Takes U32, returns STATUS.

```
#define msgAppSetBorderStyle            MakeMsg(clsApp, 95)
```

Comments

The possible values for **pArgs** are listed above in **msgAppGetBorderMetrics**.

Descendants: You normally do not handle this message.

msgAppRevert

Reverts to the filed copy of a document.

Takes BOOLEAN, returns STATUS.

```
#define msgAppRevert                    MakeMsg(clsApp, 49)
```

Comments The document reverts to its previously saved state. If true is passed in, the document displays a note, asking the user to confirm the action first. If false is passed in, the document just does the action.

Descendants: If you do not support revert, you should handle this message by returning **stsAppRefused**. On the other hand, if you support revert but you manage your own data files or use memory mapped files, then it may be necessary to handle this message by appropriately undoing all data modifications since the last save. The ancestor should be called before your handler.

msgAppIsPageLevel

Asks a document if it shows up as a page in the Notebook (as opposed to being embedded).

Takes nothing, returns STATUS.

```
#define msgAppIsPageLevel               MakeMsg(clsApp, 50)
```

Comments Descendants: You normally do not handle this message.

Return Value **stsOK** If the document is page-level (i.e., its embeddor inherits from **clsContainerApp** or **clsRootContainerApp**).

stsNoMatch If the document is not page-level.

msgAppProvideMainWin

Asks a document to provide its main window.

Takes P_OBJECT, returns STATUS.

```
#define msgAppProvideMainWin            MakeMsg(clsApp, 51)
```

Comments This message is sent during **msgAppInit**. If **pArgs** points to **objNull**, the document creates a default frame of type **clsFrame** and passes the frame's uid back in **pArgs**.

Descendants: You should handle this message if you want to replace the default **clsFrame** main window. In such cases, you tend not to call the ancestor.

See Also **msgAppCreateClientWin**

msgAppCreateLink

Creates a link from a document to another document.

Takes P_APP_LINK, returns STATUS.

```
#define msgAppCreateLink                MakeMsg(clsApp, 52)
```

Arguments

```
typedef struct APP_LINK {
    UUID    appUUID;    // UUID of the document that is linked to.
    U32     link;       // Link handle.
} APP_LINK, *P_APP_LINK;
```

Comments The uuid of the document to link to is passed in. The document passes back a link handle, which is used by **msgAppGetLink** to retrieve the document. The document stores the uuid in its **appDocLinkFileName** file.

Descendants: You normally do not handle this message.

msgAppDeleteLink

Deletes the specified link handle.

Takes P_APP_LINK, returns STATUS.

```
#define msgAppDeleteLink                MakeMsg(clsApp, 53)
```

Message Arguments

```
typedef struct APP_LINK {
    UUID    appUUID;    // UUID of the document that is linked to.
    U32     link;       // Link handle.
} APP_LINK, *P_APP_LINK;
```

Comments

Descendants: You normally do not handle this message.

msgAppGetLink

Passes back a document's UUID for the specified link handle.

Takes P_APP_LINK, returns STATUS.

```
#define msgAppGetLink                   MakeMsg(clsApp, 54)
```

Message Arguments

```
typedef struct APP_LINK {
    UUID    appUUID;    // UUID of the document that is linked to.
    U32     link;       // Link handle.
} APP_LINK, *P_APP_LINK;
```

Comments

Descendants: You normally do not handle this message.

Standard Application Menu Messages

msgAppCreateMenuBar

Creates the standard application menu bar.

Takes P_OBJECT, returns STATUS.

```
#define msgAppCreateMenuBar             MakeMsg(clsApp, 55)
```

Comments

Descendants: You should handle this message by creating the document's menu bar. If **pArgs** is non-null when the ancestor is called, **clsApp** will pre-pend the Document, Edit, and Option menus to the provided menu bar. So you should call the ancestor after you make the menu bar. After the ancestor returns, you can fix up the Document and Edit menus to remove any buttons that you don't support or to add any new buttons.

See the earlier description "Enabling and Disabling SAMs" for more details.

msgAppCreateClientWin

Creates a document's client window.

Takes P_OBJECT, returns STATUS.

```
#define msgAppCreateClientWin           MakeMsg(clsApp, 56)
```

Comments

The document creates a default client window of class **clsEmbeddedWin** and passes back its uid.

The Application Framework does not send this message by default. Instead, you should self send it at the appropriate time (typically during **msgAppInit**, since the client window is usually stateful).

Descendants: You should handle this message by creating your application- specific client window. In such cases, you tend not to call your ancestor.

msgAppSend

Sends a document.

Takes OBJECT, returns STATUS.

```
#define msgAppSend                    MakeMsg(clsApp, 57)
```

Comments

When the user taps on a button in the Send menu, the SAMs send this message to the document, passing in **theSendManager**. The document then self sends **msgAppInvokeManager**, passing on **theSendManager**.

Descendants: You normally do not handle this message.

msgAppPrint

Prints a document.

Takes OBJECT, returns STATUS.

```
#define msgAppPrint                   MakeMsg(clsApp, 58)
```

Comments

When the user issues the Print command (either by tapping on the Print button in the SAMs or by drawing the print gesture on the document's title line), the Application Framework sends this message to the document, passing it **thePrintManager**. The document then self sends **msgAppInvokeManager**, passing on **thePrintManager**.

Descendants: You normally do not handle this message.

msgAppPrintSetup

Displays a document's print setup option sheet.

Takes nothing, returns STATUS.

```
#define msgAppPrintSetup              MakeMsg(clsApp, 59)
```

Comments

When the user taps on Print Setup, the SAMs send this message to the document. The document self sends **msgAppOptionShowOptionSheet**, passing it **tagAppPrintSetupOptSheet**.

Descendants: You normally do not handle this message.

msgAppImport

Obsolete message. Not implemented.

Takes nothing, returns STATUS.

```
#define msgAppImport                  MakeMsg(clsApp, 60)
```

See Also

msgImport

msgAppExport

Prepares to export a document as a file.

Takes OBJECT, returns STATUS.

```
#define msgAppExport                  MakeMsg(clsApp, 61)
```

Comments

The document self sends **msgAppInvokeManager**, passing on **pArgs**.

Descendants: You normally do not handle this message.

msgAppAbout

Displays a document's "About" option sheet.

Takes nothing, returns STATUS.

```
#define msgAppAbout                    MakeMsg(clsApp, 62)
```

Comments

When the user taps on About, the SAMs send this message to the document. The document self sends **msgAppOptionShowSheet**, passing it **tagAppAboutOptSheet**.

Descendants: You normally do not handle this message. Instead, you should handle **msgOptionAddCards** by adding more cards to the About option sheet. Likewise, you should handle **msgOptionProvideCard** by modifying or adding specific controls to the standard About cards.

msgAppHelp

Shows help for the application. Not implemented - Reserved.

Takes nothing, returns STATUS.

```
#define msgAppHelp                     MakeMsg(clsApp, 63)
```

Comments

Descendants: You should not handle this message. Instead, you can provide help via resource files (see the Tic-Tac-Toe sample application for an example).

msgAppUndo

Undoes the previous operation on a document.

Takes nothing, returns STATUS.

```
#define msgAppUndo                     MakeMsg(clsApp, 64)
```

Comments

The document sends **msgUndoCurrent** to **theUndoManager**.

Descendants: You normally do not handle this message. Instead, see UNDO.H for information on how to undo your application's commands.

msgAppMoveSel

Prepares to move a document's selection.

Takes nothing, returns STATUS.

```
#define msgAppMoveSel                  MakeMsg(clsApp, 65)
```

Comments

When the user issues the Move command (either by tapping on Move in the SAMs or by press-holding on a selection in the document), the Application Framework sends this message to the document. The document finds its selected object (by sending **msgSelOwner** to **theSelectionManager**) and then sends it **msgSelBeginMove**.

Descendants: You normally do not handle this message.

msgAppCopySel

Prepares to copy the document's selection.

Takes nothing, returns STATUS.

```
#define msgAppCopySel                  MakeMsg(clsApp, 66)
```

Comments

When the user issues the Copy command (either by tapping on Copy in the SAMs or by tap-press-holding on a selection in the document), the Application Framework sends this message to the document. The document finds its selected object (by sending **msgSelOwner** to **theSelectionManager**) and then sends it **msgSelBeginCopy**.

Descendants: You normally do not handle this message.

msgAppDeleteSel

Deletes a document's selection.

Takes nothing, returns STATUS.

```
#define msgAppDeleteSel                MakeMsg(clsApp, 67)
```

Comments

When the user issues the Delete command (either by tapping on Delete in the SAMs or by drawing the delete gesture, the Application Framework sends this message to the document. The document gets its selected object (by sending **msgSelOwner** to **theSelectionManager**) and then sends it **msgSelDelete**.

Descendants: You normally do not handle this message.

msgAppSelOptions

Prepares to display the options for a document's selection. Obsolete.

Takes nothing, returns STATUS.

```
#define msgAppSelOptions               MakeMsg(clsApp, 68)
```

Comments

Descendants: You should not handle this message.

msgAppSelectAll

Selects all of the objects in a document.

Takes nothing, returns STATUS. Category: descendant responsibility.

```
#define msgAppSelectAll                MakeMsg(clsApp, 69)
```

Comments

When the user taps on Select All in the Standard Application Menu, the document self sends this message.

clsApp does not do anything in its message handler for this message.

Descendants: You should handle this message and select everything in the document. You tend not to call the ancestor.

msgAppSearch

Searches a document for a string.

Takes OBJECT, returns STATUS.

```
#define msgAppSearch                   MakeMsg(clsApp, 70)
```

Comments

When the user issues the Find command (either by tapping on Find in SAMs or by drawing the find gesture on the document's title line), the Application Framework sends this message to the document, passing it **theSeachManager**. In response, the document self sends **msgAppInvokeManager**, passing on **theSearchManager**.

Descendants: You normally do not handle this message.

msgAppSpell

Prepares to check a document's spelling.

Takes OBJECT, returns STATUS.

```
#define msgAppSpell                    MakeMsg(clsApp, 71)
```

Comments

When the user issues the Spell command (either by tapping on Spell in SAMs or by drawing the spell gesture on the document's title line), the Application Framework sends this message to the document, passing it **theSpellManager**. In response, the document self sends **msgAppInvokeManager**, passing on **theSpellManager**.

Descendants: You normally do not handle this message.

msgAppInvokeManager

Routes a message to a manager.

Takes OBJECT, returns STATUS.

```
#define msgAppInvokeManager            MakeMsg(clsApp, 72)
```

Comments

To route a standard application menu message to the object that provides the behavior, the document self sends **msgAppInvokeManager**. The argument to the message is the well-known UID of the manager that performs the operation. When the document receives **msgAppInvokeManager**, it sends **msgAppExecute** to the manager object.

Descendants: You normally do not handle this message.

msgAppExecute

Sent to the manager to execute the manager's behavior on a document.

Takes P_APP_EXECUTE, returns STATUS.

```
#define msgAppExecute                  MakeMsg(clsApp, 73)
```

Arguments

```
typedef struct APP_EXECUTE {
    OBJECT  app;        // Requesting document.
    OBJECT  sel;        // Selected object.
    U32     count;      // Number of uuids.
    UUID    uuid[1];    // UUIDs of documents to operate on.
} APP_EXECUTE, *P_APP_EXECUTE;
```

Comments

The document sends **msgAppExecute** to a manager when it receives **msgAppInvoke** manager. The manager performs some operation on the document or documents specified in the **pArgs**, such as printing, searching, or spell checking.

Descendants: You normally do not handle this message.

msgAppExecuteGesture

Invokes the default gesture behavior for a document's title line.

Takes P_GWIN_GESTURE, returns STATUS.

```
#define msgAppExecuteGesture           MakeMsg(clsApp, 74)
```

Comments

Descendants: You normally do not handle this message. However, if you want to handle a title line gesture differently than the default, you should handle this message. You tend not to call the ancestor.

msgAppSetSaveOnTerminate

Tells a document to save itself before terminating.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSetSaveOnTerminate        MakeMsg(clsApp, 75)
```

Comments

If **msgAppSetSaveOnTerminate** has been sent before **msgAppTerminate**, the document will be sent **msgAppSave** even if it refuses to terminate. Normally, if a document vetos **msgAppTerminate**, it is not sent **msgAppSave**.

Descendants: You normally do not handle this message.

Notification messages

msgAppTerminateConditionChanged

Try to terminate a document; sent when a terminate condition changed.

Takes nothing, returns STATUS.

```
#define msgAppTerminateConditionChanged MakeMsg(clsApp, 76)
```

Comments

In response to this message, the document self sends **msgAppTerminate**(true).

This message is self sent when a terminate condition has changed. For example, the document might have given up its selection and can now be terminated.

Descendants: You normally do not handle this message. Instead, see **msgAppTerminateOK**.

msgAppSelChanged

Sent to a document when something in it becomes selected or deselected.

Takes BOOLEAN, returns STATUS.

```
#define msgAppSelChanged                MakeMsg(clsApp, 77)
```

Comments

pArgs is true when the document (or one of its embedded documents) gains the selection. **pArgs** is false when the selection leaves the document.

The document self sends **msgAppTerminateConditionChanged** when it no longer has the selection.

Descendants: You normally do not handle this message.

msgAppOpened

Sent to observers of a document when the document is opened.

Takes APP_OPENED, returns STATUS. Category: observer notification.

```
#define msgAppOpened                    MsgNoError(MakeMsg(clsApp, 78))
```

Comments

pArgs->child is the uid of the document that has been opened.

msgAppClosed

Sent to observers of a document when the document is closed.

Takes APP_CLOSED, returns STATUS. Category: observer notification.

```
#define msgAppClosed                    MsgNoError(MakeMsg(clsApp, 79))
```

Comments

pArgs->child is the uid of the document that has been closed.

msgAppChildChanged

Sent to observers of a document when a child document is opened or closed.

Takes P_APP_CHILD_CHANGED, returns STATUS. Category: observer notification.

```
#define msgAppChildChanged              MsgNoError(MakeMsg(clsApp, 80))
```

Arguments

```
typedef struct APP_CHILD_CHANGED {
    OBJECT      parent;         // Parent of doc that changed.
    OBJECT      child;          // Doc that changed.
    UUID        uuid;           // UUID of doc that changed.
    MESSAGE     change;         // msgAppOpened or msgAppClosed.
    U32         reserved[4];    // Reserved.
} APP_CHILD_CHANGED, *P_APP_CHILD_CHANGED,
  APP_OPENED, *P_APP_OPENED,
  APP_CLOSED, *P_APP_CLOSED;
```

Comments

This message is sent to observers of a document in response to **msgAppOpened** and **msgAppClosed**.

msgAppFloated

Sent to observers when a document is floated or un-floated.

Takes P_APP_FLOATED, returns STATUS. Category: observer notification.

```
#define msgAppFloated                   MsgNoError(MakeMsg(clsApp, 81))
```

Arguments

```
typedef struct APP_FLOATED {
    OBJECT      app;        // Document that is floated or un-floated.
    BOOLEAN     floatUp;    // true=document is floated.
} APP_FLOATED, *P_APP_FLOATED;
```

msgAppCreated

Sent to observers of **clsApp** when a document is created.

Takes P_APP_CREATED, returns STATUS. Category: observer notification.

```
#define msgAppCreated                   MsgNoError(MakeMsg(clsApp, 82))
```

Arguments

```
typedef struct APP_CREATED {
    OBJECT  rootContainer;      // Root container uid.
    UUID    rootContainerUUID;  // Root container uuid.
    UUID    uuid;               // Created doc's uuid.
    U32     reserved[4];        // Reserved.
} APP_CREATED, *P_APP_CREATED;
```

msgAppDeleted

Sent to observers of **clsApp** when a document is deleted.

Takes P_APP_DELETED, returns STATUS. Category: observer notification.

```
#define msgAppDeleted                   MsgNoError(MakeMsg(clsApp, 83))
```

Arguments

```
typedef struct APP_DELETED {
    OBJECT  rootContainer;      // Root container uid.
    UUID    rootContainerUUID;  // Root container uuid.
    OBJECT  app;                // Deleted document. objNull if inactive.
    UUID    uuid;               // Deleted document's uuid.
    U32     reserved[4];        // Reserved.
} APP_DELETED, *P_APP_DELETED;
```

msgAppMoved

Sent to observers of **clsApp** when a document is moved.

Takes P_APP_MOVED_COPIED, returns STATUS. Category: observer notification.

```
#define msgAppMoved                     MsgNoError(MakeMsg(clsApp, 84))
// Move/copy values for moveCopyInfo argument
#define appMovedCopiedInto      0   // doc moved/copied to this root container
#define appMovedCopiedOutOf     1   // doc moved/copied from this root container
#define appMovedCopiedWithin    2   // doc moved/copied within this root container
```

Arguments

```
typedef struct APP_MOVED_COPIED {
    OBJECT      rootContainer;      // Root container uid.
    UUID        rootContainerUUID;  // Root container uuid.
    OBJECT      app;                // Moved/copied doc. objNull if inactive.
    UUID        uuid;               // Moved/copied document's uuid.
    U32         moveCopyInfo;       // Type of move/copy.
    U32         reserved[4];        // Reserved.
} APP_MOVED_COPIED, *P_APP_MOVED_COPIED;
```

Comments

When a document is moved, the Application Framework notifies the observers of **clsApp** that a document has moved either a) within a root container, or b) out of one root container and into another. (It may help you to remember that root containers are typically notebooks.)

To notify the observers, the Application Framework creates a list containing the document that is being moved and each of its embedded documents. If the document is being moved within the root container, then for each of the documents in the list, the Application Framework sends **msgAppMoved** to the observers of **clsApp**, specifying **appMovedCopiedWithin**. If the document is being moved from one container to another, the Application Framework sends **msgAppMoved** twice for each document, once specifying **appMovedCopiedOutOf** and once specifying **msgMovedCopiedInto**.

See Also

msgAppChanged

msgAppCopied

Sent to observers of **clsApp** when a document is copied.

Takes P_APP_MOVED_COPIED, returns STATUS. Category: observer notification.

```
#define msgAppCopied                    MsgNoError(MakeMsg(clsApp, 85))
```

Message Arguments

```
typedef struct APP_MOVED_COPIED {
    OBJECT      rootContainer;      // Root container uid.
    UUID        rootContainerUUID;  // Root container uuid.
    OBJECT      app;                // Moved/copied doc. objNull if inactive.
    UUID        uuid;               // Moved/copied document's uuid.
    U32         moveCopyInfo;       // Type of move/copy.
    U32         reserved[4];        // Reserved.
} APP_MOVED_COPIED, *P_APP_MOVED_COPIED;
```

Comments

When a document is copied, the Application Framework notifies the observers of **clsApp** that a document has been copied either a) within a root container, or b) from one root container into another. (It may help you to remember that root containers are typically notebooks.)

To notify the observers, the Application Framework creates a list containing the document that is being copied and each of its embedded documents. If the document is being copied within the root container, then for each of the documents in the list, the Application Framework sends **msgAppCopied** to the observers of **clsApp**, specifying **appMovedCopiedWithin**. If the document is being copied from one container to another, the Application Framework sends **msgAppCopied** twice for each document, once specifying **appMovedCopiedOutOf** and once specifying **msgMovedCopiedInto**.

See Also

msgAppChanged

msgAppChanged

Sent to observers of **clsApp** when a document has changed.

Takes P_APP_CHANGED, returns STATUS. Category: observer notification.

```
#define msgAppChanged                   MsgNoError(MakeMsg(clsApp, 86))
// State of a doc's bookmark (which is interpreted in the NUI as a tab)
#define appBookmarkOn   1
#define appBookmarkOff  2
```

Arguments

```
typedef struct APP_CHANGED {
    OBJECT  rootContainer;          // In: Root container uid.
    UUID    rootContainerUUID;      // In: Root container uuid.
    UUID    uuid;                   // In: The uuid of the changed document.
    OBJECT  uid;                    // In: objNull if changed doc was not active.
    U16     globalSequence  : 1;    // In: true if doc's container (i.e.,
                                    // notebook) needs to be renumbered.
    U16     name            : 1;    // In: true if doc's name changed
    U16     bookmark        : 2;    // In: new bookmark state, if changed
    U16     create          : 1;    // In: true if doc is new
    U16     deleted         : 1;    // In: true if doc was deleted
    U16     move            : 1;    // In: true if doc was moved
    U16     copy            : 1;    // In: true if doc was copied
    U16     reserved1       : 8;
    U16     moveCopyInfo;           // In: if doc was moved or copied, this
                                    // is set to move/copy value described
                                    // in msgAppMoved.
    U32     reserved2[4];
} APP_CHANGED, *P_APP_CHANGED;
```

Comments

This message is sent to observers of **clsApp** when a document has changed in some way (e.g., the document has moved, has a new name, has been created, and so on).

When a document is moved or copied, this message is sent to observers of **clsApp**. However, it is not sent for all of the document's embedded documents (thereby making it different from **msgAppMoved** and **msgAppCopied**).

See Also

msgAppMoved

msgAppInstalled

Sent to observers of **clsApp** when an application is installed.

Takes CLASS, returns STATUS. Category: observer notification.

```
#define msgAppInstalled                 MsgNoError(MakeMsg(clsApp, 87))
```

Comments

pArgs is the class of the application just installed.

msgAppDeInstalled

Sent to observers of **clsApp** when an application is deinstalled.

Takes CLASS, returns STATUS. Category: observer notification.

```
#define msgAppDeInstalled               MsgNoError(MakeMsg(clsApp, 88))
```

Comments

pArgs is the class of the application just deinstalled.

Public Functions

AppMain

Creates a document instance and starts dispatching messages to it.

Returns nothing.

Function Prototype

```
STATUS EXPORTED AppMain          (void);
```

Comments

All developers should call AppMain from their main routine whenever **processCount** is greater than 0.

AppMonitorMain

Creates an app monitor instance and handles installing the application.

Returns nothing.

Function Prototype

```
STATUS EXPORTED AppMonitorMain  (OBJECT, OBJECT);
```

Comments

All developers should call AppMonitorMain from their main routine when **processCount** is equal to 0. You specify the well-known uid of your application class and the well-known uid of your app monitor class. If you do not have an app monitor class, simply specify **objNull** for the second parameter.

APPDIR.H

This file contains the API definition for **clsAppDir**.

clsAppDir inherits from **clsDirHandle.**

Provides management for document directories.

"AppDir" stands for Application Directory Handle.

Introduction

Application directory nodes represent documents in the document hierarchy. Application directories are where documents store their resource files and any other files they use. Attributes on application directories specify useful information about each document.

clsAppDir is used to manage the various file system attributes associated with a document in PenPoint. It includes definitions of these attributes and messages to manage them. **clsAppDir** also provides support for enumerating embedded documents via the filesystem. This is similar to the file system's FSReadDir facilities, but **clsAppDir** filters out all files and directories that are not documents.

A document can find its application directory by self sending **msgAppGetMetrics**. The application directory's uid will be passed back in the dir field of the APP_METRICS structure. See app.h for more information.

Application directories are created automatically for documents during AppInit time by the Application Framework. Application classes generally should never create or destroy application directories themselves.

```
#ifndef APPDIR_INCLUDED
#define APPDIR_INCLUDED
#ifndef APP_INCLUDED
#include <app.h>
#endif
```

Common #defines and typedefs

```
typedef OBJECT APP_DIR, *P_APP_DIR;
```

File System Attributes

These attributes are stamped on every document directory.

```
#define appAttrClass            FSMakeFix32Attr(clsAppDir, 1)
#define appAttrSequence         FSMakeFix32Attr(clsAppDir, 4)
#define appAttrNumChildren      FSMakeFix32Attr(clsAppDir, 3)
#define appAttrFlags            FSMakeFix64Attr(clsAppDir, 6)
#define appAttrBookmark         FSMakeStrAttr(clsAppDir, 9)
#define appAttrAuthor           FSMakeStrAttr(clsAppDir, 10)
#define appAttrComments         FSMakeStrAttr(clsAppDir, 11)
#define appAttrClassName        FSMakeStrAttr(clsAppDir, 12)
#define appAttrGlobalSequence   FSMakeFix32Attr(clsAppDir, 4)
```

Application Directory Flags

This structure defines the application directory flags. They are stamped on a document directory with **appAttrFlags**. This structure is used in the flags field of APP_DIR_ATTRS.

```
typedef struct APP_DIR_FLAGS {
    U16     application     : 1;    // true = this is an application.
    U16     newInstance     : 1;    // true = new app instance.
    U16     disabled        : 1;    // true = app is disabled, don't activate.
    U16     bookmark        : 1;    // true = app has a tab
    U16     readOnly        : 1;    // True = app is read only.
    U16     deletable       : 1;    // true = app can be deleted.
    U16     movable         : 1;    // true = app can be moved.
    U16     copyable        : 1;    // true = app can be copied.
    U16     reserved1       : 8;    // Reserved.
    U16     reserved2       : 16;   // Reserved.
    U16     reserved3       : 16;   // Reserved.
    U16     reserved4       : 16;   // Reserved.
} APP_DIR_FLAGS, *P_APP_DIR_FLAGS;
```

Application Directory Attributes Structure

This structure is used to specify and pass back the directory attributes in one chunk.

- appClass The document's application class (sub-class of **clsApp**).
- uuid The document's uuid. Can be used in **msgNew** to **clsDirHandle** or **clsAppDir** to open a handle on a document directory.
- sequence The 1-based position of a document within its embeddor. If the document is in a notebook, this is the document's position within its section.
- numChildren The total number of embedded children.

```
typedef struct APP_DIR_ATTRS {
    CLASS           appClass;       // Application class.
    UUID            uuid;           // Application uuid.
    U32             sequence;       // Local sequence number.
    U32             numChildren;    // Number of child apps (recursive).
    APP_DIR_FLAGS   flags;          // Flags.
} APP_DIR_ATTRS, *P_APP_DIR_ATTRS;
```

Messages

msgNew

Creates a new AppDir.

Takes P_FS_NEW, returns STATUS. Category: class message.

Comments

See fs.h for the FS_NEW structure definition.

clsAppDir has no method for **msgNewDefaults**. See fs.h for a description of **clsDirHandle**'s handler for **msgNewDefaults**.

msgAppDirGetAttrs

Passes back a document's application directory attributes.

Takes P_APP_DIR_GET_SET_ATTRS, returns STATUS.

```
#define msgAppDirGetAttrs                MakeMsg(clsAppDir, 1)
```

Arguments

```
typedef struct APP_DIR_GET_SET_ATTRS {
    P_STRING        pPath;  // in: Path relative to target directory.
    APP_DIR_ATTRS   attrs;  // in/out: Application directory attributes.
} APP_DIR_GET_SET_ATTRS, *P_APP_DIR_GET_SET_ATTRS;
```

Comments

If you are interested in only one of the attributes, use the individual **msgAppDirGet...** messages described below. They're generally faster.

msgAppDirSetAttrs

Specifies a document's application directory attributes.

Takes P_APP_DIR_GET_SET_ATTRS, returns STATUS.

```
#define msgAppDirSetAttrs                MakeMsg(clsAppDir, 2)
```

Message Arguments

```
typedef struct APP_DIR_GET_SET_ATTRS {
    P_STRING        pPath;  // in: Path relative to target directory.
    APP_DIR_ATTRS   attrs;  // in/out: Application directory attributes.
} APP_DIR_GET_SET_ATTRS, *P_APP_DIR_GET_SET_ATTRS;
```

Comments

If you are interested in only one of the attributes, use the individual **msgAppDirSet...** messages described below. They're generally faster.

msgAppDirGetFlags

Passes back a document's application directory flags.

Takes P_APP_DIR_GET_SET_FLAGS, returns STATUS.

```
#define msgAppDirGetFlags                MakeMsg(clsAppDir, 3)
```

Arguments

```
typedef struct APP_DIR_GET_SET_FLAGS {
    P_STRING        pPath;  // in: Path relative to target directory.
    APP_DIR_FLAGS   flags;  // in/out: Application directory control flags.
} APP_DIR_GET_SET_FLAGS, *P_APP_DIR_GET_SET_FLAGS;
```

msgAppDirSetFlags

Specifies a document's application directory flags.

Takes P_APP_DIR_GET_SET_FLAGS, returns STATUS.

```
#define msgAppDirSetFlags                MakeMsg(clsAppDir, 4)
```

Message Arguments

```
typedef struct APP_DIR_GET_SET_FLAGS {
    P_STRING        pPath;  // in: Path relative to target directory.
    APP_DIR_FLAGS   flags;  // in/out: Application directory control flags.
} APP_DIR_GET_SET_FLAGS, *P_APP_DIR_GET_SET_FLAGS;
```

msgAppDirGetClass

Passes back a document's application class.

Takes P_APP_DIR_UPDATE_CLASS, returns STATUS.

```
#define msgAppDirGetClass                MakeMsg(clsAppDir, 5)
```

Arguments

```
typedef struct APP_DIR_UPDATE_CLASS {
    P_STRING    pPath;      // in: Path relative to target directory.
    CLASS       appClass;   // in/out: Application directory class.
} APP_DIR_UPDATE_CLASS, *P_APP_DIR_UPDATE_CLASS;
```

msgAppDirSetClass

Specifies a document's application class.

Takes P_APP_DIR_UPDATE_CLASS, returns STATUS.

```
#define msgAppDirSetClass                MakeMsg(clsAppDir, 6)
```

Message Arguments

```
typedef struct APP_DIR_UPDATE_CLASS {
    P_STRING    pPath;      // in: Path relative to target directory.
    CLASS       appClass;   // in/out: Application directory class.
} APP_DIR_UPDATE_CLASS, *P_APP_DIR_UPDATE_CLASS;
```

msgAppDirGetUUID

Passes back an application directory's uuid.

Takes P_APP_DIR_UPDATE_UUID, returns STATUS.

```
#define msgAppDirGetUUID                 MakeMsg(clsAppDir, 7)
```

Arguments

```
typedef struct APP_DIR_UPDATE_UUID {
    P_STRING    pPath;      // in: Path relative to target directory.
    UUID        uuid;       // in/out: Application directory uuid.
} APP_DIR_UPDATE_UUID, *P_APP_DIR_UPDATE_UUID;
```

msgAppDirSetUUID

Specifies an application directory's uuid.

Takes P_APP_DIR_UPDATE_UUID, returns STATUS.

```
#define msgAppDirSetUUID                 MakeMsg(clsAppDir, 8)
```

Message Arguments

```
typedef struct APP_DIR_UPDATE_UUID {
    P_STRING    pPath;      // in: Path relative to target directory.
    UUID        uuid;       // in/out: Application directory uuid.
} APP_DIR_UPDATE_UUID, *P_APP_DIR_UPDATE_UUID;
```

msgAppDirGetUID

Passes back an application directory's uid.

Takes P_APP_DIR_UPDATE_UID, returns STATUS.

```
#define msgAppDirGetUID                  MakeMsg(clsAppDir, 9)
```

Arguments

```
typedef struct APP_DIR_UPDATE_UID {
    P_STRING    pPath;  // in: Path relative to target directory.
    UID         uid;    // in/out: App directory uid.
} APP_DIR_UPDATE_UID, *P_APP_DIR_UPDATE_UID;
```

msgAppDirSetUID

Specifies an application directory's uid.

Takes P_APP_DIR_UPDATE_UID, returns STATUS.

```
#define msgAppDirSetUID                 MakeMsg(clsAppDir, 10)
```

Message Arguments

```
typedef struct APP_DIR_UPDATE_UID {
    P_STRING    pPath;  // in: Path relative to target directory.
    UID         uid;    // in/out: App directory uid.
} APP_DIR_UPDATE_UID, *P_APP_DIR_UPDATE_UID;
```

msgAppDirGetSequence

Passes back an application directory's sequence number.

Takes P_APP_DIR_UPDATE_SEQ, returns STATUS.

```
#define msgAppDirGetSequence            MakeMsg(clsAppDir, 11)
```

Arguments

```
typedef struct APP_DIR_UPDATE_SEQUENCE {
    P_STRING    pPath;      // in: Path relative to target directory.
    U32         sequence;   // in/out: Application directory sequence.
} APP_DIR_UPDATE_SEQUENCE, *P_APP_DIR_UPDATE_SEQUENCE;
```

Comments

If the document is in a notebook, the sequence number is a 1-based position within the section.

msgAppDirSetSequence

Specifies an application directory's sequence number.

Takes P_APP_DIR_UPDATE_SEQUENCE, returns STATUS.

```
#define msgAppDirSetSequence            MakeMsg(clsAppDir, 12)
```

Message Arguments

```
typedef struct APP_DIR_UPDATE_SEQUENCE {
    P_STRING    pPath;      // in: Path relative to target directory.
    U32         sequence;   // in/out: Application directory sequence.
} APP_DIR_UPDATE_SEQUENCE, *P_APP_DIR_UPDATE_SEQUENCE;
```

Comments

If the document is in a notebook, the sequence number is a 1-based position within the section.

msgAppDirGetNumChildren

Passes back the total number of embedded children of a document.

Takes P_APP_DIR_UPDATE_NUM_CHILDREN, returns STATUS.

```
#define msgAppDirGetNumChildren         MakeMsg(clsAppDir, 22)
```

Arguments

```
typedef struct APP_DIR_UPDATE_NUM_CHILDREN {
    P_STRING    pPath;          // in: Path relative to target directory.
    U32         numChildren;    // in/out: App directory attr numchildren.
} APP_DIR_UPDATE_NUM_CHILDREN, *P_APP_DIR_UPDATE_NUM_CHILDREN;
```

msgAppDirSetNumChildren

Specifies the total number of embedded children of a document.

Takes P_APP_DIR_UPDATE_NUM_CHILDREN, returns STATUS.

```
#define msgAppDirSetNumChildren         MakeMsg(clsAppDir, 23)
```

Message Arguments

```
typedef struct APP_DIR_UPDATE_NUM_CHILDREN {
    P_STRING    pPath;          // in: Path relative to target directory.
    U32         numChildren;    // in/out: App directory attr numchildren.
} APP_DIR_UPDATE_NUM_CHILDREN, *P_APP_DIR_UPDATE_NUM_CHILDREN;
```

msgAppDirGetGlobalSequence

Passes back an application directory's global sequence number.

Takes P_APP_DIR_GET_GLOBAL_SEQUENCE, returns STATUS.

```
#define msgAppDirGetGlobalSequence      MakeMsg(clsAppDir, 21)
```

Arguments

```
typedef struct APP_DIR_GET_GLOBAL_SEQUENCE {
    P_STRING    pPath;          // in: Path relative to target directory.
    U32         globalSequence; // in/out: App directory global sequence.
} APP_DIR_GET_GLOBAL_SEQUENCE, *P_APP_DIR_GET_GLOBAL_SEQUENCE;
```

Comments

The global sequence number is the 1-based position of a document within its **clsRootContainerApp** embeddor (i.e., the document's page number in the notebook).

msgAppDirGetBookmark

Passes back an document's application tab.

Takes P_APP_DIR_GET_BOOKMARK, returns STATUS.

```
#define msgAppDirGetBookmark            MakeMsg(clsAppDir, 13)
```

Arguments

```
typedef struct APP_DIR_GET_BOOKMARK {
    P_STRING    pPath;              // in: Path relative to target directory.
    char        label[nameBufLength]; // out: tab label.
} APP_DIR_GET_BOOKMARK, *P_APP_DIR_GET_BOOKMARK;
```

Comments

If the application directory has no tab (**appDirFlags.bookmark==false**), **msgAppDirGetBookmark** will return **stsOK** and **pArgs->**label will be unchanged. For this reason it is recommended that you drop a null byte into **pArgs->**label[0] before calling **msgAppDirGetBookmark**. Then, if the application directory has no tab, you will get back a null string.

msgAppDirSetBookmark

Specifies a document's application tab.

Takes P_APP_DIR_SET_BOOKMARK, returns STATUS.

```
#define msgAppDirSetBookmark            MakeMsg(clsAppDir, 14)
```

Arguments

```
typedef struct APP_DIR_SET_BOOKMARK {
    BOOLEAN     on;                 // in: Turn bookmark on or off.
    P_STRING    pPath;              // in: Path relative to target directory.
    char        label[nameBufLength]; // in/out: tab label.
} APP_DIR_SET_BOOKMARK, *P_APP_DIR_SET_BOOKMARK;
```

Comments

clsAppDir sends **msgAppChanged** to observers of **clsApp** as a result of this message. See app.h for a description of **msgAppChanged**.

If label[0] is NULL, **clsAppDir** uses the default label, which is the name of the document.

msgAppDirGetNextInit

Initializes an APP_DIR_NEXT structure.

Takes P_APP_DIR_NEXT, returns STATUS.

```
#define msgAppDirGetNextInit            MakeMsg(clsAppDir, 15)
```

Comments

Send this message to an application directory to prepare it for an ensuing **msgAppDirGetNext** loop.

msgAppDirGetNext

Passes back the attributes of the next application directory.

Takes P_APP_DIR_NEXT, returns STATUS.

```
#define msgAppDirGetNext                MakeMsg(clsAppDir, 16)
```

Arguments

```
typedef struct APP_DIR_NEXT {
    APP_DIR_ATTRS   attrs;      // out: attrs for next child.
    P_STRING        pName;      // out: name of next child.
    U32             fsFlags;    // out: fs flags for next child (see fs.h)
    P_UNKNOWN       pFirst;     // out: first app dir to examine
    P_UNKNOWN       pNext;      // out: next app dir to examine
    P_UNKNOWN       handle;     // out: current app dir
} APP_DIR_NEXT, *P_APP_DIR_NEXT;
```

Comments

Send this message to an application directory in a loop to get the **appDirAttrs** for each embedded document (not recursive), ordered by sequence number.

You generally do not change the values in the APP_DIR_NEXT structure between calls to **msgAppDirGetNext**. Doing so jeopardizes the traversal of the embedded documents.

msgAppDirReset

Frees resources after a series of **msgAppDirGetNext** messages.

Takes P_APP_DIR_NEXT, returns STATUS.

```
#define msgAppDirReset                  MakeMsg(clsAppDir, 17)
```

Message Arguments

```
typedef struct APP_DIR_NEXT {
    APP_DIR_ATTRS   attrs;      // out: attrs for next child.
    P_STRING        pName;      // out: name of next child.
    U32             fsFlags;    // out: fs flags for next child (see fs.h)
    P_UNKNOWN       pFirst;     // out: first app dir to examine
    P_UNKNOWN       pNext;      // out: next app dir to examine
    P_UNKNOWN       handle;     // out: current app dir
} APP_DIR_NEXT, *P_APP_DIR_NEXT;
```

Comments

You must send this message to the application directory after the **msgAppDirGetNext** loop has completed. Failing to do so can cause internally allocated memory not to be deallocated.

msgAppDirSeqToName

Passes back the name of the embedded document with a specified sequence number.

Takes P_APP_DIR_SEQ_TO_NAME, returns STATUS.

```
#define msgAppDirSeqToName              MakeMsg(clsAppDir, 18)
```

Arguments

```
typedef struct APP_DIR_SEQ_TO_NAME {
    U32         sequence;       // in: Sequence number.
    P_STRING    pName;          // out: Buffer for name.
                                // Must be nameBufLength long.
} APP_DIR_SEQ_TO_NAME, *P_APP_DIR_SEQ_TO_NAME;
```

msgAppDirGetDirectNumChildren

Passes back the number of directly embedded documents (not recursive).

Takes P_U32, returns STATUS.

```
#define msgAppDirGetDirectNumChildren   MakeMsg(clsAppDir, 19)
```

msgAppDirGetTotalNumChildren

Passes back the total number of embedded documents (recursive).

Takes P_U32, returns STATUS.

```
#define msgAppDirGetTotalNumChildren    MakeMsg(clsAppDir, 20)
```

APPMGR.H

This file contains the API definition for **clsAppMgr**.

clsAppMgr inherits from **clsClass.**

Provides support for application classes and document management.

"AppMgr" stands for Application Manager.

Introduction

When you create a new application class (i.e., install an application), rather than sending **msgNew** to **clsClass** you send **msgNew** to **clsAppMgr**. This allows you to specify properties of the application class, and also to specify in advance some default properties of the documents (i.e., instances) of the application class.

There is one instance of **clsAppMgr** for each installed application class. This object is given the well-known uid of the application class. The application manager class implements document management messages and stores information about the installed application class in its instance data.

```
#ifndef APPMGR_INCLUDED
#define APPMGR_INCLUDED
#include <fs.h>
#include <geo.h>
```

Common #defines and typedefs

```
typedef OBJECT APPMGR, *P_APPMGR;
```

AppMgr Flags

Various settings for the installed application class.

stationery: If true, an instance of the application will be placed in the Stationery Notebook when the application is installed. The instance will have default parameters. You can also create customized stationery instances using the STATNRY subdirectory. See appmon.h for more details.

accessory: If true, an instance of the application will be placed in the Accessories Palette. The instance will have default parameters. You can also create customized accessories instances using the ACESSRY subdirectory. See appmon.h for more details.

hotMode: If true, instances of the application are created in hot mode by default. Note that you can change a document's hot mode flag at **msgInit** time (or at any other time) using **msgAppSetHotMode**. See app.h for more details.

allowEmbedding: If true, instances of the application allow child applications to be embedded within them. This parameter cannot be modified on a per-document basis.

confirmDelete: If true, PenPoint will ask for user confirmation before deleting any instance of the application. This parameter cannot be modified on a per-document basis.

deinstallable: If false, users will be prevented from deinstalling the application class.

systemApp: If true, users will not see the application on the list of choices for importing documents.

lowMemoryApp: If false, users will be prevented from activating instances of the application when the system is low on memory.

fullEnvironment: If true, instance 0 of the application will have a full environment, including a resource list and floating window list. If false, these two items are destroyed, saving memory. In general, if your application does no processing in instance 0 (i.e., it simply calls AppMonitorMain()), you should set **fullEnvironment** to false to save unneeded memory.

```
typedef struct APP_MGR_FLAGS {
    U16     stationery          : 1;    // Put in stationery notebook.
    U16     accessory           : 1;    // Put in accessory palette.
    U16     hotMode             : 1;    // Create docs in hot mode.
    U16     allowEmbedding      : 1;    // Allow child embedded apps.
    U16     confirmDelete       : 1;    // Confirm document deletes.
    U16     deinstallable       : 1;    // App class deinstallable.
    U16     systemApp           : 1;    // Disable imports into this app.
    U16     lowMemoryApp        : 1;    // Allow activation under low memory.
    U16     fullEnvironment     : 1;    // Initialize instance 0 environment.
    U16     reserved1           : 7;    // Reserved.
    U16     reserved2           : 16;   // Reserved.
} APP_MGR_FLAGS, *P_APP_MGR_FLAGS;
```

AppMgr Metrics and NEW Structure

Public instance data for an installed application class. Also the new structure for creating a new installed application class.

```
typedef struct APP_MGR_METRICS {
// All fields are passed back from msgAppMgrGetMetrics.
// For msgNew: in=specified, out=passed back, na=not applicable (don't care).
    OBJECT          dir;                        // na: App monitor dir.
    OBJECT          appMonitor;                 // na: App monitor object.
    OBJECT          resFile;                    // na: App res file.
    OBJECT          iconBitmap;                 // na: Icon bitmap.
    OBJECT          smallIconBitmap;            // na: Small icon bitmap.
    OBJECT          appWinClass;                // in: always clsAppWin.
    RECT32          defaultRect;                // in: Default rectangle
                                                //      (in points).
    char            name[nameBufLength];        // na: Application name.
    char            version[nameBufLength];     // na: Version.
    char            company[nameBufLength];     // in: Company name.
    char            defaultDocName[nameBufLength]; // in/out: Default
                                                //      document name.
    P_STRING        copyright;                  // in: Copyright notice.
    OS_PROG_HANDLE  programHandle;              // out: Program handle.
    U32             reserved[4];                // na: Reserved.
    APP_MGR_FLAGS   flags;                      // in: Described above.
} APP_MGR_METRICS, *P_APP_MGR_METRICS,
  APP_MGR_NEW_ONLY, *P_APP_MGR_NEW_ONLY;
```

---

msgNew

Install a new application class.

Takes P_APP_MGR_NEW, returns STATUS. Category: class message.

```
#define appMgrNewFields         \
    classNewFields              \
    APP_MGR_NEW_ONLY            appMgr;
```

Arguments

```
typedef struct APP_MGR_NEW {
    appMgrNewFields
} APP_MGR_NEW, *P_APP_MGR_NEW;
```

Comments

The fields you commonly set are:

pArgs->object.uid your application class's uid

pArgs->cls.**pMsg** your application class's method table

pArgs->cls.ancestor your application class's ancestor (usually **clsApp**)

pArgs->cls.size size of a document's instance data

pArgs->cls.**newArgsSize** size of the _NEW struct for the app class

pArgs->appMgr.**defaultRect** rectangle to open doc to when floating

pArgs->appMgr.company your company's name

pArgs->appMgr.**defaultDocName** name of new documents of this application

pArgs->appMgr.copyright copyright notice

pArgs->appMgr.flags (see description of flags above)

clsAppMgr objects cannot be locked, so **clsAppMgr** forces **pArgs**->object.key to 0.

msgNewDefaults

Initializes APP_MGR_NEW structure to default values.

Takes P_APP_MGR_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct APP_MGR_NEW {
    appMgrNewFields
} APP_MGR_NEW, *P_APP_MGR_NEW;
```

Comments

Zeroes out **pArgs**->appMgr and sets

```
pArgs->object.cap |= objCapCall | objCapSend | objCapScavenge;

pArgs->appMgr.flags.stationery     = true;
pArgs->appMgr.flags.accessory      = false;
pArgs->appMgr.flags.allowEmbedding = true;
pArgs->appMgr.flags.confirmDelete  = true;
pArgs->appMgr.flags.deinstallable  = true;
pArgs->appMgr.flags.systemApp      = false;
pArgs->appMgr.flags.hotMode        = false;
pArgs->appMgr.appWinClass          = clsAppWin;

// Default rect: 300 x 300 points, centered in theRootWindow
WIN_METRICS wm;
ObjCallRet(msgWinGetMetrics, theRootWindow, &wm, s);
pArgs->appMgr.defaultRect.size.w   = 300;
pArgs->appMgr.defaultRect.size.h   = 300;
pArgs->appMgr.defaultRect.origin.x = (wm.bounds.size.w/2) -
                                     (pArgs->appMgr.defaultRect.size.w/2);
pArgs->appMgr.defaultRect.origin.y = (wm.bounds.size.h/2) -
                                     (pArgs->appMgr.defaultRect.size.h/2);
```

msgAppMgrGetMetrics

Passes back the AppMgr metrics.

Takes P_APP_MGR_METRICS, returns STATUS. Category: class message.

```
#define msgAppMgrGetMetrics                MakeMsg(clsAppMgr, 1)
```

Message Arguments

```
typedef struct APP_MGR_METRICS {
// All fields are passed back from msgAppMgrGetMetrics.
// For msgNew: in=specified, out=passed back, na=not applicable (don't care).
    OBJECT          dir;                          // na: App monitor dir.
    OBJECT          appMonitor;                   // na: App monitor object.
    OBJECT          resFile;                      // na: App res file.
    OBJECT          iconBitmap;                   // na: Icon bitmap.
    OBJECT          smallIconBitmap;              // na: Small icon bitmap.
    OBJECT          appWinClass;                  // in: always clsAppWin.
    RECT32          defaultRect;                  // in: Default rectangle
                                                  //      (in points).
    char            name[nameBufLength];          // na: Application name.
    char            version[nameBufLength];       // na: Version.
    char            company[nameBufLength];       // in: Company name.
    char            defaultDocName[nameBufLength]; // in/out: Default
                                                  //      document name.
    P_STRING        copyright;                    // in: Copyright notice.
    OS_PROG_HANDLE  programHandle;                // out: Program handle.
    U32             reserved[4];                  // na: Reserved.
    APP_MGR_FLAGS   flags;                        // in: Described above.
} APP_MGR_METRICS, *P_APP_MGR_METRICS,
```

msgAppMgrCreate

Creates a directory entry for a new document.

Takes P_APP_MGR_CREATE, returns STATUS.

```
#define msgAppMgrCreate                    MakeMsg(clsAppMgr, 2)
```

Arguments

```
typedef struct APP_MGR_CREATE {
    FS_LOCATOR  locator;        // Parent doc. uid must be of clsAppDir.
    P_STRING    pName;          // in/out: Name of new app.
    U32         sequence;       // Sequence of new app in parent app.
    BOOLEAN     renumber;       // true=update global sequence #s.
    U32         reserved[2];    // reserved.
} APP_MGR_CREATE, *P_APP_MGR_CREATE;
```

Comments

This message transitions a document from the Non-Existent state to the Created state.

clsAppMgr creates a new file system directory entry for the new document, using the name im **pName**. **clsAppMgr** also stamps the new directory with the application's class.

If **pName** is **pNull**, **clsAppMgr** creates a unique name, based on the application name. If **pName** is not **pNull**, it points to a client-allocated buffer that must be **nameBufLength** bytes long.

After **msgAppMgrCreate**, the document will appear in the appropriate table of contents or icon window. But the application instance itself will not be created until **msgAppMgrActivate**, which transitions the document from the Created state to the Activated state.

Return Value

stsFSNodeNotFound Invalid **pArgs**->locator

msgAppMgrActivate

Activates a document.

Takes P_APP_MGR_ACTIVATE, returns STATUS.

```
#define msgAppMgrActivate                    MakeMsg(clsAppMgr, 3)
```

Arguments

```
typedef struct APP_MGR_ACTIVATE {
    OBJECT      winDev;     // Window device to activate app on.
    FS_LOCATOR  locator;    // Location of doc to activate.
    OBJECT      parent;     // Parent doc uid.
    OBJECT      uid;        // out: activated doc uid.
} APP_MGR_ACTIVATE, *P_APP_MGR_ACTIVATE;
#define stsAppMgrLowMemNoActivate       MakeStatus(clsAppMgr, 3)
```

Comments

This message transitions a document from the Created or Dormant state to the Activated state.

clsAppMgr creates a new process for the document, and a new instance of the application class in the new process. The Application Framework will then send the new application instance **msgAppInit** if the document was in the Created state, or **msgAppRestore** if the document was in the Dormant state.

Return Value

stsAppMgrLowMemNoActivate Document could not be activated due to low memory conditions.

stsFSNodeNotFound Invalid **pArgs**->locator.

msgAppMgrMove

Moves a document to a new location.

Takes P_APP_MGR_MOVE_COPY, returns STATUS.

```
#define msgAppMgrMove                        MakeMsg(clsAppMgr, 4)
```

Arguments

```
typedef struct APP_MGR_MOVE_COPY_STYLE {
    U16 showConfirm         : 1;    // show confirmation UI
    U16 showProgress        : 1;    // show progress UI
    U16 reserved            : 14;   // reserved.
    U16 reserved2           : 16;   // reserved.
} APP_MGR_MOVE_COPY_STYLE, *P_APP_MGR_MOVE_COPY_STYLE;
typedef struct APP_MGR_MOVE_COPY {
    FS_LOCATOR              locator;            // Source document location.
    OBJECT                  source;             // Source object.
    OBJECT                  dest;               // Destination object.
    XY32                    xy;                 // x,y location in dest object.
    CHAR                    name[nameBufLength];// in:out New doc name;
    BOOLEAN                 renumber;           // true=update global sequence #s.
    APP_MGR_MOVE_COPY_STYLE style;              // Move/copy style.
    OBJECT                  appWin;             // out: move/copied appwin.
} APP_MGR_MOVE_COPY, *P_APP_MGR_MOVE_COPY;
```

Comments

clsAppMgr will display the appropriate UI to show the progress of any time-consuming moves.

If the move fails due to low memory, user cancellation, etc., **msgAppMgrMove** will nevertheless return a value >= **stsOK**. The user will have been notified of the condition via standard error messaging facilities.

msgAppMgrCopy

Copies a document to a new location.

Takes P_APP_MGR_MOVE_COPY, returns STATUS.

```
#define msgAppMgrCopy                        MakeMsg(clsAppMgr, 5)
```

Message Arguments

```
typedef struct APP_MGR_MOVE_COPY {
    FS_LOCATOR              locator;            // Source document location.
    OBJECT                  source;             // Source object.
    OBJECT                  dest;               // Destination object.
    XY32                    xy;                 // x,y location in dest object.
    CHAR                    name[nameBufLength];// in:out New doc name;
    BOOLEAN                 renumber;           // true=update global sequence #s.
    APP_MGR_MOVE_COPY_STYLE style;              // Move/copy style.
    OBJECT                  appWin;             // out: move/copied appwin.
} APP_MGR_MOVE_COPY, *P_APP_MGR_MOVE_COPY;
```

Comments

clsAppMgr will display the appropriate UI to show the progress of any time-consuming copies.

If the copy fails due to low memory, user cancellation, etc., **msgAppMgrCopy** will nevertheless return a value >= **stsOK**. The user will have been notified of the condition via standard error messaging facilities.

msgAppMgrFSMove

Low-level move message used internally by **msgAppMgrMove**.

Takes P_APP_MGR_FS_MOVE_COPY, returns STATUS. Category: internal use only.

```
#define msgAppMgrFSMove                     MakeMsg(clsAppMgr, 17)
```

Arguments

```
typedef struct APP_MGR_FS_MOVE_COPY {
    FS_LOCATOR      source;             // Source doc location.
    FS_LOCATOR      dest;               // Location of new parent doc.
    U32             sequence;           // Sequence of new doc in parent doc.
    CHAR            name[nameBufLength];// in/out: Name of new doc.
    U32             reserved[2];        // reserved.
} APP_MGR_FS_MOVE_COPY, *P_APP_MGR_FS_MOVE_COPY;
```

msgAppMgrFSCopy

Low-level copy message used internally by **msgAppMgrCopy**.

Takes P_APP_MGR_FS_MOVE_COPY, returns STATUS. Category: internal use only.

```
#define msgAppMgrFSCopy                     MakeMsg(clsAppMgr, 18)
```

Message Arguments

```
typedef struct APP_MGR_FS_MOVE_COPY {
    FS_LOCATOR      source;             // Source doc location.
    FS_LOCATOR      dest;               // Location of new parent doc.
    U32             sequence;           // Sequence of new doc in parent doc.
    CHAR            name[nameBufLength];// in/out: Name of new doc.
    U32             reserved[2];        // reserved.
} APP_MGR_FS_MOVE_COPY, *P_APP_MGR_FS_MOVE_COPY;
```

msgAppMgrDelete

Deletes a document.

Takes P_APP_MGR_DELETE, returns STATUS.

```
#define msgAppMgrDelete                     MakeMsg(clsAppMgr, 6)
```

Arguments

```
typedef struct APP_MGR_DELETE {
    FS_LOCATOR  locator;        // Document to delete.
    BOOLEAN     renumber;       // true=update global sequence #s.
    U32         reserved[2];    // reserved.
} APP_MGR_DELETE, *P_APP_MGR_DELETE;
```

Comments

This message transitions a document from the Created or Dormant state to the Non-Existent state. The document is deleted along with all of its directory nodes, embedded documents, document processes, and so on.

msgAppMgrRename

Renames a document.

Takes P_APP_MGR_RENAME, returns STATUS.

```
#define msgAppMgrRename                         MakeMsg(clsAppMgr, 7)
```

Arguments

```
typedef struct APP_MGR_RENAME {
    FS_LOCATOR  locator;        // Location of app to rename.
    P_STRING    pName;          // in/out: New app name.
    U32         reserved[2];    // reserved.
} APP_MGR_RENAME, *P_APP_MGR_RENAME;
```

Comments

pName must point to a buffer **nameBufLength** long.

Return Value

stsAppBadName Invalid new name.

stsAppDuplicateName Name already in use.

msgAppMgrShutdown

Unconditionally shuts down an application instance and all children.

Takes P_FS_LOCATOR, returns STATUS.

```
#define msgAppMgrShutdown                       MakeMsg(clsAppMgr, 8)
```

Comments

This message transitions a document from the Activated or Opened state to the Dormant state. The document is not given the opportunity to veto the shutdown. The document is sent **msgAppSave** before the shutdown, so it can file its data.

msgAppMgrGetRoot

Passes back the root application (**clsRootContainerApp**) of a tree of applications.

Takes P_APP_MGR_GET_ROOT, returns STATUS.

```
#define msgAppMgrGetRoot                        MakeMsg(clsAppMgr, 9)
```

Arguments

```
typedef struct APP_MGR_GET_ROOT {
    FS_LOCATOR  locator;                // Location of app.
    char        path[fsPathBufLength];  // out: Path to root.
    UUID        uuid;                   // out: Root uuid;
    OBJECT      app;                    // out: Root app. objNull if inactive.
    U32         reserved[2];            // reserved.
} APP_MGR_GET_ROOT, *P_APP_MGR_GET_ROOT;
```

msgAppMgrSetIconBitmap

Specifies the large application icon bitmap.

Takes OBJECT, returns STATUS.

```
#define msgAppMgrSetIconBitmap                  MakeMsg(clsAppMgr, 10)
```

msgAppMgrSetSmallIconBitmap

Specifies the small application icon bitmap.

Takes OBJECT, returns STATUS.

```
#define msgAppMgrSetSmallIconBitmap             MakeMsg(clsAppMgr, 11)
```

msgAppMgrRevert

Reverts a document to its most recently filed copy.

Takes P_FS_LOCATOR, returns STATUS.

```
#define msgAppMgrRevert                    MakeMsg(clsAppMgr, 12)
```

msgAppMgrRenumber

Renumbers an application heirarchy.

Takes P_FS_LOCATOR, returns STATUS.

```
#define msgAppMgrRenumber                  MakeMsg(clsAppMgr, 13)
```

Comments

The FS_LOCATOR must be a locator for a **clsRootContainerApp**.

msgAppMgrDumpSubtree

Dumps the attributes of a subtree of documents.

Takes P_FS_LOCATOR, returns STATUS.

```
#define msgAppMgrDumpSubtree               MakeMsg(clsAppMgr, 14)
```

Comments

The information is output to the debug window or device. The dumped fields for each node are:

- document name
- UUID (low 32 bits followed by high 32 bits)
- old UUID (low 32 bits followed by high 32 bits)
- application class
- number of children
- sequence number

msgAppMgrGetResList

Creates a resource list, given an application UUID.

Takes P_APP_MGR_GET_RES_LIST, returns STATUS.

```
#define msgAppMgrGetResList                MakeMsg(clsAppMgr, 15)
```

Arguments

```
typedef struct APP_MGR_GET_RES_LIST {
    UUID        appUUID;    // App uuid.
    OBJECT      resList;    // in/out: resource file list.
} APP_MGR_GET_RES_LIST, *P_APP_MGR_GET_RES_LIST;
```

Comments

The resource list will contain the document resource file, the application resource file, the preference resource file, and the system resource file. **resList** should be set to **objNull** or a well-known uid.

APPMON.H

This file contains the API definition for **clsAppMonitor**.

clsAppMonitor inherits from **clsApp.**

Provides the standard behavior for an application's monitor object.

You create an application monitor when you call AppMonitorMain from your main routine, when **processCount** is zero. An application monitor drives application installation and helps with deinstallation. It also controls displaying global application options, maintaining global state, and importing files.

You should subclass **clsAppMonitor** if your application needs to do a more sophisticated installation (such as installing shared dictionaries or data files), to support file import, to set and save global application configurations, and to provide file converters. See the section below on Subclassing.

clsAppMonitor's Lifecycle

Every application has a single instance of its application monitor class alive as long as the application is installed. The app monitor object is owned by the application's **processCount** 0 process. Clients can get the uid of the app monitor object by sending **msgAppMgrGetMetrics** to an application's class.

clsAppMonitor is a descendant of **clsApp**. It makes use of the standard Application Framework lifecycle messages to perform some of its functions:

msgAppInit Install the application.

msgAppRestore Reinitialize the application after a warm-boot.

msgAppOpenTo Display global application option sheet.

msgAppCloseTo Take down global application option sheet.

Note: **msgAppTerminate** must *never* be sent directly to the app monitor. Use **msgAMTerminateOK** and **msgAMTerminate** instead.

Application Installation

Application installation is performed as follows:

1. Somebody sends **msgIMInstall** to **theInstalledApps**. **theInstalledApps** creates an application directory in the selected volume under \penpoint\sys\app, copies the application's resource file into the application directory, and installs the application's code. See appimgr.h for details.
2. When the code is installed, the operating system creates the application's first process (**processCount** = 0) and begins execution of the main() routine. The application installs its classes and calls AppMonitorMain(). AppMonitorMain never returns; it creates the app monitor object and goes into an object dispatch loop (see clsmgr.h).
3. The Application Framework sends **msgAppInit** to the app monitor. This initiates the app monitor's installation sequence.

4. The app monitor self sends **msgAMLoadInitDll**. This causes an optional initialization .dll to be run and then be unloaded.
5. The app monitor self sends **msgAMPopupOptions**. If a descendant wants to pop up the app monitor global option sheet, it must handle this message and set **pArgs** to true, then pass it on to its ancestor. This will cause the option sheet protocol (**msgOptionAddCards**, etc) to be sent to the app monitor.
6. The app monitor self sends **msgAMLoadMisc**. This causes any files that the application has in the MISC directory to be copied into the app directory in the selected volume.
7. The app monitor self sends **msgLoadAuxNotebooks**, which causes **msgLoadStationery** and **msgLoadHelp** to be sent to self. **msgLoadStationery** causes all the stationery and accessory templates that do not have an **anmAttrNoLoad** attribute on them to be loaded into the machine. Stationery is stored in the STATNRY directory; Accessories are stored in the ACESSRY directory. **msgLoadHelp** causes all Help Notebook documents and templates that do not have the **anmAttrNoLoad** attribute set to be loaded into the Help Notebook.
8. The app monitor self sends **msgAMLoadFormatConverters** and **msgAMLoadOptionalDlls**. These messages are currently not implemented by **clsAppMonitor**; descendants can deal with them if desired. There might be default superclass behavior in the future.

Stationery, Accessory, and Help Documents

Stationery and Accessory documents can either be saved document instances (typically copied out to a distribution disk with the Connections Notebook), or plain directories containing files that the application knows about.

Help documents can be directories containing ASCII or RTF files, or PenPoint documents.

These items must be located in the application's installation directory in subdirectories called STATNRY, ACCESSRY, and HELP.

Subclassing clsAppMonitor

The app monitor is an excellent place to add global application control and syncronization functions, since it is always around and easily accessable. For instance, if an application wants its documents to access some application-specific shared data (such as a list of worldwide telephone country codes), the app monitor for the application could manage this data and provide an API to access it.

Applications can have a global application option sheet automatically displayed when the application is installed by handling **msgAMPopupOptions**. A special resource is written into the application's resource file after this occurs, inhibiting subsequent popups if the resource file is copied to the application's installation directory. **clsAppMon** does not provide any default cards; you must provide at least one if you handle **msgAMPopupOptions**.

If you display a user interface from your app monitor you will probably have to turn on the **fullEnvironment** app manager flag when you create your main application class. If this flag is false then the app monitor will run in a stripped down process environment. This saves a substantial amount of memory, but does not have process-local resources such as **theProcessResList**.

If you subclass **clsAppMonitor**, you must specify your descendant's class name when you call AppMonitorMain. The first parameter to this routine is the global well-known name of your application class. The second is the global well-known name of your descendant of **clsAppMonitor**. If you do not

subclass **clsAppMonitor**, pass **objNull** for the second parameter. The AppMonitorMain routine will know to create a default application monitor.

```
#ifndef APPMON_INCLUDED
#define APPMON_INCLUDED
#ifndef FS_INCLUDED
#include <fs.h>
#endif
#ifndef OPTION_INCLUDED
#include <option.h>
#endif
```

Common #defines and typedefs

This attribute represents the last modified date that a piece of stationery had when it was installed on the machine.

```
#define amAttrDateTimeLoaded            FSMakeFix32Attr(clsAppMonitor, 2)
```

Application Framework Messages

msgAppInit

Installs the application.

Takes DIR_HANDLE, returns STATUS.

Comments

This message is sent once and only once by the system, when the application is first installed from disk.

The app monitor initializes its instance data, runs the installation protocol (**msgAMLoadInitDLL**, **msgAMLoadStationery**, **msgAMLoadMisc**, etc), adds this application to system lists, and signals the installation process to continue running.

Descendants: You can handle this message to perform any first-time initialization. The ancestor must be called before your handler.

msgAppRestore

Reinitializes the application after a warm-boot.

Takes nothing, returns STATUS.

Comments

This message is sent by the system when a warm-boot occurs. The app monitor initializes its instance data and signals the system warm-boot process to proceed.

Descendants: You can handle this message and perform any first-time initialization. The ancestor must be called before your handler.

msgAppOpen

Displays the global configuration option sheet.

Takes P_APP_OPEN, returns STATUS.

Comments

This message is self-sent by **msgAMPopupOptions**. It can also be sent by anyone else.

The app monitor displays the application configuration option sheet (**tagAppDocOptSheet**).

Descendants: You normally do not handle this message. To provide an option sheet, see **msgAMPopupOptions**.

msgAppClose

Removes the global configuration option sheet.

Takes nothing, returns STATUS.

Comments

This message is self-sent by **msgAMPopupOptions**. It can also be sent by anyone else.

Descendants: You normally do not handle this message.

Import Messages

msgImportQuery

Determines if a file can be imported by the application.

Takes P_IMPORT_QUERY, returns STATUS.

Comments

The app monitor forwards **msgImportQuery** to its class as a class message. If it isn't handled there, the app monitor sends back "No" to all import requests. In the future there will be support to run through any of the file translators that the application has loaded.

Descendants: You normally do not handle this message.

See Also

import.h

msgImport

Imports a file.

Takes P_IMPORT_DOC, returns STATUS.

Comments

The app monitor first creates a new document object and activates it. It then forwards **msgImport** to the document. Next, it sends **msgAppMgrShutdown** to both save the document and shut it down.

Descendants: You normally do not handle this message.

See Also

import.h

App Monitor Messages

msgAMGetMetrics

Gets the app monitor's metrics.

Takes P_AM_METRICS, returns STATUS.

```
#define msgAMGetMetrics                    MakeMsg(clsAppMonitor, 1)
```

Arguments

```
typedef struct AM_METRICS {
    CLASS               appClass;  // Main application class.
    OBJECT              handle;    // This app's handle in theInstalledApps.
    U32                 unused2;
    U32                 unused3;
    U32                 unused4;
    U16                 unused;
} AM_METRICS, *P_AM_METRICS;
```

Comments

Descendants: You normally do not handle this message.

msgAMGetInstallDir

Creates a directory handle on the application's installation directory.

Takes P_OBJECT, returns STATUS.

```
#define msgAMGetInstallDir                    MakeMsg(clsAppMonitor, 2)
```

Comments The app monitor creates a **clsDirHandle** object which references the location on external media that the application was installed from. If the external volume is not connected, the user is asked to attach it.

If this application was bundled with PenPoint then there is no valid external volume beyond installation time. **stsFailed** is returned in this case.

NOTE: CALLER IS RESPONSIBLE FOR DESTROYING THE DIR HANDLE WHEN DONE.

Return Value **stsOK** The external volume is attached. The user tapped the Cancel button when promptedto attach the external volume. The external volume cannot be determined becausethis application was bundled with PenPoint.

Descendants: You normally do not handle this message.

msgAMLoadInitDll

Loads, runs, and unloads an optional dll initialization routine.

Takes OBJECT, returns STATUS.

```
#define msgAMLoadInitDll                      MakeMsg(clsAppMonitor, 4)
```

Comments The app monitor looks for an init.dll file in the application's directory (which is specified in **pArgs**). If it is found, the DllMain routine for this dll is run. The dll is then unloaded.

Descendants: You normally do not handle this message.

Return Value **stsOK** Either the dll initialization was not found or it was found andrun successfully.

msgAMLoadMisc

Load the application's miscellaneous files.

Takes nothing, returns STATUS.

```
#define msgAMLoadMisc                         MakeMsg(clsAppMonitor, 5)
```

Comments If a directory called MISC exists, the app monitor copies this directory into the in-memory application directory.

Descendants: You normally do not handle this message. However, you can create the MISC directory and place in it files that all of your documents need to use. For example, your documents may need to reference a file that contains all of the postal/zip codes for a country.

Return Value **stsOK** Either the MISC directory was not found or wasfound and copied successfully.

msgAMLoadStationery

Loads stationery and accessory templates.

Takes nothing, returns STATUS.

```
#define msgAMLoadStationery                   MakeMsg(clsAppMonitor, 6)
```

Comments

The app monitor looks for stationery in a directory named STATNRY and accessories in a directory named ACCESSRY in the app's directory. It copies any templates that are not marked with the **noLoad** attribute from these directories to the Stationery and Accessories notebooks.

A template is a subdirectory with a either a complete, saved document or any kind of file that the application can read.

If **appMgrMetrics.flags.stationery** is true, the app monitor creates a default piece of stationery (an empty document of its application type). Similarly, if **appMgrMetrics.flags.accessory** is true, the app monitor places an empty document in the Accessories notebook.

Descendants: You normally do not handle this message.

---

msgAMRemoveStationery

Removes all the stationery and accessory templates for this application.

Takes nothing, returns STATUS.

```
#define msgAMRemoveStationery                MakeMsg(clsAppMonitor, 7)
```

Comments

The app monitor removes the stationery notebook section for this application, which removes the stationery loaded in **msgAMLoadStationery** and any user- defined stationery. It then removes all of this application's documents from the Accessories notebook (thereby removing templates loaded in **msgAMLoadStationery** and any documents that the user placed there).

Descendants: You normally do not handle this message.

---

msgAMLoadHelp

Loads the application's help into the Help Notebook.

Takes nothing, returns STATUS.

```
#define msgAMLoadHelp                        MakeMsg(clsAppMonitor, 8)
```

Comments

The app monitor looks for a HELP subdirectory in the application's directory. If HELP exists, the app monitor copies all of the help templates that are not marked with the **noLoad** attribute to the Help Notebook. Help templates can be directories with ASCII, RTF or saved MiniText documents in them.

Descendants: You normally do not handle this message.

---

msgAMRemoveHelp

Removes all Help Notebook items for this application.

Takes nothing, returns STATUS.

```
#define msgAMRemoveHelp                      MakeMsg(clsAppMonitor, 9)
```

Comments

The app monitor removes all of this application's items from the Help Notebook.

Descendants: You normally do not handle this message.

---

msgAMPopupOptions

Pops up a global option sheet the first time the app is installed.

Takes P_BOOLEAN, returns STATUS.

```
#define msgAMPopupOptions                MakeMsg(clsAppMonitor, 17)
```

Comments

If **pArgs** is false, the app monitor does not do anything. If it is true, the app monitor pops up the global option sheet, then writes a resource in the application's resource file which inhibits subsequent popups.

Descendants: If you want to allow the user to configure (or check the configuration of) the application as it is being installed, you need to handle this message. In your handler, you should set **pArgs** to true and then call the ancestor. You also need to create an option sheet resource with a tag of **tagAppDocOptSheet** (in your application's **msgAppAddCards** handler).

You can have the option sheet to always pop up (even after the first time the user installs the application) by not calling the ancestor and popping up the option sheet yourself with:

ObjCallRet(**msgAppOpenTo**, self, (P_ARGS) **appOpenToFloating**, s);

msgAMLoadAuxNotebooks

Loads items into auxilliary notebooks.

Takes nothing, returns STATUS.

```
#define msgAMLoadAuxNotebooks                MakeMsg(clsAppMonitor, 14)
```

Comments

The app monitor self sends **msgAMLoadStationery** and **msgAmLoadHelp** to load the application's stationery, accessory, and help templates.

Descendants: You normally do not handle this message.

msgAMLoadFormatConverters

Loads file format converter .dlls.

Takes nothing, returns STATUS.

```
#define msgAMLoadFormatConverters            MakeMsg(clsAppMonitor, 10)
```

Comments

Currently, the app monitor does not do anything in response to this message. It will do something in the future.

Descendants: You normally do not handle this message.

msgAMUnloadFormatConverters

Unloads file format converter .dlls.

Takes nothing, returns STATUS.

```
#define msgAMUnloadFormatConverters          MakeMsg(clsAppMonitor, 11)
```

Comments

Currently, the app monitor does not do anything in response to this message. It will do something in the future.

Descendants: You normally do not handle this message.

msgAMLoadOptionalDlls

Loads an application's optional .dlls.

Takes nothing, returns STATUS.

```
#define msgAMLoadOptionalDlls                MakeMsg(clsAppMonitor, 12)
```

Comments

Currently, the app monitor does not do anything in response to this message. It will do something in the future.

Descendants: You normally do not handle this message.

msgAMUnloadOptionalDlls

Unloads an application's optional .dlls.

Takes nothing, returns STATUS.

```
#define msgAMUnloadOptionalDlls                MakeMsg(clsAppMonitor, 13)
```

Comments

Currently, the app monitor does not do anything in response to this message. It will do something in the future.

Descendants: You normally do not handle this message.

msgAMTerminateOK

Asks if this application is willing to terminate.

Takes P_OBJECT, returns STATUS.

```
#define msgAMTerminateOK                       MakeMsg(clsAppMonitor, 20)
```

Comments

Deinstallation is a two phase process. All applications and services that are to be deinstalled together get the chance to veto. This message is sent to an application monitor to see if it wishes to veto.

By default, the app monitor unconditionally terminates all of its application's instances. To do so, it sends **msgAppMgrShutdown** to its application class for each of its active documents.

Descendants: If you want to be given the chance to terminate the application, you should handle this message. In your handler, if you decide that you want to terminate, you simply pass the message on to your ancestor.

You can veto the termination by returning anything other than **stsOK** and by not passing the message on to your ancestor. If you veto, you must set **pArgs** to the uid of the object that was responsible for the veto, which is typically self.

See Also

msgAMTerminate

msgAMTerminate

Terminates this application.

Takes nothing, returns STATUS.

```
#define msgAMTerminate                         MakeMsg(clsAppMonitor, 21)
```

Comments

Deinstallation is a two phase process. All applications and services that are to deinstalled together get the chance to veto. This message is sent to an application monitor after everyone has agreed to the deinstallation.

This message unconditionally terminates the application in the final phase of deinstallation. The app monitor self sends **msgAMRemoveStationery** and **msgAMRemoveHelp**, and then calls OSTaskTerminate to kill the application's **processCount** 0 task.

Descendants: You should handle this message to remove anything you have loaded. The ancestor must be called after your handler.

See Also

msgAMTerminateOK

msgAMTerminateVetoed

Sent when the application termination sequence is vetoed.

Takes P_AM_TERMINATE_VETOED, returns STATUS.

```
#define msgAMTerminateVetoed                MakeMsg(clsAppMonitor, 22)
```

Arguments

```
typedef struct AM_TERMINATE_VETOED {
    OBJECT      vetoer;     // Object or class that vetoed the deinstallation.
    STATUS      status;     // Veto status.
} AM_TERMINATE_VETOED, *P_AM_TERMINATE_VETOED;
```

Comments

When one of the applications or services that are deinstalled together vetoes termination, the Application Framework sends this message to those applications and services.

pArgs->vetoer gives the uid of the object or class that vetoed the deinstallation. **pArgs**->status gives the return status of the veto. The app monitor does not do anything in response to this message.

Descendants: You can handle this message if you wish. If you handled **msgTerminateOK**, and changed anything because you thought you were about to be terminated, you should handle this message to change things back to the way they were.

See Also

msgAMTerminateOK

Tags

```
#define tagAMFirstTime                      MakeTag(clsAppMonitor, 2)
```

APPTAG.H

This file contains constant tags used by the Application Framework.

There are three kinds of tags in this file:

- Resource tags
- Window tags
- Quick help tags

Resource tags are used to construct resource identifiers (**resID**'s) that identify well-known resources in the system resource file. Developers can use these tags to read a copy of any of these resources from their document's **resList** (see app.h and resfile.h).

Window tags are used as arguments to **msgWinFindTag** to locate well-known windows. For example, all the standard application menus (SAMS) are tagged so they can be programatically located and changed or removed by an application.

Quick help tags are used for two purposes: (1) to construct the resource identifier used to read a quick-help string from the document's **resList**, and (2) stored in **clsGWin** as the quick-help tag (see gwin.h).

All the resource ids in this file are constructed by (see resfile.h):

```
MakeWknResId(resId, appResId, tag);
```

To write an object resource:

```
write.resId     = tagAppObject;
write.mode      = resWriteObjectOnce;
write.object    = objectToWrite;
ObjCallRet(msgResWriteObject, file, &write, s);
```

To read an object resource:

```
ObjectCall(msgNewDefaults, clsObject, &read.new);
read.resId  = tagAppObject;
read.mode   = resReadObjectOnce;
ObjCallRet(msgResReadObject, resList, &read, s);
newObject = read.new.uid;
```

```
#ifndef APPTAG_INCLUDED
#define APPTAG_INCLUDED
```

Resource Tags

clsApp Resource Identifiers

Used to construct Application Framework **resID**'s (see above).

```
#define appResId                                MakeTag(clsApp, 1)
// next: 194
```

Tags used by StdMsg.

```
#define tagAppDeleteRequest                 MakeDialogTag(clsAppMgr, 0)
#define tagAppDeleteSectRequest             MakeDialogTag(clsAppMgr, 1)
#define tagAppRevertRequest                 MakeDialogTag(clsAppMgr, 2)
#define tagAppSystemShutdownRequest         MakeDialogTag(clsAppMgr, 3)
#define tagAppSystemSoftShutdownRequest     MakeDialogTag(clsAppMgr, 4)
```

Miscellaneous tags.

```
#define tagAppObject                    MakeTag(clsApp, 138)
#define tagAppClass                     MakeTag(clsApp, 118)
#define tagAppQHAppClass                MakeTag(clsApp, 155)
#define tagAppTitleBar                  MakeTag(clsApp, 119)
#define tagAppMoveIconMarquee           MakeTag(clsApp, 135)
#define tagAppCopyIconMarquee           MakeTag(clsApp, 136)
#define tagAppPrintMetrics              MakeTag(clsApp, 139)
#define tagAppMenuImport                MakeTag(clsApp, 148)
#define tagAppMenuExport                MakeTag(clsApp, 149)
```

These identify each item in the SAMS menu bar.

```
#define tagAppMenuBar                   MakeTag(clsApp, 1)
#define tagAppMenuDocument              MakeTag(clsApp, 2)
#define tagAppMenuEdit                  MakeTag(clsApp, 3)
#define tagAppMenuOptions               MakeTag(clsApp, 4)
#define tagAppMenuCreate                MakeTag(clsApp, 156)
```

These identify each item in the Document menu.

```
#define tagAppMenuCheckpoint            MakeTag(clsApp, 5)
#define tagAppMenuRevert                MakeTag(clsApp, 6)
#define tagAppMenuPrint                 MakeTag(clsApp, 7)
#define tagAppMenuPrintSetup            MakeTag(clsApp, 8)
#define tagAppMenuSend                  MakeTag(clsApp, 9)
#define tagAppMenuAbout                 MakeTag(clsApp, 10)
```

These identify each item in the Edit menu.

```
#define tagAppMenuUndo                  MakeTag(clsApp, 11)
#define tagAppMenuSelectAll             MakeTag(clsApp, 12)
#define tagAppMenuMove                  MakeTag(clsApp, 13)
#define tagAppMenuCopy                  MakeTag(clsApp, 14)
#define tagAppMenuDelete                MakeTag(clsApp, 124)
#define tagAppMenuSearch                MakeTag(clsApp, 125)
#define tagAppMenuSpell                 MakeTag(clsApp, 126)
```

These identify SAMS option sheets.

```
#define tagAppAboutOptSheet             MakeTag(clsApp, 120)
#define tagAppDocOptSheet               MakeTag(clsApp, 121)
#define tagAppPrintSetupOptSheet        MakeTag(clsApp, 122)
#define tagAppIconOptSheet              MakeTag(clsApp, 123)
```

These identify each card in the Document option sheet.

```
#define tagAppOptControlsCard           MakeTag(clsApp, 142)
#define tagAppOptAccessCard             MakeTag(clsApp, 143)
#define tagAppOptCommentsCard           MakeTag(clsApp, 144)
#define tagAppOptIconCard               MakeTag(clsApp, 147)
#define tagAppOptGotoButtonCard         MakeTag(clsApp, 154)
#define tagAppOptIconWinCard            MakeTag(clsApp, 172)
```

These identify each card in the About option sheet.

```
#define tagAppOptInfoCard               MakeTag(clsApp, 140)
#define tagAppOptAboutCard              MakeTag(clsApp, 141)
```

These identify each card in the Print Setup option sheet.

```
#define tagAppOptPrintCard                  MakeTag(clsApp, 145)
#define tagAppOptHeadersCard                MakeTag(clsApp, 146)
#define tagAppOptEmbeddeeCard               MakeTag(clsApp, 173)
```

These identify each item in the Borders & Controls card.

```
#define tagAppOptCtrls                      MakeTag(clsApp, 127)
#define tagAppOptCtrlsLabel                 MakeTag(clsApp, 128)
#define tagAppOptCtrlsOn                    MakeTag(clsApp, 129)
#define tagAppOptCtrlsOff                   MakeTag(clsApp, 130)
#define tagAppOptCtrlStyle                  MakeTag(clsApp, 131)
#define tagAppOptCtrlStyleLabel             MakeTag(clsApp, 132)
#define tagAppOptCtrlTitleBar               MakeTag(clsApp, 133)
#define tagAppOptCtrlMenuBar                MakeTag(clsApp, 134)
#define tagAppOptCtrlScrollBars             MakeTag(clsApp, 26)
#define tagAppOptCtrlCorkMargin             MakeTag(clsApp, 27)
#define tagAppOptBorderStyle                MakeTag(clsApp, 157)
#define tagAppOptBorderStyleLabel           MakeTag(clsApp, 158)
#define tagAppOptBorderSingle               MakeTag(clsApp, 159)
#define tagAppOptBorderDouble               MakeTag(clsApp, 162)
#define tagAppOptBorderDashed               MakeTag(clsApp, 161)
#define tagAppOptBorderNone                 MakeTag(clsApp, 160)
```

These identify each item in the Access card.

```
#define tagAppOptDelete                     MakeTag(clsApp, 28)
#define tagAppOptDeleteLabel                MakeTag(clsApp, 29)
#define tagAppOptDeleteOn                   MakeTag(clsApp, 30)
#define tagAppOptDeleteOff                  MakeTag(clsApp, 31)
#define tagAppOptReadOnly                   MakeTag(clsApp, 32)
#define tagAppOptReadOnlyLabel              MakeTag(clsApp, 33)
#define tagAppOptReadOnlyOn                 MakeTag(clsApp, 34)
#define tagAppOptReadOnlyOff                MakeTag(clsApp, 35)
#define tagAppOptHotMode                    MakeTag(clsApp, 36)
#define tagAppOptHotModeLabel               MakeTag(clsApp, 37)
#define tagAppOptHotModeOn                  MakeTag(clsApp, 38)
#define tagAppOptHotModeOff                 MakeTag(clsApp, 39)
```

These identify each item in the Comments card.

```
#define tagAppOptCommentsTable              MakeTag(clsApp, 191)
#define tagAppOptTitle                      MakeTag(clsApp, 40)
#define tagAppOptTitleLabel                 MakeTag(clsApp, 41)
#define tagAppOptAuthor                     MakeTag(clsApp, 42)
#define tagAppOptAuthorLabel                MakeTag(clsApp, 43)
#define tagAppOptComments                   MakeTag(clsApp, 44)
#define tagAppOptCommentsSWin               MakeTag(clsApp, 190)
#define tagAppOptCommentsLabel              MakeTag(clsApp, 45)
```

These identify each item in the About/Document card.

```
#define tagAppOptCreated                    MakeTag(clsApp, 46)
#define tagAppOptCreatedLabel               MakeTag(clsApp, 47)
#define tagAppOptModified                   MakeTag(clsApp, 48)
#define tagAppOptModifiedLabel              MakeTag(clsApp, 49)
#define tagAppOptFiledSize                  MakeTag(clsApp, 50)
#define tagAppOptFiledSizeLabel             MakeTag(clsApp, 51)
#define tagAppOptActiveSize                 MakeTag(clsApp, 52)
#define tagAppOptActiveSizeLabel            MakeTag(clsApp, 53)
```

These identify each item in the About/Application card.

```
#define tagAppOptApp                        MakeTag(clsApp, 54)
#define tagAppOptAppLabel                   MakeTag(clsApp, 55)
#define tagAppOptVersion                    MakeTag(clsApp, 56)
#define tagAppOptVersionLabel               MakeTag(clsApp, 57)
```

```
#define tagAppOptCompany                        MakeTag(clsApp, 58)
#define tagAppOptCompanyLabel                   MakeTag(clsApp, 59)
#define tagAppOptCopyright                      MakeTag(clsApp, 60)
#define tagAppOptCopyrightLabel                 MakeTag(clsApp, 61)
#define tagAppOptIcon                           MakeTag(clsApp, 62)
#define tagAppOptIconLabel                      MakeTag(clsApp, 63)
#define tagAppOptIconSmall                      MakeTag(clsApp, 64)
#define tagAppOptIconSmallLabel                 MakeTag(clsApp, 65)
```

These identify each item in the Icon Window Layout card.

```
#define tagAppIconWinLayout                     MakeTag(clsApp, 163)
#define tagAppIconWinLayoutLabel                MakeTag(clsApp, 164)
#define tagAppIconWinTToB                       MakeTag(clsApp, 165)
#define tagAppIconWinBToT                       MakeTag(clsApp, 166)
#define tagAppIconWinUnconstrained              MakeTag(clsApp, 167)
#define tagAppIconWinStyle                      MakeTag(clsApp, 168)
#define tagAppIconWinStyleLabel                 MakeTag(clsApp, 169)
#define tagAppIconWinKeepSame                   MakeTag(clsApp, 170)
#define tagAppIconWinOpenInPlace                MakeTag(clsApp, 171)
```

These identify each item in the Print Setup cards.

```
#define tagAppPaperSize                         MakeTag(clsApp, 66)
#define tagAppPaperSizeLabel                    MakeTag(clsApp, 67)
#define tagAppPaperWidth                        MakeTag(clsApp, 68)
#define tagAppPaperHeight                       MakeTag(clsApp, 69)
#define tagAppTopMargin                         MakeTag(clsApp, 70)
#define tagAppTopMarginLabel                    MakeTag(clsApp, 71)
#define tagAppBottomMargin                      MakeTag(clsApp, 72)
#define tagAppBottomMarginLabel                 MakeTag(clsApp, 73)
#define tagAppLeftMargin                        MakeTag(clsApp, 74)
#define tagAppLeftMarginLabel                   MakeTag(clsApp, 75)
#define tagAppRightMargin                       MakeTag(clsApp, 76)
#define tagAppRightMarginLabel                  MakeTag(clsApp, 77)
#define tagAppLeftHeader                        MakeTag(clsApp, 78)
#define tagAppLeftHeaderLabel                   MakeTag(clsApp, 79)
#define tagAppCenterHeader                      MakeTag(clsApp, 80)
#define tagAppCenterHeaderLabel                 MakeTag(clsApp, 81)
#define tagAppRightHeader                       MakeTag(clsApp, 82)
#define tagAppRightHeaderLabel                  MakeTag(clsApp, 83)
#define tagAppLeftFooter                        MakeTag(clsApp, 84)
#define tagAppLeftFooterLabel                   MakeTag(clsApp, 85)
#define tagAppCenterFooter                      MakeTag(clsApp, 86)
#define tagAppCenterFooterLabel                 MakeTag(clsApp, 87)
#define tagAppRightFooter                       MakeTag(clsApp, 88)
#define tagAppRightFooterLabel                  MakeTag(clsApp, 89)
#define tagAppEmbedVisible                      MakeTag(clsApp, 90)
#define tagAppEmbedVisibleLabel                 MakeTag(clsApp, 91)
#define tagAppOrientation                       MakeTag(clsApp, 92)
#define tagAppOrientationLabel                  MakeTag(clsApp, 93)
#define tagAppHeaderMargin                      MakeTag(clsApp, 94)
#define tagAppHeaderMarginLabel                 MakeTag(clsApp, 95)
#define tagAppFooterMargin                      MakeTag(clsApp, 96)
#define tagAppFooterMarginLabel                 MakeTag(clsApp, 97)
#define tagAppHeaderFont                        MakeTag(clsApp, 98)
#define tagAppHeaderFontLabel                   MakeTag(clsApp, 99)
#define tagAppHeaderSize                        MakeTag(clsApp, 100)
#define tagAppHeaderSizeLabel                   MakeTag(clsApp, 101)
#define tagAppFirstPage                         MakeTag(clsApp, 102)
#define tagAppFirstPageLabel                    MakeTag(clsApp, 103)
#define tagAppOtherLabel                        MakeTag(clsApp, 104)
#define tagAppEmbedLoc                          MakeTag(clsApp, 174)
#define tagAppEmbedLocLabel                     MakeTag(clsApp, 175)
#define tagAppEmbedApplyTo                      MakeTag(clsApp, 176)
#define tagAppHeaderMarginOtherButton           MakeTag(clsApp, 177)
```

```
#define tagAppHeaderMarginOtherField                MakeTag(clsApp, 178)
#define tagAppFooterMarginOtherButton               MakeTag(clsApp, 179)
#define tagAppFooterMarginOtherField                MakeTag(clsApp, 180)
#define tagAppTopMarginOtherButton                  MakeTag(clsApp, 181)
#define tagAppTopMarginOtherField                   MakeTag(clsApp, 182)
#define tagAppBottomMarginOtherButton               MakeTag(clsApp, 183)
#define tagAppBottomMarginOtherField                MakeTag(clsApp, 184)
#define tagAppLeftMarginOtherButton                 MakeTag(clsApp, 185)
#define tagAppLeftMarginOtherField                  MakeTag(clsApp, 186)
#define tagAppRightMarginOtherButton                MakeTag(clsApp, 187)
#define tagAppRightMarginOtherField                 MakeTag(clsApp, 188)
#define tagAppEmbedApplyToLabel                     MakeTag(clsApp, 192)
```

These identify each item in the Icon option card.

```
#define tagAppIconTitle                             MakeTag(clsApp, 105)
#define tagAppIconTitleLabel                        MakeTag(clsApp, 106)
#define tagAppIconOpen                              MakeTag(clsApp, 107)
#define tagAppIconOpenLabel                         MakeTag(clsApp, 108)
#define tagAppIconOpenInPlace                       MakeTag(clsApp, 109)
#define tagAppIconOpenFloating                      MakeTag(clsApp, 110)
#define tagAppIconType                              MakeTag(clsApp, 111)
#define tagAppIconTypeLabel                         MakeTag(clsApp, 112)
#define tagAppIconTypePictAndTitle                  MakeTag(clsApp, 113)
#define tagAppIconTypePictOnly                      MakeTag(clsApp, 114)
#define tagAppIconTypeSmallPictAndTitle             MakeTag(clsApp, 115)
#define tagAppIconTypeSmlPictOverTitle              MakeTag(clsApp, 116)
#define tagAppIconTypeSmallPictOnly                 MakeTag(clsApp, 117)
```

These identify each item in the Goto Button option card.

```
#define tagAppGotoButtonTitle                       MakeTag(clsApp, 150)
#define tagAppGotoButtonTitleLabel                  MakeTag(clsApp, 151)
#define tagAppGotoButtonTargetDoc                   MakeTag(clsApp, 152)
#define tagAppGotoButtonTargetDocLabel              MakeTag(clsApp, 153)
#define tagAppGotoButtonBorderLabel                 MakeTag(clsApp, 154)
#define tagAppGotoButtonBorder                      MakeTag(clsApp, 155)
#define tagAppGotoButtonSquare                      MakeTag(clsApp, 156)
#define tagAppGotoButtonRound                       MakeTag(clsApp, 157)
#define tagAppGotoButtonHRound                      MakeTag(clsApp, 158)
#define tagAppGotoButtonNone                        MakeTag(clsApp, 159)
```

These identify various bitmaps.

```
#define tagAppIconBitmap                            MakeTag(clsApp, 15)
#define tagAppSmallIconBitmap                       MakeTag(clsApp, 16)
#define tagAppDefaultDocIconBitmap                  MakeTag(clsApp, 17)
#define tagAppDefaultDocSmallIconBitmap             MakeTag(clsApp, 18)
#define tagAppMoveIconBitmap                        MakeTag(clsApp, 19)
#define tagAppCopyIconBitmap                        MakeTag(clsApp, 20)
#define tagAppLinkIconBitmap                        MakeTag(clsApp, 21)
#define tagAppClosedFolderBitmap                    MakeTag(clsApp, 22)
#define tagAppClosedFolderSmBitmap                  MakeTag(clsApp, 23)
#define tagAppOpenFolderBitmap                      MakeTag(clsApp, 24)
#define tagAppOpenFolderSmBitmap                    MakeTag(clsApp, 25)
```

Tags used during the creation of a document to get default values for some fields from the application resource file.

```
#define tagAppMgrDefaultDocName                     MakeTag(clsApp, 189)
#define tagAppMgrDisplayedAppName                   MakeTag(clsApp, 193)
```

APPWIN.H

This file contains the API definition for **clsAppWin.**

clsAppWin inherits from **clsCustomLayout.**

Provides support for embedded applications.

"AppWin" stands for Application Window.

Introduction

clsAppWin is an embedded window that manages an embedded document. It shrink-wraps around a **clsIcon** object to display an icon to the user, like those on the bookshelf or embedded in a document. When an icon with style **awOpenInPlace** is tapped, the application window destroys the icon and opens the associated document into itself. The application window then shrink-wraps around the document's main window.

Application Windows live in the process space and are filed with the embeddor document.

An application window reads its icon bitmap from metrics.**resList** of OSThisApp() in response to **msgIconProvideBitmap** (see icon.h). It uses the following **resID** (see apptag.h):

```
MakeWknResIdX(read.resId, appResId, tagAppIconBitmap);
```

This bitmap is usually found in the app.res file of the application class for the associated document. The document can override this bitmap by filing a resource with the above **resId** into its doc.res file.

AppWins can also store their own private bitmaps. Use **msgAppWinSetIconBitmap** to give an application window a bitmap. This bitmap object will be filed by the application window. If an application window has its own bitmap object, it will not read from the **resList.**

```
#ifndef APPWIN_INCLUDED
#define APPWIN_INCLUDED
#ifndef CLAYOUT_INCLUDED
#include <clayout.h>
#endif
```

Common #defines and typedefs

```
typedef OBJECT APP_WIN, *P_APP_WIN;
```

Application Window States

These are the valid states for an application window.

```
#define awClosed                    0
#define awOpenedFloating            1
#define awOpenedInPlace             2
#define awOpenedInPlaceFloating     3
```

Application Window Open Styles

These are the valid styles for directing an application window how to open.

```
#define awOpenInPlace               0
#define awOpenFloating              1
```

Application Window Icon Types

These are the valid icon types.

```
#define awPictAndTitle              0
#define awPictOnly                  1
#define awSmallPictAndTitle         2
#define awSmallPictOnly             3
#define awSmallPictOverTitle        4
```

Application Window Style Structure

This structure defines the various application window styles.

```
typedef struct APP_WIN_STYLE {
    U16 open            : 2;    // Open style.
    U16 type            : 4;    // Icon type.
    U16 openStyleLock   : 1;    // True = cannot change open style.
    U16 private1        : 1;    // Reserved.
    U16 private2        : 1;    // Reserved.
    U16 reserved        : 7;    // Reserved.
} APP_WIN_STYLE, *P_APP_WIN_STYLE;
```

Messages

msgNew

Creates a new Application Window.

Takes P_APP_WIN_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct APP_WIN_NEW_ONLY {
    UUID            appUUID;                // App uuid.
    APP_WIN_STYLE   style;                  // Application Window style.
    U16             state;                  // Application Window state.
    char            label[nameBufLength];   // Icon label.
    U32             reserved[4];            // Reserved.
} APP_WIN_NEW_ONLY, *P_APP_WIN_NEW_ONLY;
#define appWinNewFields         \
    customLayoutNewFields       \
    APP_WIN_NEW_ONLY            appWin;
typedef struct APP_WIN_NEW {
    appWinNewFields
} APP_WIN_NEW, *P_APP_WIN_NEW;
```

msgNewDefaults

Initializes the APP_WIN_NEW structure to default values.

Takes P_APP_WIN_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct APP_WIN_NEW {
    appWinNewFields
} APP_WIN_NEW, *P_APP_WIN_NEW;
```

Comments

Zeroes out pArgs->appWin and sets

```
pArgs->win.flags.style              |= wsCaptureGeometry
                                     | wsSendGeometry
                                     | wsShrinkWrapWidth
                                     | wsShrinkWrapHeight;
pArgs->win.flags.input              |= inputHoldTimeout;
pArgs->embeddedWin.style.embeddee    = true;
pArgs->embeddedWin.style.moveable    = true;
pArgs->embeddedWin.style.copyable    = true;
pArgs->border.style.previewAlter     = bsAlterNone;
pArgs->border.style.selectedAlter    = bsAlterNone;
pArgs->appWin.style.open             = awOpenInPlace;
pArgs->appWin.style.type             = awSmallPictAndTitle;
pArgs->appWin.state                  = awClosed;
```

msgAppWinGetMetrics

Passes back an application window's metrics.

Takes P_APP_WIN_METRICS, returns STATUS.

```
#define msgAppWinGetMetrics             MakeMsg(clsAppWin, 1)
```

Arguments

```
typedef struct APP_WIN_METRICS {
    UUID            appUUID;                // Application uuid.
    OBJECT          icon;                   // Application Window icon.
    OBJECT          iconBitmap;             // Icon bitmap.
    OBJECT          smallIconBitmap;        // Small icon bitmap.
    OBJECT          appClass;               // Application class.
    APP_WIN_STYLE   style;                  // Application Window style.
    U16             state;                  // Application Window state.
    char            label[nameBufLength];   // Icon label.
    U32             reserved[4];            // Reserved.
} APP_WIN_METRICS, *P_APP_WIN_METRICS;
```

msgAppWinGetState

Passes back an application window's state.

Takes P_U16, returns STATUS.

```
#define msgAppWinGetState               MakeMsg(clsAppWin, 2)
```

Comments

Possible values are described in Application Window States, above.

msgAppWinSetState

Specifies an application window's state.

Takes U16, returns STATUS.

```
#define msgAppWinSetState               MakeMsg(clsAppWin, 3)
```

Comments

Possible values are described in Application Window States, above.

msgAppWinGetStyle

Passes back an application window's style.

Takes P_APP_WIN_STYLE, returns STATUS.

```
#define msgAppWinGetStyle               MakeMsg(clsAppWin, 4)
```

Message Arguments

```
typedef struct APP_WIN_STYLE {
    U16 open            : 2;    // Open style.
    U16 type            : 4;    // Icon type.
    U16 openStyleLock   : 1;    // True = cannot change open style.
    U16 private1        : 1;    // Reserved.
    U16 private2        : 1;    // Reserved.
    U16 reserved        : 7;    // Reserved.
} APP_WIN_STYLE, *P_APP_WIN_STYLE;
```

msgAppWinSetStyle

Specifies an application window's style.

Takes APP_WIN_STYLE, returns STATUS.

```
#define msgAppWinSetStyle               MakeMsg(clsAppWin, 5)
```

Message Arguments

```
typedef struct APP_WIN_STYLE {
    U16 open            : 2;    // Open style.
    U16 type            : 4;    // Icon type.
    U16 openStyleLock   : 1;    // True = cannot change open style.
    U16 private1        : 1;    // Reserved.
    U16 private2        : 1;    // Reserved.
    U16 reserved        : 7;    // Reserved.
} APP_WIN_STYLE, *P_APP_WIN_STYLE;
```

msgAppWinSetLabel

Specifies an application window's label.

Takes P_STRING, returns STATUS.

```
#define msgAppWinSetLabel               MakeMsg(clsAppWin, 6)
```

msgAppWinSetIconBitmap

Specifies an application window's large icon bitmap.

Takes BITMAP, returns STATUS.

```
#define msgAppWinSetIconBitmap          MakeMsg(clsAppWin, 7)
```

msgAppWinSetSmallIconBitmap

Specifies an application window's small icon bitmap.

Takes BITMAP, returns STATUS.

```
#define msgAppWinSetSmallIconBitmap     MakeMsg(clsAppWin, 8)
```

msgAppWinOpen

Opens the document associated with an application window.

Takes nothing, returns STATUS.

```
#define msgAppWinOpen                   MakeMsg(clsAppWin, 9)
```

msgAppWinClose

Closes the document associated with an application window.

Takes nothing, returns STATUS.

```
#define msgAppWinClose                  MakeMsg(clsAppWin, 10)
```

msgAppWinDelete

Deletes an application window.

Takes BOOLEAN, returns STATUS.

```
#define msgAppWinDelete                MakeMsg(clsAppWin, 11)
```

Comments

If **pArgs** is true, **msgAppWinDelete** also deletes the associated document. If **pArgs** is false, **msgAppWinDelete** does not delete the document.

msgAppWinSetUUID

Specifies the UUID of the document to which an application window is linked.

Takes P_UUID, returns STATUS.

```
#define msgAppWinSetUUID               MakeMsg(clsAppWin, 12)
```

msgAppWinCreateIcon

Creates an application window's icon.

Takes P_UUID, returns STATUS.

```
#define msgAppWinCreateIcon            MakeMsg(clsAppWin, 13)
```

msgAppWinDestroyIcon

Destroys an application window's icon.

Takes P_UUID, returns STATUS.

```
#define msgAppWinDestroyIcon           MakeMsg(clsAppWin, 14)
```

msgAppWinStyleChanged

Notification that an application window style changed.

Takes OBJECT, returns STATUS.

```
#define msgAppWinStyleChanged          MakeMsg(clsAppWin, 15)
```

Comments

Application windows send this message to their observers whenever they receive **msgAppWinSetStyle**. Note that application icon option cards will send **msgAppWinSetStyle** to application windows whenever they cause the application window's icon style to change.

msgAppWinEditName

Pops up an edit pad to allow the user to rename the document associated with an application window.

Takes nothing, returns STATUS.

```
#define msgAppWinEditName              MakeMsg(clsAppWin, 16)
```

CBWIN.H

This file contains the API definition for **clsCorkBoardWin**.

clsCorkBoardWin inherits from **clsIconWin.**

"cbwin" stands for Cork Board Window.

Introduction

A cork board window is an icon window associated with a document. The cork board window puts embedded documents in a subdirectory of the document. This frees the document's application from having to manage the embedded windows and documents in the cork board window. The PenPoint Application Framework uses **clsCorkBoardWin** to implement the "cork margin" that all documents have by default.

Clients should rarely (if ever) need to create cork board windows themselves since the Application Framework has a clean UI and API for enabling the cork margin. **clsApp** creates a cork board window as the command bar of the document's main window (assuming the main window is a frame).

See Also

- app.h for messages to enable the cork margin of an application.

```
#ifndef CBWIN_INCLUDED
#define CBWIN_INCLUDED

#ifndef ICONWIN_INCLUDED
#include <iconwin.h>
#endif
```

Common #defines and typedefs

```
typedef OBJECT CORKBOARD_WIN, *P_CORKBOARD_WIN;
```

Quick Help Tags

```
#define qhCorkBoardWin              MakeTag(clsCorkBoardWin, 1)
```

Messages

msgNew

Creates a cork board window.

Takes P_CORKBOARD_WIN_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct CORKBOARD_WIN_NEW_ONLY {
    U32     reserved1[4];
    U16     reserved2:16;
} CORKBOARD_WIN_NEW_ONLY, *P_CORKBOARD_WIN_NEW_ONLY;

#define corkboardWinNewFields   \
    iconWinNewFields            \
    CORKBOARD_WIN_NEW_ONLY      corkboardWin;
```

```
typedef struct CORKBOARD_WIN_NEW {
    corkboardWinNewFields
} CORKBOARD_WIN_NEW, *P_CORKBOARD_WIN_NEW;
```

msgNewDefaults

Initializes the CORKBOARD_WIN_NEW structure to default values.

Takes P_CORKBOARD_WIN_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct CORKBOARD_WIN_NEW {
    corkboardWinNewFields
} CORKBOARD_WIN_NEW, *P_CORKBOARD_WIN_NEW;
```

Comments

Zeroes out **pArgs**->corkboardWin and sets:

```
pArgs->win.flags.style                  |= wsShrinkWrapWidth;
pArgs->win.flags.style                  |= wsShrinkWrapHeight;
pArgs->embeddedWin.style.quickMove      = false;
pArgs->border.style.topMargin           = bsMarginSmall;
pArgs->border.style.bottomMargin        = bsMarginSmall;
pArgs->border.style.leftMargin          = bsMarginSmall;
pArgs->border.style.rightMargin         = bsMarginSmall;
pArgs->iconWin.style.iconType           = awSmallPictAndTitle;
pArgs->iconWin.style.propagateIconType  = true;
pArgs->iconWin.style.allowOpenInPlace   = false;
pArgs->iconWin.style.constrainedLayout  = true;
```

Messages from other classes

msgEmbeddedWinGetDest

Passes back the destination for embedded win move or copy.

Takes P_EMBEDDED_WIN_GET_DEST, returns STATUS.

Comments

clsCorkBoardWin responds by forcing the embedded document to be put in the embedding document's cork board subdirectory (**appCorkboardDirName**), creating this directory if it does not exist.

See Also

app.h definition of **appCorkboardDirName** string.

CLSPRN.H

This file contains the app-level API for **clsPrn**.

clsPrn inherits from **clsOBXService**.

Very few developers would or should deal with instances of **clsPrn**. Its clients would be those writing print-wrapper applications or printer drivers. Both kinds of clients would need far more information than what could be described in a header file.

WARNING: the **clsPrn** API is likely to change in the future.

Much more functionality is in **clsPrn** but things not documented here are GO-internal.

```
#ifndef CLSPRN_INCLUDED
#define CLSPRN_INCLUDED
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef OBXSVC_INCLUDED
#include <obxsvc.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
#pragma pack(1)
```

Common #defines and typedefs

Popular paper types

```
#define prnPaperLetter     0              // all printers
#define prnPaperLegal      1              // Pcl, Postscript
#define prnPaperExec       2              // Pcl
#define prnPaperA4         3              // Pcl, Postscript
#define prnPaperCom10      4              // Pcl
#define prnPaperMonarc     5              // Pcl
#define prnPaperC5         6              // Pcl
#define prnPaperDL         7              // Pcl
#define prnPaperB5         8              // Postscript
#define prnPaperLetterSmall 9             // Postscript
#define prnPaperA4Small   10              // Postscript
#define prnPaperTypeMax   10
#define prnPaperUserDefined 0xffff
```

Paper metrics

```
typedef struct PAPER_CONFIG {   // Paper configuration
   U16     type;                // out: one of paper--- above
   U16     width, height;       // out: paper dimensions in mm
   U16     landScape;           // out:
   U16     nCopies;             // out: # of copies to print
} PAPER_CONFIG, *P_PAPER_CONFIG;
```

Common header for all printer objects in its FS node

```
typedef struct PRN_FS_HDR {
   U16          majorVersion,                  // versioning
                minorVersion;
   PAPER_CONFIG paper;
   U32          portMetricsFPos;
   U16          portMetricsSz;
} PRN_FS_HDR, *P_PRN_FS_HDR;
```

Error Messages

```
#define stsPrnStreamError       MakeStatus(clsPrn,1)
#define stsPrnNoStream          MakeStatus(clsPrn,2)
#define stsPrnUserAbort         MakeStatus(clsPrn,3)
#define stsPrnFntError          MakeStatus(clsPrn,4)
```

Dialog Messages

```
#define tagPrnManualFeedDialog  MakeDialogTag(clsPrn, 0)
```

Quick Help Id's

```
#define tagQhPrnOptions         MakeTag(clsPrn, 12)
#define tagQhPrnModel           MakeTag(clsPrn, 13)
#define tagQhPrnPort            MakeTag(clsPrn, 14)
// Epson driver specific
#define tagQhEpModelSheet       MakeTag(clsEpson, 10)
#define tagQhEpModelList        MakeTag(clsEpson, 11)
#define tagQhEpPaperFeed        MakeTag(clsEpson, 15)

// Pcl   driver specific
#define tagQhPclModelSheet      MakeTag(clsPcl, 10)
#define tagQhPclModelList       MakeTag(clsPcl, 11)
#define tagQhPclPaperFeed       MakeTag(clsPcl, 15)
#define tagQhPclBinding         MakeTag(clsPcl, 16)
```

---

msgNew

Creates a new printer object under the auspices of **clsService**.

Takes P_PRN_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct PRN_NEW_ONLY {
   U16          model;          // in:  model of printer (subclass defined)
   U16          fsNodeIsNew;    // out: first instantiation of object
   U16          filedDataSz;    // in:  # of bytes to read/write from/to fs node
   P_PRN_FS_HDR pFileData;      // in:  pointer to read/write filed data
} PRN_NEW_ONLY, *P_PRN_NEW_ONLY;
#define prnNewFields \
   obxServiceNewFields \
   PRN_NEW_ONLY prn;
typedef struct PRN_NEW {
   prnNewFields
} PRN_NEW, *P_PRN_NEW;
```

Device and Page Controls

msgPrnGetPaperConfig

Get the currently selected paper type, metrics and orientation.

Takes P_PAPER_CONFIG, returns STATUS. Category: class message.

```
#define msgPrnGetPaperConfig    MakeMsg(clsPrn,2)
```

Message Arguments

```
typedef struct PAPER_CONFIG {   // Paper configuration
   U16     type;                // out: one of paper--- above
   U16     width, height;       // out: paper dimensions in mm
   U16     landScape;           // out:
   U16     nCopies;             // out: # of copies to print
} PAPER_CONFIG, *P_PAPER_CONFIG;
```

msgPrnSetPaperConfig

Set the currently selected paper type, metrics and orientation.

Takes P_PAPER_CONFIG, returns STATUS. Category: class message.

```
#define msgPrnSetPaperConfig    MakeMsg(clsPrn,3)
```

Message Arguments

```
typedef struct PAPER_CONFIG {   // Paper configuration
   U16     type;                // out: one of paper--- above
   U16     width, height;       // out: paper dimensions in mm
   U16     landScape;           // out:
   U16     nCopies;             // out: # of copies to print
} PAPER_CONFIG, *P_PAPER_CONFIG;
```

msgPrnGetMetrics

Query a printer's device metrics.

Takes P_PRN_METRICS, returns STATUS. Category: descendant responsibility.

```
#define msgPrnGetMetrics        MakeMsg(clsPrn,12)
```

Arguments

```
typedef struct PRN_METRICS {
   U8  prnType;                 // out: printer type (prnType---)
   U8  cap;                     // out: capability bits
   // minimum scan line count for a band buffer (if one is needed).
   // for dot matrix printers, this should be the pin size (8 or 24)
   U16 minBandSz;
   U32 devPPMX,                 // out: pixel densities:
       devPPMY;                 // out: unit is pixels/meter
   U16 nPlanes;                 // out: Number of planes of the device
   // Number of colors of the device  (note: this number does not
   // necessarily equal (1 << devPlanes) because of halftoning
   U16 nColors;                 // out:
   // currently selected paper metrics in pixels
   U16 width, height;           // out: printable area size
   U16 left, right, top, bottom;// out: unprintable margins
} PRN_METRICS, *P_PRN_METRICS;

                                // PRN_METRICS.prnType
#define prnTypeBm       0       // dot matrix printers
#define prnTypePcl      1       // HP laserjets
#define prnTypePscript  2       // Postscript

                                // PRN_METRICS.cap
#define prnDLBitmap        0x80    // can download bitmap font
#define prnDLOutline       0x40    // can download outline font
#define prnAutoRotate      0x20    // can print in rotated mode
#define prnAutoCopies      0x10    // can print multiple copies of a page
```

```
#define prnDuplexPrint      0x08    // can do double-sided printing
#define prnSubbandable      0x04    // can create bandding region of a
                                    // portion of a page (relevant to a
                                    // banding printer only
```

msgPrnStartDoc

Prepare to start a new document.

Takes nothing, returns STATUS. Category: descendant responsibility.

```
#define msgPrnStartDoc          MakeMsg(clsPrn,13)
```

msgPrnEndDoc

End the currently printing document.

Takes nothing, returns STATUS. Category: descendant responsibility.

```
#define msgPrnEndDoc            MakeMsg(clsPrn,14)
```

msgPrnBeginPage

Prepare to start a new page.

Takes nothing, returns STATUS. Category: descendant responsibility.

```
#define msgPrnBeginPage         MakeMsg(clsPrn,15)
```

msgPrnShowPage

Output the current page.

Takes optional U16, returns STATUS. Category: descendant responsibility.

```
#define msgPrnShowPage          MakeMsg(clsPrn,16)
#define prnNextSide   0       // if current side is front, print at back
                                // if current side is back, print at front
                                // msgPrnStartDoc always set the next side
                                // to be the front side.
#define prnFrontSide  1       // print on the front side
#define prnBackSide   2       // print on the back  side
```

Comments

P_ARGS is ignored if the printer can only do single-sided printing. P_ARGS is a number specifying page duplexing for printers that can do double-sided printing.

msgPrnSetCopyCount

Set the copy count.

Takes U32, returns STATUS. Category: descendant responsibility.

```
#define msgPrnSetCopyCount      MakeMsg(clsPrn,17)
```

Comments

Valid only for devices with **prnAutoCopies** set in the metrics spec (**msgPrnGetMetrics**).

msgPrnSetRotation

Tell device to operate in 0 or 90 degree mode.

Takes BOOLEAN, returns STATUS. Category: descendant responsibility.

```
#define msgPrnSetRotation       MakeMsg(clsPrn,18)
```

Comments

Note: Change rotation only at the beginning of a new page.

For printers with the **prnAutoRotate** capability, sending this message in the middle of page formatting will cause undefined behavior of the printer. The co-ordinate system of the device will be rotated automatically.

For printers **withOUT** the **prnAutoRotate** capability, this message will only affect the metrics returned by the **msgPrnGetMetrics** call. The co-ordinate system of the device remains unaffected.

msgPrnStartDoc will always put the device back into the non-rotated mode.

msgPrnEnumModels

Enumerate the models that this class supports.

Takes P_PRN_ENUM_MODELS, returns STATUS. Category: class message.

```
#define msgPrnEnumModels        MakeMsg(clsPrn, 22)
```

Arguments

```
typedef struct {
    U16     model;              // Out: model id (class defined)
    RES_ID  iconResIdNormal;    // Out: resId of model's normal icon
    RES_ID  iconResIdSmall;     // Out: resId of model's small icon
    CHAR    name[nameBufLength];// Out: name of model
} PRN_MODEL, *P_PRN_MODEL;
typedef struct {
  U16               max,          // in = size of pModel[] array
                    count;        // in = # to return in array
                                  // if count > max then memory may be allocated
                                  // out = # of valid entries in array
  P_PRN_MODEL       pModel;       // in = ptr to array
                                  // out = if memory was allocated
                                  // client should free the memory
  U16               next;         // in  = 0 to start at beginning
                                  //       OR previous out value to pick up
                                  //       where we left off
} PRN_ENUM_MODELS, *P_PRN_ENUM_MODELS;
```

msgPrnGetModel

Passes back the receiver's model.

Takes P_PRN_MODEL, returns STATUS.

```
#define msgPrnGetModel          MakeMsg(clsPrn, 23)
```

Message Arguments

```
typedef struct {
    U16     model;              // Out: model id (class defined)
    RES_ID  iconResIdNormal;    // Out: resId of model's normal icon
    RES_ID  iconResIdSmall;     // Out: resId of model's small icon
    CHAR    name[nameBufLength];// Out: name of model
} PRN_MODEL, *P_PRN_MODEL;
```

Line Printer Mode Support

msgPrnMoveTo

Move the printer's 'cursor' to the specified point.

Takes P_XY32, returns STATUS. Category: descendant responsibility.

```
#define msgPrnMoveTo            MakeMsg(clsPrn,19)
```

msgPrnGetLptFontMetrics

Get the metrics/information of a given harware font.

Takes P_PRN_TEXTOUT, returns STATUS. Category: descendant responsibility.

```
#define msgPrnGetLptFontMetrics MakeMsg(clsPrn,20)
```

msgPrnLptTextOut

Output a line of text starting from where the printer was 'msgPrnMoveTo' last.

Takes P_PRN_TEXTOUT, returns STATUS. Category: descendant responsibility.

```
#define msgPrnLptTextOut        MakeMsg(clsPrn,21)
```

Arguments

```
typedef struct PRN_TEXTOUT {
   U16        nChars;           // in: number of characters to output
   P_CHAR     pStr;             // in: where the string is. Output will
                                // be terminated if a NULL is encountered,
                                // regardless of nChars.
   // additional font attributes subject to printer's capabilities
   U16        fontSz;           // in: big, medium or small
   U16 width, height;           // out: character metrics in pixels
   // transformable attributes:
   // in:  (msgPrnLptTextOut) specifies requested font attributes
// BOOLEAN underline, bold, italic;
   U16     underline, bold, italic;
   // out: (msgPrnGetFontMetrics) tell client what the selected
   //      font is capable of
// BOOLEAN canUnderline, canBold, canItalic;
   U16     canUnderline, canBold, canItalic;
} PRN_TEXTOUT, *P_PRN_TEXTOUT;
#define prnLPTSmall        0       // fontSz field above
#define prnLPTMedium       1
#define prnLPTBig          2
#pragma pack()
```

EMBEDWIN.H

This file contains the API definition for **clsEmbeddedWin.**

clsEmbeddedWin inherits from **clsGWin.**

Embedded windows provide default functionality for embedding windows, move/copy, selection ownership and input target interaction.

Other Important Files

ewnew.h contains the API definition for creating **embeddedWins.** Of particular interest there are definitions for:

- embedded window style (EMBEDDED_WIN_STYLE)
- embedded window metrics (EMBEDDED_WIN_METRICS)
- new structs (EMBEDDED_WIN_NEW_ONLY, EMBEDDED_WIN_NEW)
- selection types (**ewSelect...**)
- move/copy modes

Road Map

Typical subclasses self send:

- msgEmbeddedWinBeginMove
- msgEmbeddedWinBeginCopy
- several messages defined in xfer.h and sel.h

Typical subclasses handle:

- several messages defined in xfer.h and sel.h

Subclasses that support traversal (see mark.h) probably handle:

- msgEmbeddedWinShowChild

Subclasses that manage child windows as part of their data (e.g. text editors) probably handle:

- msgEmbeddedWinInsertChild
- msgEmbeddedWinExtractChild
- msgEmbeddedWinPositionChild

Subclasses that file information other than instance data (e.g. reference buttons) probably handle:

- msgEmbeddedWinDestroy
- msgEmbeddedWinGetDest
- msgEmbeddedWinForwardedGetDest

Subclasses that implement sophisticated printing behavior probably handle:

- msgEmbeddedWinGetPrintInfo

Embedding

When an **embeddedWin** has style.embeddor true, it can embed all **embeddedWins** with style.embeddee true. It can also have **embeddedWins** moved or copied into it. Examples of embeddors are (1) cork margins, (2) bookshelves, and (3) the main window of most applications. An **embeddedWin** with style.embeddor true also responds to the "link" gesture (**xgsDblCircle** in xgesture.h) by creating a goto button in the window.

When an **embeddedWin** has style.embeddee true, the **embeddedWin** can be embedded, moved and copied. Examples of embeddees are (1) icons for an application (2) **appWins** around an application's frame (see appwin.h) and (3) goto buttons (see goto.h).

Move/Copy Behavior

The header files sel.h and xfer.h describe PenPoint's move/copy mechanism. You need to understand PenPoint's general move/copy mechanism before you'll be able to understand **embeddedWin**'s specific use of it.

clsEmbeddedWin defines a data transfer type, **xferEmbeddedWin**, and a corresponding data transfer protocol. These can be used to move and copy **embeddedWins**.

Unlike most PenPoint data transfer protocols, the **xferEmbeddedWin** protocol is primarily a "push" protocol -- the destination sends a message to the source instructing the source to move/copy itself into the destination.

If the source and destination agree to move data using **xferEmbeddedWin**, the following steps are taken. (This discussion assumes that the destination's style.**quickMove** is true; see section "Move Optimizations" for more information.)

- The destination **embeddedWin** sends **msgEmbeddedWinMove** to the source **embeddedWin** to have the source move itself into the destination at **pArgs**->xy.
- In response, the source self sends **msgEmbeddedWinMoveCopyOK**. If the resulting **moveOK** is false, the source returns **stsEWSelRefusedMove**.
- If the destination's parent window is the same as self's parent window, then the source **embeddedWin** "moves" itself by sending **msgEmbeddedWinPositionChild** to the destination.
- If self and the destination are in the same process, then the source **embeddedWin** "moves" itself by sending **msgEmbeddedWinExtractChild** to its parent, and then sending **msgEmbeddedWinInsertChild** to the destination.
- If self and the destination are in different processes, then the source **embeddedWin** "moves" itself by (1) using **msgCopy** to create a copy of itself that is owned by the destination's process, and (2) sending **msgEmbeddedWinInsertChild** to the destination. Finally the original source **embeddedWin** posts **msgEmbeddedWinDestroy** to itself.

Copying data goes through the following steps:

- The destination **embeddedWin** sends **msgEmbeddedWinCopy** to the source **embeddedWin** to have the source copy itself into the destination at **pArgs**->xy.

- In response, the source self sends **msgEmbeddedWinMoveCopyOK**. If the resulting **copyOK** is false, the source returns **stsEWSelRefusedCopy**.
- The source **embeddedWin** "copies" itself by (1) using **msgCopy** to create a copy of itself that is owned by the destination's process, and (2) sending **msgEmbeddedWinInsertChild** to the destination.

Selection Interaction

The header file sel.h describes PenPoint's selection mechanism. You need to understand PenPoint's general selection mechanism before you can understand **embeddedWin**'s specific use of it.

clsEmbeddedWin provides default selection management for itself and its subclasses.

Some objects should take selection ownership via **msgSelSetOwner** and some should take ownership via **msgSelSetOwnerPreserve**. (See sel.h for complete information, but here's one example: objects in pop-up dialog boxes, such as option sheets, should typically take ownership via **msgSelSetOwnerPreserve**.)

Rather than having each subclass or instance compute which way to take the selection, **embeddedWin** creators can given an **embeddedWin** a style.selection value which tells the **embeddedWin** which message to use to take selection ownership.

Subclasses of **clsEmbeddedWin** should self send **msgSelSelect** to take selection ownership rather than sending **msgSelSetOwner** or **msgSelSetOwnerPreserve** directly to **theSelectionManager**.

In response to **msgSelSelect**, an **embeddedWin** does the following:

- If style.selection is **ewSelect**, the **embeddedWin** sends **msgSelSetOwner** to **theSelectionManager** with self as the value of **pArgs**.
- If style.selection is **ewSelectPreserve**, the **embeddedWin** sends **msgSelSetOwnerPreserve** to **theSelectionManager** with self as the value of **pArgs**.
- If style.selection is **ewSelectUknown** (the default), the **embeddedWin** searches up the window hierarchy looking for the first window that (1) is an **embeddedWin** and (2) has a style.selection other than **ewSelectUnknown**. The value of that window's style.selection is used. If no ancestor sets this bit, or no ancestor is an **embeddedWin**, the **embeddedWin** takes the selection via **msgSelSetOwner**.

In addition to selection ownership message, an **embeddedWin** provides default responses to several other messages defined in sel.h. Details of each response are described with the specific messages later in this file.

Input Target Interaction

One of PenPoint's UI guidelines is that, in most cases, the selection owner should also be the input target. The input target receives keyboard events from the input system. (See sel.h and input.h for more information.)

While PenPoint as a whole does not enforce a link between selection ownership and the input target, **clsEmbeddedWin** does. As part of its response to **msgSelSelect** and **msgSelPromote**, an **embeddedWin** makes itself the input target.

Enabling Move/Copy of the Entire Window

If you want an entire **embeddedWin** to be moveable or copyable as a window, then you should set style.moveable and style.copyable to true. Also, you should turn on the **inputHoldTimeout** flag of the window's input flags.

```
pArgs->win.flags.input  |= inputHoldTimeout;
```

Move Optimizations

By default, an **embeddedWin**'s style.**quickMove** is true, and the section "Move/Copy Behavior" correctly describes what happens during a move. But a client or subclass can set style.**quickMove** false, and thereby defeat the "same parent" and "same process" optimizations.

```
#ifndef EMBEDWIN_INCLUDED
#define EMBEDWIN_INCLUDED
#ifndef EMBEDWIN_NEW_INCLUDED
#include <ewnew.h>
#endif
#ifndef FS_INCLUDED
#include <fs.h>
#endif
#ifndef PRINT_INCLUDED
#include <print.h>
#endif
```

Common #defines and typedefs

```
typedef OBJECT EMBEDDED_WIN, *P_EMBEDDED_WIN;
```

Status Codes

```
#define stsEWNoSelection              MakeStatus(clsEmbeddedWin, 1)
#define stsEWSelRefusedMove           MakeStatus(clsEmbeddedWin, 2)
#define stsEWSelRefusedCopy           MakeStatus(clsEmbeddedWin, 3)
#define stsEWSelRefusedLink           MakeStatus(clsEmbeddedWin, 4)
#define stsEWUnrecognizedFormat       MakeStatus(clsEmbeddedWin, 5)
#define stsEWMoveToInvalidLocation    MakeStatus(clsEmbeddedWin, 6)
#define stsEWCopyToInvalidLocation    MakeStatus(clsEmbeddedWin, 7)
#define stsEWNotEmbeddee              MakeStatus(clsEmbeddedWin, 8)
#define stsEWRefusedDelete            MakeStatus(clsEmbeddedWin, 9)
```

xferEmbeddedWin is the data transfer type **clsEmbeddedWin** uses to move or copy **embeddedWins**.

```
#define xferEmbeddedWin               MakeTag(clsEmbeddedWin, 1)
```

Messages

msgEmbeddedWinGetMetrics

Passes back an **embeddedWin**'s metrics.

Takes P_EMBEDDED_WIN_METRICS, returns STATUS.

```
#define msgEmbeddedWinGetMetrics      MakeMsg(clsEmbeddedWin, 1)
```

Comments

pArgs->uuid is set if and only if style.embeddee is true.

See ewnew.h for the definition of P_EMBEDDED_WIN_METRICS.

msgEmbeddedWinGetStyle

Passes back an **embeddedWin**'s style.

Takes P_EMBEDDED_WIN_STYLE, returns STATUS.

```
#define msgEmbeddedWinGetStyle          MakeMsg(clsEmbeddedWin, 2)
```

Comments — See ewnew.h for the definition of P_EMBEDDED_WIN_STYLE.

msgEmbeddedWinSetStyle

Specifies an **embeddedWin**'s style.

Takes P_EMBEDDED_WIN_STYLE, returns STATUS.

```
#define msgEmbeddedWinSetStyle          MakeMsg(clsEmbeddedWin, 3)
```

Comments — If **pArgs**->embeddee is true and the **embeddedWin**'s uuid is nil, a uuid is created for the window. Clients must not alter the value of style.**moveCopyMode**.

See ewnew.h for the definition of P_EMBEDDED_WIN_STYLE.

Move/Copy Protocol Messages

msgEmbeddedWinBeginMove

Places an **embeddedWin** in move mode.

Takes P_EMBEDDED_WIN_BEGIN_MOVE_COPY, returns STATUS.

```
#define msgEmbeddedWinBeginMove         MakeMsg(clsEmbeddedWin, 4)
```

Arguments

```
typedef struct EMBEDDED_WIN_BEGIN_MOVE_COPY {
    XY32        xy;             // x,y in source to begin move/copy.
    RECT32      bounds;         // Bounding box of area to move/copy.
    U32         reserved[4];    // Reserved.
} EMBEDDED_WIN_BEGIN_MOVE_COPY, *P_EMBEDDED_WIN_BEGIN_MOVE_COPY;
```

Comments — An **embeddedWin** self sends this message to get itself into move mode. This message is usually self sent by an **embeddedWin** as part of the response to **msgSelBeginMove** if style.moveable is set.

clsEmbeddedWin responds by creating a move icon (an instance of **clsMoveCopyIcon**). If **pArgs**->bounds is a visible rectangle, the move icon is created with an image of what's displayed in the **pArgs**->bounds rectangle in the **embeddedWin**. Otherwise a default move icon is displayed centered at **pArgs**->xy. The client of the icon is self. Also style.**moveCopyMode** becomes **ewMoveMode**.

Return Value — **stsRequestDenied** The window is already in either **ewMoveMode** or **ewCopyMode**

See Also — **msgSelBeginMove**

msgEmbeddedWinBeginCopy

Places an **embeddedWin** in copy mode.

Takes P_EMBEDDED_WIN_BEGIN_MOVE_COPY, returns STATUS.

```
#define msgEmbeddedWinBeginCopy         MakeMsg(clsEmbeddedWin, 5)
```

Message Arguments

```
typedef struct EMBEDDED_WIN_BEGIN_MOVE_COPY {
    XY32        xy;             // x,y in source to begin move/copy.
    RECT32      bounds;         // Bounding box of area to move/copy.
    U32         reserved[4];    // Reserved.
} EMBEDDED_WIN_BEGIN_MOVE_COPY, *P_EMBEDDED_WIN_BEGIN_MOVE_COPY;
```

Comments

An **embeddedWin** self sends this message to get itself into copy mode. This message is usually self sent by an **embeddedWin** as part of the response to **msgSelBeginCopy** if style.copyable is set.

clsEmbeddedWin responds by creating a copy icon (an instance of **clsMoveCopyIcon**). If **pArgs**->bounds is a visible rectangle, the copy icon is created with an image of what's displayed in the **pArgs**->bounds rectangle in the **embeddedWin**. Otherwise a default copy icon is displayed centered at **pArgs**->xy. The client of the icon is self. Also style.**moveCopyMode** becomes **ewCopyMode**.

Return Value

stsRequestDenied The window is already in either **ewMoveMode** or **ewCopyMode**.

See Also

msgSelBeginCopy

msgEmbeddedWinMove

Moves an **embeddedWin** to the destination.

Takes P_EMBEDDED_WIN_MOVE_COPY, returns STATUS.

```
#define msgEmbeddedWinMove              MakeMsg(clsEmbeddedWin, 6)
```

Arguments

```
typedef struct EMBEDDED_WIN_MOVE_COPY {
    XY32        xy;             // x,y location in dest.
    OBJECT      dest;           // Destination object.
    TAG         format;         // Data transfer format. Must be
                                // xferEmbeddedWin.
    OBJECT      uid;            // out: moved/copied object.
    U32         reserved[2];    // Reserved.
} EMBEDDED_WIN_MOVE_COPY, *P_EMBEDDED_WIN_MOVE_COPY;
```

Comments

A destination **embeddedWin** sends this message to a source **embeddedWin** to have the source **embeddedWin** move itself to the destination.

See the section "Move/Copy Behavior" for more information.

Return Value

stsEWSelRefusedMove The send of **msgEmbeddedWinMoveCopyOK** returned FALSE for **moveOK**.

stsEWMoveToInvalidLocation window could not be moved to **pArgs**->dest.

msgEmbeddedWinProvideIcon

Asks an **embeddedWin** to provide the move/copy icon.

Takes P_EMBEDDED_WIN_PROVIDE_ICON, returns STATUS.

```
#define msgEmbeddedWinProvideIcon       MakeMsg(clsEmbeddedWin, 23)
```

Arguments

```
typedef struct EMBEDDED_WIN_PROVIDE_ICON {
    MESSAGE     msg;            // msgEmbeddedWinMove or msgEmbeddedWinCopy.
    XY32        xy;             // x,y in source to begin move/copy.
    RECT32      bounds;         // Bounding box of area to move/copy.
    OBJECT      icon;           // out: the icon.
    U32         reserved[4];    // Reserved.
} EMBEDDED_WIN_PROVIDE_ICON, *P_EMBEDDED_WIN_PROVIDE_ICON;
```

Comments

An **embeddedWin**'s default response is as follows:

- if **pArgs**->bounds.size.w and **pArgs**->bounds.size.h are both greater than zero, then a marquee style icon is created using a "snapshot" of the screen image contained in **pArgs**->bounds.
- Otherwise, a default move or copy icon is created.

msgEmbeddedWinCopy

Copies an **embeddedWin** to the destination.

Takes P_EMBEDDED_WIN_MOVE_COPY, returns STATUS.

```
#define msgEmbeddedWinCopy              MakeMsg(clsEmbeddedWin, 7)
```

Message Arguments

```
typedef struct EMBEDDED_WIN_MOVE_COPY {
    XY32        xy;             // x,y location in dest.
    OBJECT      dest;           // Destination object.
    TAG         format;         // Data transfer format. Must be
                                // xferEmbeddedWin.
    OBJECT      uid;            // out: moved/copied object.
    U32         reserved[2];    // Reserved.
} EMBEDDED_WIN_MOVE_COPY, *P_EMBEDDED_WIN_MOVE_COPY;
```

Comments

A destination **embeddedWin** sends this message to a source **embeddedWin** to have the source **embeddedWin** copy itself to the destination.

See the section "Move/Copy Behavior" for more information.

Return Value

stsEWSelRefusedCopy The send of **msgEmbeddedWinMoveCopyOK** returned FALSE for **copyOK**.

stsEWCopyToInvalidLocation window could not be copied to **pArgs**->dest.

msgEmbeddedWinMoveCopyOK

Asks whether it is OK to move or copy an **embeddedWin** to a destination.

Takes P_EMBEDDED_WIN_MOVE_COPY_OK, returns STATUS.

```
#define msgEmbeddedWinMoveCopyOK        MakeMsg(clsEmbeddedWin, 8)
```

Arguments

```
typedef struct EMBEDDED_WIN_MOVE_COPY_OK {
    BOOLEAN                 moveOK; // out: true if ok to move.
    BOOLEAN                 copyOK; // out: true if ok to copy.
    EMBEDDED_WIN_MOVE_COPY  target; // move/copy struct.
} EMBEDDED_WIN_MOVE_COPY_OK, *P_EMBEDDED_WIN_MOVE_COPY_OK;
```

Comments

A source **embeddedWin** self sends this message to check that it is OK to move or copy itself to the destination. The default response to this message is to fill in **pArgs**->moveOK with style.moveable and **pArgs**->copyOK with style.copyable.

See the section "Move/Copy Behavior" for more information.

Return Value

stsEWUnrecognizedFormat target.format was not **xferEmbeddedWin**.

stsEWNotEmbeddee embeddedWin is not an embeddee.

See Also

msgEmbeddedWinMove

msgEmbeddedWinGetPenOffset

Passes back the pen offset during move or copy.

Takes P_XY32, returns STATUS.

```
#define msgEmbeddedWinGetPenOffset          MakeMsg(clsEmbeddedWin, 9)
```

Comments

This message allows the destination of a move or copy to determine the actual pen position relative to the lower-left hand corner of the move/copy icon.

When the user lifts the pen, **msgSelBeginMove** passes the x,y position of the icon, not the pen.

msgEmbeddedWinGetDest

Get the destination for **embeddedWin** move or copy.

Takes P_EMBEDDED_WIN_GET_DEST, returns STATUS.

```
#define msgEmbeddedWinGetDest       MakeMsg(clsEmbeddedWin, 10)
#define ewPropCopyDest              MakeTag(clsEmbeddedWin, 1)  // Private.
```

Arguments

```
typedef struct EMBEDDED_WIN_GET_DEST {
    XY32            xy;                     // x,y location in self.
    FS_LOCATOR      locator;                // out: Destination parent app.
    U16             sequence;               // out: Sequence in parent.
    char            path[fsPathBufLength];  // Path buffer for locator.
    OBJECT          source;                 // Object to be moved/copied.
    U32             reserved[3];            // Reserved.
} EMBEDDED_WIN_GET_DEST, *P_EMBEDDED_WIN_GET_DEST;
```

Comments

Some source **embeddedWins** move or copy more than themselves in response to **msgEmbeddedWinMove** or **msgEmbeddedWinCopy**. Some also transfer filed information. (For instance, reference buttons have to move filed information about the destination of the button.) The source sends **msgEmbeddedWinGetDest** to the destination to get the file system location that the destination wants the source to use for this filed information.

An **embeddedWin**'s default response is to (1) set **pArgs**->locator to OSThisApp()'s locator, (2) set **pArgs**->sequence to 1, and (3) set **pArgs**->path to the empty string. Then if style.**embedForward** is true, **msgEmbeddedWinForwardedGetDest** is sent to self's parent window.

Corkboard Windows (**clsCorkBoardWin**; see cbwin.h) are an example of a class that that has a non-default response to this message. When an **embeddedWin** is copied to a cork margin, it may represent a document, and the source is likely to copy not only the window but also the document files to the destination. The cork margin cannot allow the source to copy these files into the directory of the cork margin's containing application since then the files would look like they're in the parent application -- the wrong place! So in response to **msgEmbeddedWinGetDest**, a corkboard window appends an extra directory level to is ancestor's response to **msgEmbeddedWinGetDest**.

msgEmbeddedWinForwardedGetDest

Get the destination for **embeddedWin** move or copy.

Takes P_EMBEDDED_WIN_GET_DEST, returns STATUS.

```
#define msgEmbeddedWinForwardedGetDest      MakeMsg(clsEmbeddedWin, 22)
```

Message Arguments

```
typedef struct EMBEDDED_WIN_GET_DEST {
    XY32            xy;                     // x,y location in self.
    FS_LOCATOR      locator;                // out: Destination parent app.
    U16             sequence;               // out: Sequence in parent.
    char            path[fsPathBufLength];  // Path buffer for locator.
    OBJECT          source;                 // Object to be moved/copied.
    U32             reserved[3];            // Reserved.
} EMBEDDED_WIN_GET_DEST, *P_EMBEDDED_WIN_GET_DEST;
```

Comments

If a child **embeddedWin**'s style.**embedForward** is true, then the child sends **msgEmbeddedWinForwardedGetDest** to the parent to allow the parent to override all or part of the child's response to **msgEmbeddedWinGetDest**.

An **embeddedWin**'s default response to this message is identical to the default response to **msgEmbeddedWinGetDest**.

msgEmbeddedWinInsertChild

Asks an **embeddedWin** to insert a child window.

Takes P_EMBEDDED_WIN_INSERT_CHILD, returns STATUS.

```
#define msgEmbeddedWinInsertChild          MakeMsg(clsEmbeddedWin, 11)
```

Arguments

```
typedef struct EMBEDDED_WIN_INSERT_CHILD {
    XY32        xy;             // x,y location in destination.
    OBJECT      win;            // Window to insert/extract/position.
    OBJECT      source;         // Requestor.
    U32         reserved[4];    // Reserved.
} EMBEDDED_WIN_INSERT_CHILD, *P_EMBEDDED_WIN_INSERT_CHILD,
  EMBEDDED_WIN_EXTRACT_CHILD, *P_EMBEDDED_WIN_EXTRACT_CHILD,
  EMBEDDED_WIN_POSITION_CHILD, *P_EMBEDDED_WIN_POSITION_CHILD;
```

Comments

clsEmbeddedWin's default response is as follows; this is illustrated in the sample code below.

- send **msgEmbeddedWinGetPenOffset** to **pArgs**->source
- offset **pArgs**->xy by the value passed back by **msgEmbeddedWinGetPenOffset**
- send **msgWinInsert** to **pArgs**->win with self as the parent.

```
XY32        xy;
WIN_METRICS wm;
ObjSendUpdateRet(msgEmbeddedWinGetPenOffset, pArgs->source, &xy,
        SizeOf(xy));
ObjSendUpdateRet(msgWinGetMetrics, pArgs->win, &wm, SizeOf(wm), s);
wm.bounds.origin.x = pArgs->xy.x - xy.x;
wm.bounds.origin.y = pArgs->xy.y - xy.y;
ObjSendRet(msgWinDelta, pArgs->win, &wm, SizeOf(wm), s);
wm.options  = wsPosTop;
wm.parent   = self;
ObjSendRet(msgWinInsert, pArgs->win, &wm, SizeOf(wm), s);
```

This message may be sent during a move/copy operation; see the section "Move/Copy Behavior" for more information.

msgEmbeddedWinExtractChild

Asks an **embeddedWin** to extract a child window.

Takes P_EMBEDDED_WIN_EXTRACT_CHILD, returns STATUS.

```
#define msgEmbeddedWinExtractChild      MakeMsg(clsEmbeddedWin, 12)
```

Comments

clsEmbeddedWin's default response is to ObjectSend **msgWinExtract** to **pArgs**->win.

This message may be sent during a move/copy operation; see the section "Move/Copy Behavior" for more information.

msgEmbeddedWinPositionChild

Asks an **embeddedWin** to reposition a child window.

Takes P_EMBEDDED_WIN_POSITION_CHILD, returns STATUS.

```
#define msgEmbeddedWinPositionChild     MakeMsg(clsEmbeddedWin, 13)
```

Comments

clsEmbeddedWin's default response is as follows; this is illustrated in the sample code below.

- send **msgEmbeddedWinGetPenOffset** to **pArgs**->source
- offset **pArgs**->xy by the value passed back by **msgEmbeddedWinGetPenOffset**
- self send **msgWinDelta**.

```
XY32        xy;
WIN_METRICS wm;
ObjSendUpdateRet(msgEmbeddedWinGetPenOffset, pArgs->source, &xy,
        SizeOf(xy), s);
ObjSendUpdateRet(msgWinGetMetrics, pArgs->win, &wm, SizeOf(wm), s);
wm.bounds.origin.x = pArgs->xy.x - xy.x;
wm.bounds.origin.y = pArgs->xy.y - xy.y;
ObjSendRet(msgWinDelta, pArgs->win, &wm, SizeOf(wm), s);
```

This message may be sent during a move/copy operation; see the section "Move/Copy Behavior" for more information.

Linking Related Messages

msgEmbeddedWinShowChild

Display a given area of an **embeddedWin** to the user

Takes P_EMBEDDED_WIN_SHOW_CHILD, returns STATUS.

```
#define msgEmbeddedWinShowChild         MakeMsg(clsEmbeddedWin, 14)
```

Arguments

```
typedef struct EMBEDDED_WIN_SHOW_CHILD {
    WIN         child;              // the child directly below
    UUID        childUUID;          // its UUID
    RECT32      area;               // area to show
    WIN         areaWin;            // window that the area is relative to
} EMBEDDED_WIN_SHOW_CHILD, * P_EMBEDDED_WIN_SHOW_CHILD;
```

Comments

Clients send this message to ask an **embeddedWin** to show the rectangle **pArgs**->area to the user, scrolling if necessary.

Note that **pArgs**->area is relative to **pArgs**->areaWin. Therefore handling this message may involve transforming **pArgs**->area to be relative to self. This can be accomplished as follows:

```
WIN_METRICS wm;
wm.bounds = pArgs->area;
wm.parent = self;
ObjCallJmp(msgWinTransformBounds, pArgs->areaWin, &wm, s, Error);
```

In many cases, subclasses need do nothing; **clsScrollWin**'s response to this message takes care of it all.

However, if a subclass does its own scrolling, manages embeddees (for example, by not having them inserted when off-screen) or uses something other than window coordinates to scroll a scroll window, then it needs to respond to this message in the following manner:

- ensure that child is inserted and delta'd to the correct place (possibly scrolling it into view if needed)
- transform the rect to the child (remember: it may be in some nested window)
- scroll as needed to get that rect into view.
- call ancestor.

clsEmbeddedWin's default response is to set **pArgs**->child to self, set **pArgs**->childUUID to self's UUID and ObjectSend the message to its parent.

Other Messages

msgEmbeddedWinSetUUID

Specifies an **embeddedWin**'s uuid.

Takes P_UUID, returns STATUS.

```
#define msgEmbeddedWinSetUUID          MakeMsg(clsEmbeddedWin, 19)
```

Comments

Gives an **embeddedWin** a UUID, if style.embeddee is true.

msgEmbeddedWinDestroy

Permanently destroys an **embeddedWin**.

Takes OBJ_KEY, returns STATUS.

```
#define msgEmbeddedWinDestroy          MakeMsg(clsEmbeddedWin, 20)
```

Comments

This message is sent to an **embeddedWin** in response to **msgSelDelete**, or as the last step of **msgEmbeddedWinMove**. This message is different from **msgDestroy** in that this message is sent when the **embeddedWin** is being permanently destroyed and will never be restored. (**msgDestroy** is sent when the **embeddedWin** is being destroyed but may be restored later.)

Any subclasses that file data to maintain information as part of their embedding behavior should free that data in response to this message. They should not free that data in response to **msgDestroy**.

clsEmbeddedWin's default response is as follows:

- if style.deleteable is false, return **stsEWRefusedDelete**.
- Send **msgEmbeddedWinDestroy** to any child **embeddedWins** that are in the same task.
- Self send **msgDestroy**.

msgEmbeddedWinGetPrintInfo

Passes back an **embeddedWin**'s print information.

Takes P_EMBEDDEE_PRINT_INFO, returns STATUS.

```
#define msgEmbeddedWinGetPrintInfo     MakeMsg(clsEmbeddedWin, 21)
```

Comments

This message gives subclasses an opportunity to support more advanced printing of **embeddedWins**.

clsEmbeddedWin's default response is to set all fields in *pArgs to 0.

Messages Defined in clsmgr.h

msgFree

Defined in clsmgr.h.

Takes OBJ_KEY, returns STATUS.

msgSave

Defined in clsmgr.h.

Takes P_OBJ_SAVE, returns STATUS.

Comments

clsEmbeddedWin saves the **embeddedWin**'s style and UUID.

msgRestore

Defined in clsmgr.h.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsEmbeddedWin restores the **embeddedWin**'s style and UUID.

Messages Defined in xfer.h and sel.h

msgXferList

Defined in xfer.h.

Takes OBJECT, returns STATUS.

Comments

This message is sent to an object to ask it to provide the list of data transfer types it can provide.

clsEmbeddedWin's default response is to add the transfer type **xferEmbeddedWin** to the end of the list.

msgSelMoveSelection

Defined in sel.h.

Takes P_XY32, returns STATUS.

Comments

This message is sent to an object to ask it to move the selection to itself.

See the section "Move/Copy Behavior" for more information.

Return Value

stsRequestForward embeddedWin is not an embeddor.

stsEWSelRefusedMove destination **embeddedWin** refused the move.

stsEWNoSelection No selection exists in the system.

msgSelCopySelection

Defined in sel.h.

Takes P_XY32, returns STATUS.

Comments

This message is sent to an object to ask it to copy the selection to itself.

See the section "Move/Copy Behavior" for more information.

Return Value

stsRequestForward embeddedWin is not an embeddor.

stsEWSelRefusedCopy destination **embeddedWin** refused the copy.

stsEWNoSelection No selection exists in the system.

msgSelRememberSelection

Defined in sel.h.

Takes P_XY32, returns STATUS.

Comments

Self sent by an **embeddedWin** in response to the Circle-Tap gesture.

clsEmbeddedWin's default response is to

- create a reference button
- insert the button by self sending **msgEmbeddedWinInsertChild**.

Return Value **stsRequestForward** The window is not an embeddor.

stsEWNoSelection No selection exists.

msgSelSelect

Defined in sel.h.

Takes nothing, returns STATUS.

Comments See the section "Selection Interaction" for a description of an **embeddedWin**'s response to **msgSelSelect**.

msgSelPromote

Defined in sel.h.

Takes nothing, returns STATUS.

Comments **clsEmbeddedWin**'s default response is to become the input target by calling InputSetTarget (see input.h) with self as the target.

msgSelYield

Defined in sel.h.

Takes BOOLEAN, returns STATUS.

Comments **clsEmbeddedWin**'s default response is to return **stsOK**.

msgSelIsSelected

Defined in sel.h.

Takes nothing, returns BOOLEAN.

Return Value **stsOK** self is the selection owner.

other self is not the selection owner. (Note that self may be the preserved selection owner.)

msgSelDelete

Defined in sel.h.

Takes U32, returns STATUS.

Comments See sel.h for a complete description of when this message is sent. Typically, an **embeddedWin** receives this message because the destination of the move is deleting the source.

embeddedWin's default response is to self send **msgEmbeddedWinDestroy**.

msgSelBeginMove

Defined in sel.h.

Takes nothing, returns STATUS.

Comments See sel.h for a complete description of when this message is sent.

clsEmbeddedWin's default response is to self send **msgEmbeddedWinMove**.

Return Value **stsRequestDenied** the **embeddedWin** is already in move or copy mode.

msgSelBeginCopy

Defined in sel.h.

Takes nothing, returns STATUS.

Comments

See sel.h for a complete description of when this message is sent.

clsEmbeddedWin's default response is to self send **msgEmbeddedWinCopy**.

Return Value

stsRequestDenied the **embeddedWin** is already in move or copy mode.

Other Messages

msgIconProvideBitmap

Defined in icon.h.

Takes P_ICON_PROVIDE_BITMAP, returns STATUS.

Comments

An **embeddedWin** receives this message from a move/copy icon (since the **embeddedWin** is the icon's client.)

clsEmbeddedWin's default response is to forward the message to OSThisApp().

msgMoveCopyIconDone

Defined in mcicon.h.

Takes OBJECT, returns STATUS.

Comments

An **embeddedWin** receives this message when a move/copy icon completes. (The move/copy icon completes when it dropped on some destination window.)

clsEmbeddedWin's default response is to send **msgSelMoveSelection** or **msgSelCopySelection** (as appropriate) to the destination window.

msgMoveCopyIconCancel

Defined in mcicon.h.

Takes OBJECT, returns STATUS.

Comments

An **embeddedWin** receives this message when a move/copy icon is canceled. **clsEmbeddedWin**'s default response is to take itself out of move/copy mode (by setting self's style.**moveCopyMode** to **ewMoveCopyModeOff**).

msgTrackProvideMetrics

Defined in track.h.

Takes P_TRACK_METRICS, returns STATUS.

Comments

An **embeddedWin** receives this message from the move/copy icon's tracker. (The tracker can be recognized as the move/copy icon's tracker because **pArgs**->tag will be **tagMoveCopyIconTrack**.)

Subclasses can handle this message by repositioning the tracker (and therefore the move/copy icon) relative to the pen. This is done by modifying **pArgs**->initRect. Typically you do not call the ancestor in such cases. For instance, PenPoint's text component "jumps" the icon so that the pen is at the vertical center of the left edge of the icon by using code similar to the following:

```
MsgHandlerArgType(SomeViewTrackProvideMetrics, P_TRACK_METRICS)
{
    if (pArgs->tag == tagMoveCopyIconTrack) {
        pArgs->initRect.origin = pArgs->origXY;
        pArgs->initRect.origin.y -= pArgs->initRect.size.h/2;
        return stsOK;
    } else {
        return ObjectCallAncestorCtx(ctx);
    }
    ...
}
```

EWNEW.H

This file contains the API definition for creating embedded windows.

See embedwin.h for information. Essentially all of the documentation is in embedwin.h.

```
#ifndef EWNEW_INCLUDED
#define EWNEW_INCLUDED
#ifndef GWIN_INCLUDED
#include <gwin.h>
#endif
#ifndef UUID_INCLUDED
#include <uuid.h>
#endif
```

Common #defines and typedefs

EmbeddedWin Selection Types

Use one of these values in an **embeddedWin**'s style.selection.

See the section "Selection Interaction" in embedwin.h for a description of each of these values.

```
#define ewSelectUnknown         0   // take selection based on parent
                                    // embeddedWin's style.selection
#define ewSelect                1   // take selection via msgSelSetOwner
#define ewSelectPreserve        2   // take selection via
                                    // msgSelSetOwnerPreserve
```

Move/Copy Modes

These are the possible values for style.**moveCopyMode**. The mode is set while an **embeddedWin** is involved in a move/copy. Clients and subclasses must NOT alter the value of this field.

```
#define ewMoveCopyModeOff       0
#define ewMoveMode              1
#define ewCopyMode              2
```

Embedded Window Style

```
typedef struct EMBEDDED_WIN_STYLE {
    U16 embeddor          : 1;  // Allow embedding. Causes response to
                                // msgGWinGesture, msgEmbeddedWinMove,
                                // and msgEmbeddedWinCopy. See section
                                // "Embedding."
    U16 embeddee          : 1;  // Can be embedded. Causes embeddedWin to
                                // generate UUID. See section "Embedding."
    U16 selection         : 2;  // Selection style. Most clients use
                                // ewSelectUnknown. See section "Selection
                                // Interaction."
    U16 moveable          : 1;  // embeddedWin is moveable. Responds
                                // to msgSelBeginMove by self sending
                                // msgEmbeddedWinBeginMove.
    U16 copyable          : 1;  // embeddedWin is copyable. Responds
                                // to msgSelBeginCopy by self sending
```

```
                                    // msgEmbbeddedWinBeginCopy.
    U16 moveCopyMode      : 2;  // Current move/copy mode. Clients must not
                                    // set this field.
    U16 deletable         : 1;  // Destroy in response to msgEWDestroy?
    U16 moveCopyContainer : 1;  // Private
    U16 embedForward      : 1;  // See comments with msgEmbeddedWinGetDest
                                    // and msgEmbeddedWinForwardedGetDest.
    U16 quickMove         : 1;  // Use optimizations when moving windows
                                    // within a common parent or within a common
                                    // process. True by default. See section
                                    // "Move Optimizations."
                                    // msgEmbeddedWinExtract/InsertChild.
    U16 reserved          : 4;  // Reserved for future use.
    U16 reserved2         : 16; // Reserved for future use.
} EMBEDDED_WIN_STYLE, *P_EMBEDDED_WIN_STYLE;
```

Embedded Window Metrics

Passed back from **msgEmbeddedWinGetMetrics**.

```
typedef struct EMBEDDED_WIN_METRICS {
    UUID                uuid;           // Defined if style.embeddee is true.
    EMBEDDED_WIN_STYLE  style;
} EMBEDDED_WIN_METRICS, *P_EMBEDDED_WIN_METRICS;
```

---

msgNew

Creates a new **embeddedWin** object.

Takes P_EMBEDDED_WIN_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct EMBEDDED_WIN_NEW_ONLY {
    UUID                uuid;
    EMBEDDED_WIN_STYLE  style;
    U32                 reserved[4];
} EMBEDDED_WIN_NEW_ONLY, *P_EMBEDDED_WIN_NEW_ONLY;

#define embeddedWinNewFields    \
    gWinNewFields               \
    EMBEDDED_WIN_NEW_ONLY       embeddedWin;

typedef struct EMBEDDED_WIN_NEW {
    embeddedWinNewFields
} EMBEDDED_WIN_NEW, *P_EMBEDDED_WIN_NEW;
```

Comments

If style.embeddor is true, **objCapCreate** is set in object.cap. If the passed in uuid is nil, and the object is an embeddee, a uuid is created.

---

msgNewDefaults

Initializes the EMBEDDED_WIN_NEW structure to default values.

Takes P_EMBEDDED_WIN_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct EMBEDDED_WIN_NEW {
    embeddedWinNewFields
} EMBEDDED_WIN_NEW, *P_EMBEDDED_WIN_NEW;
```

Comments

Zeros out **pNew**->embeddedWin and then executes the following:

```
    win.flags.style |= wsSendFile
    MakeNilUUID(pArgs->embeddedWin.uuid);
    pArgs->embeddedWin.style.deletable = true;
    pArgs->embeddedWin.style.quickMove = true;
```

GOTO.H

This file contains the API definition for **clsGotoButton.**

clsGotoButton inherits from **clsButton.**

Provides links to other documents.

A Goto Button is a Button associated with a Mark object. When the Goto Button is tapped, the data pointed to by the Mark are brought into view. Note that Goto Buttons are called Reference Buttons in the PenPoint User Interface.

```
#ifndef GOTO_INCLUDED
#define GOTO_INCLUDED
#ifndef BUTTON_INCLUDED
#include <button.h>
#endif
#ifndef MARK_INCLUDED
#include <mark.h>
#endif
typedef OBJECT GOTO_BUTTON, *P_GOTO_BUTTON;
#define qhGotoButton                MakeTag(clsGotoButton, 1)
```

msgNew

Creates a new Goto Button object.

Takes P_GOTO_BUTTON_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct GOTO_BUTTON_NEW_ONLY {
    MARK        mark;           // the mark of the button, or objNull
    MARK_NEW    markNew;        // New structure used to create a mark
    U32         reserved[2];    // Reserved.
} GOTO_BUTTON_NEW_ONLY, *P_GOTO_BUTTON_NEW_ONLY;
#define gotoButtonNewFields     \
    buttonNewFields             \
    GOTO_BUTTON_NEW_ONLY        gotoButton;
typedef struct GOTO_BUTTON_NEW {
    gotoButtonNewFields
} GOTO_BUTTON_NEW, *P_GOTO_BUTTON_NEW;
```

Comments

You can pass in the exact mark object that you want the Goto Button to use, or simply set up the **markNew** structure and let the Goto Button create its own mark.

msgNewDefaults

Initializes a GOTO_BUTTON_NEW structure.

Takes P_GOTO_BUTTON_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct GOTO_BUTTON_NEW {
    gotoButtonNewFields
} GOTO_BUTTON_NEW, *P_GOTO_BUTTON_NEW;
```

Comments

clsGoto sets up the structure so that the Goto Button will create its own mark for the selection. The mark will be document relative because of the setting of the **markForSelection** and **markDocRelative** flags in the **markNew** structure.

Zeroes out **pArgs**->gotoButton and sets

```
pArgs->win.flags.input              |= inputHoldTimeout;
pArgs->gWin.helpId                  = qhGotoButton;
pArgs->embeddedWin.style.embeddee   = true;
pArgs->embeddedWin.style.moveable   = true;
pArgs->embeddedWin.style.copyable   = true;
pArgs->embeddedWin.style.selection  = ewSelect;
pArgs->label.scale                  = lsScaleMedium;

ObjectCall(msgNewDefaults, clsMark, &(pArgs->gotoButton.markNew));
pArgs->gotoButton.markNew.mark.flags |= markForSelection
                                      | markDocRelative
                                      | markRelaxActivate;
```

msgGotoButtonGetMark

Passes back the mark object being used by a Goto Button.

Takes P_MARK, returns STATUS. Category: class message.

```
#define msgGotoButtonGetMark                MakeMsg(clsGotoButton, 1)
```

msgGotoButtonGotoLink

Jumps to the mark being used by a Goto Button.

Takes BOOLEAN, returns STATUS.

```
#define msgGotoButtonGotoLink               MakeMsg(clsGotoButton, 3)
```

Comments

If **pArgs** is true, turn to the document; if **pArgs** is false, float the document.

msgGotoButtonDeleteLink

Deletes a Goto Button link.

Takes nothing, returns STATUS.

```
#define msgGotoButtonDeleteLink             MakeMsg(clsGotoButton, 4)
```

msgGotoButtonLinkToSelection

Links a Goto Button to the selection.

Takes nothing, returns STATUS.

```
#define msgGotoButtonLinkToSelection        MakeMsg(clsGotoButton, 5)
```

msgGotoButtonEditLabel

Allows the user to edit a Goto Button's label.

Takes nothing, returns STATUS.

```
#define msgGotoButtonEditLabel              MakeMsg(clsGotoButton, 7)
```

msgGotoButtonPressed

Sent to observers when a Goto Button has been executed.

Takes OBJECT, returns STATUS.

```
#define msgGotoButtonPressed                    MakeMsg(clsGotoButton, 6)
```

Comments

pArgs is the button that was pressed.

msgGotoButtonResetLabel

Causes a Goto Button to reset its label based on the thing it points to.

Takes nothing, returns STATUS.

```
#define msgGotoButtonResetLabel                 MakeMsg(clsGotoButton, 2)
```

Comments

This message is self sent at object new time, and generally should never be resent as it destroys any editing the user has done.

msgGotoButtonGetLabel

Sent to the component containing the marked selection when the Goto Button's label is reset.

Takes P_GOTO_BUTTON_GET_LABEL, returns STATUS.

```
#define msgGotoButtonGetLabel                   MakeMsg(clsGotoButton, 8)
```

Arguments

```
typedef struct GOTO_BUTTON_GET_LABEL {
    MARK_MSG_HEADER     header;
    U32                 bufLen;
    P_CHAR              pBuf;
} GOTO_BUTTON_GET_LABEL, * P_GOTO_BUTTON_GET_LABEL;
```

Comments

Components that support Goto Buttons should fill in the buffer (*pBuf) with the label to use. If you don't support this message, then **clsGoto** will try **msgSRGetChars** to get the characters pointed to by the mark.

msgGotoButtonRePosition

Sent to the component conataining the mark to request possible re-positioning for the Goto Button.

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgGotoButtonRePosition                 MakeMsg(clsGotoButton, 9)
```

Comments

This message is sent when a component wants the Goto Button to end up pointing at a child and not itself. To do this the component returns **stsMarkEnterChild** to this message, and then the Goto Button will send **msgMarkGetChild** to re-position the mark at the child (but not actually enter it). Most clients that support Goto Buttons ignore this message.

ICONWIN.H

This file contains the API definition for **clsIconWin**.

clsIconWin inherits from **clsTkTable.**

Icon windows are windows that contain a number of embedded windows.

Icon windows can manage their children icons to give them uniform appearance and layout. Icon windows can also force their icons to open floating, and they can deny the ability of users to set icon options. Examples of icon window subclasses are the Bookshelf, Accessories, and the Cork Margin.

```
#ifndef ICONWIN_INCLUDED
#define ICONWIN_INCLUDED

                                                    #ifndef TKTABLE_INCLUDED
#include <tktable.h>
                                                    #endif
```

Common #defines and typedefs

```
typedef OBJECT ICON_WIN, *P_ICON_WIN;
```

Icon Window Style

This structure defines the various icon window styles. The fields are as follows:

- iconType What appearance to give the icons. The values for this field are defined in appwin.h, and are things like **awPictAndTitle** (large icon over label), **awPictOnly** (large icon), **awSmallPictAndTitle** (small icon to the left of a label), **awSmallPictOnly** (small icon), and **awSmallPictOverTitle** (small icon over label).
- propagateIconType If this field is true, all icons in the icon window are forced to have the same **iconType.** If the user changes one icon's **iconType**, all icons in the icon window will change to match.
- allowOpenInPlace If this field is true, documents will be able to open inside the icon window. If false, documents will always open floating.
- constrainedLayout If this field is true, the icon window will arrange icons into neat rows and columns. An icon dragged to a new location in the icon window will be "snapped" into place. If this field is false, icons are left where they're dropped.
- showOptions If this field is true, users may make the check gesture over an icon in the icon window to bring up the icon option sheet. If it is false, the check gesture will be rejected.

```
typedef struct ICON_WIN_STYLE {
    U16 iconType         : 4;  // Use AppWin icon types (see appwin.h).
    U16 propagateIconType : 1;  // True = all icons in win are same type.
    U16 allowOpenInPlace  : 1;  // False= always open floating.
    U16 constrainedLayout : 1;  // True = line up icons in rows & columns.
    U16 showOptions       : 1;  // True = allow option sheet display.
    U16 reserved          : 8;  // Reserved.
} ICON_WIN_STYLE, *P_ICON_WIN_STYLE;
```

Messages

msgNew

Creates a new icon window.

Takes P_ICON_WIN_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct ICON_WIN_NEW_ONLY {
    ICON_WIN_STYLE  style;
    U32             reserved[4];
} ICON_WIN_NEW_ONLY, *P_ICON_WIN_NEW_ONLY;
#define iconWinNewFields        \
    tkTableNewFields            \
    ICON_WIN_NEW_ONLY           iconWin;
typedef struct ICON_WIN_NEW {
    iconWinNewFields
} ICON_WIN_NEW, *P_ICON_WIN_NEW;
```

msgNewDefaults

Initializes the ICON_WIN_NEW structure to default values.

Takes P_ICON_WIN_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct ICON_WIN_NEW {
    iconWinNewFields
} ICON_WIN_NEW, *P_ICON_WIN_NEW;
```

Comments

Zeroes out **pArgs**->iconWin and sets

```
pArgs->win.flags.style                  &= ~wsShrinkWrapWidth;
pArgs->win.flags.style                  &= ~wsShrinkWrapHeight;
pArgs->win.flags.style                  |= wsCaptureGeometry;
pArgs->win.flags.style                  |= wsClipChildren;
pArgs->win.flags.style                  |= wsHeightFromWidth;
pArgs->gWin.style.grabDown              = false;
pArgs->embeddedWin.style.embeddor       = true;
pArgs->tableLayout.style.tblXAlignment  = tlAlignLeft;
pArgs->tableLayout.style.tblYAlignment  = tlAlignBottom;
pArgs->tableLayout.style.childXAlignment = tlAlignCenter;
pArgs->tableLayout.style.childYAlignment = tlAlignCenter;
pArgs->tableLayout.style.growChildWidth  = false;
pArgs->tableLayout.style.growChildHeight = false;
pArgs->tableLayout.style.placement      = tlPlaceRowMajor;
pArgs->tableLayout.style.senseOrientation = false;
pArgs->tableLayout.style.reverseX       = false;
pArgs->tableLayout.style.reverseY       = true;
pArgs->tableLayout.numRows.constraint   = tlInfinite;
pArgs->tableLayout.numCols.constraint   = tlMaxFit;
pArgs->tableLayout.rowHeight.constraint = tlGroupMax;
pArgs->tableLayout.rowHeight.gap        = 2;
pArgs->tableLayout.colWidth.constraint  = tlGroupMax;
pArgs->tableLayout.colWidth.gap         = 3;
pArgs->iconWin.style.iconType           = awSmallPictAndTitle;
pArgs->iconWin.style.propagateIconType  = false;
pArgs->iconWin.style.allowOpenInPlace   = false;
pArgs->iconWin.style.constrainedLayout  = true;
```

If the environment variable "ICONWIN.SHOWOPTIONS" is set, **pArgs**->iconWin.style.**showOptions** is set to true, otherwise false.

msgIconWinGetMetrics

Passes back an icon window's metrics.

Takes P_ICON_WIN_METRICS, returns STATUS.

```
#define msgIconWinGetMetrics                    MakeMsg(clsIconWin, 1)
```

Arguments

```
typedef struct ICON_WIN_METRICS {
    ICON_WIN_STYLE  style;
    U32             reserved[4];
} ICON_WIN_METRICS, *P_ICON_WIN_METRICS;
```

Comments

Since the icon window metrics structure currently contains no information other than the icon window style, use **msgIconWinGetStyle** instead of this message.

msgIconWinGetStyle

Passes back an icon window's style.

Takes P_ICON_WIN_STYLE, returns STATUS.

```
#define msgIconWinGetStyle                      MakeMsg(clsIconWin, 2)
```

Message Arguments

```
typedef struct ICON_WIN_STYLE {
    U16 iconType          : 4;  // Use AppWin icon types (see appwin.h).
    U16 propagateIconType : 1;  // True = all icons in win are same type.
    U16 allowOpenInPlace  : 1;  // False= always open floating.
    U16 constrainedLayout : 1;  // True = line up icons in rows & columns.
    U16 showOptions       : 1;  // True = allow option sheet display.
    U16 reserved          : 8;  // Reserved.
} ICON_WIN_STYLE, *P_ICON_WIN_STYLE;
```

msgIconWinSetStyle

Specifies an icon window's style.

Takes P_ICON_WIN_STYLE, returns STATUS.

```
#define msgIconWinSetStyle                      MakeMsg(clsIconWin, 3)
```

Message Arguments

```
typedef struct ICON_WIN_STYLE {
    U16 iconType          : 4;  // Use AppWin icon types (see appwin.h).
    U16 propagateIconType : 1;  // True = all icons in win are same type.
    U16 allowOpenInPlace  : 1;  // False= always open floating.
    U16 constrainedLayout : 1;  // True = line up icons in rows & columns.
    U16 showOptions       : 1;  // True = allow option sheet display.
    U16 reserved          : 8;  // Reserved.
} ICON_WIN_STYLE, *P_ICON_WIN_STYLE;
```

MARK.H

clsMark

clsMark inherits from **clsObject.**

clsMark provides a path to interact with data in other, possibly nested, components. It is used by Goto Buttons, Search/Replace, and Spell.

See Also goto.h, sr.h

Overview

PenPoint allows parts of the system, such as search and replace, spell checking and reference buttons, to operate and refer to data in any document or nested embedded documents. This generic reference to data is done with **clsMark**. In order for **clsMark** to work, applications must support the client side of **clsMark**'s protocol and the client side of the various system protocols (which are described elsewhere, specifically in sr.h and goto.h).

What follows describes in more detail how **clsMark** relates to the rest of PenPoint. You may wish to skip ahead to the Example and/or Quick Start sections and refer back to here later.

In PenPoint, the data that make up a document are held in one or more 'components'. Typically these components are descendants of **clsEmbeddedWin**. Alternatively, your descendant of **clsApp** might hold all the data. In either case the individual pieces of data (individual words in a text component, shapes in a drawing component, etc.) are only accessible via the component object. No other object knows how the data is actually stored and the data are not usually accessible as objects outside the component.

There are times, however, when these individual data items need to be manipulated from outside of your application. Goto buttons, for example, allow a user to create a link to such a data item, and later turn back to it. Search & Replace, which is driven by a PenPoint supplied manager, needs to access successive pieces of text in both your application and documents embedded within you.

An instance of **clsMark**, (from now on, simply 'a mark',) is a reference to a data item in a component. We call this data item the 'target' as it is this data item that a Goto button or Search is really interested in, not the component that contains it. The object that uses the mark is called the 'holder' of the mark. A mark may be persistent or temporary. In the former case, once established a mark will remain valid across document shut-downs and re-boots. In the latter, the mark is valid only so long as the component remains active.

In order to support marks a component must create a mapping between the two U32s, or 'token', that a mark holds and its data items. For example, a data base might use this to hold a record number. Remember that the mark might persist beyond a single operation. Therefore, a text editor would NOT use these U32s to be a character position. This is because if a mark is created for a word, and then text is deleted before the word, the desired action is for the mark to still refer to the word which has now moved in character position. Remember: once a mark has been created for a piece of data, there is no way for the component to update the token it has given for it.

An Example

The process of using a mark is best illustrated by the Search & Replace mechanism in PenPoint:

Search/Replace, Spelling, etc. use the mark mechanism to traverse the contents of applications. All applications that allow themselves to be searched, spelled or printed support the component half of this protocol. Implementors of new functionality similar to Search/Replace, Spell, or Print must implement the driver half of the protocol.

When the user selects Find from the Edit menu, the Search Manager responds by displaying an option sheet and by creating a mark which initially points to the document the user is working in.

As the user requests find and replace operations, the Search Manager calls the mark with **msgMarkDeliver** with arguments specifying the **clsSR** messages it wants sent to the component. In turn, the mark sends those messages, along with its own messages to the component and, if requested, each nested component. It is these messages that a client must implement. (The **clsMark** messages are described in this file, the **clsSR** messages are in sr.h.)

After the component performs the request find and/or replace, the status is passed back all the way to the Search Manager which lets the user know. Note that the messages to hilite and select the found text are also passed from the Search Manager to the component this way.

Quick Start

How to be a Client that Supports Marks

1) You must decide how to refer to the data items in the component via tokens. There are several considerations: How will you treat marks that survive save & restore? How will the mark be affected by edit operations? What is the ordering of data items (even if the data items have no intrinsic ordering, you will still need a way to enumerate over them in some serial order)? Do you inherit markable data from your ancestor that you don't take care of.

2) Support the basic messages:

- msgMarkCreateToken
- msgMarkDeleteToken (if necessary)
- msgMarkGetDataAncestor

3) For a component that can be traversed, support the following. These are typically very easy to implement, and all markable components should support them.

- msgMarkPositionAtEdge
- msgMarkPositionAtToken
- msgMarkCompareTokens

4) If the component has a graphical view of the data, support the following. This allow Goto Buttons to work (first three messages) and the Search & Replace and Spell gestures to work (last message).

- msgMarkShowTarget
- msgMarkSelectTarget (if it can hold the selection)
- msgMarkPositionAtSelection (if it can hold the selection)
- msgMarkPositionAtGesture (if it can target gestures to data)

5) If the component has any text as data, support the following. These support the text side of both Search & Replace and Spell. They are also used by reference buttons. See sr.h for a description of these messages.

- msgSRNextChars
- msgSRGetChars
- msgSRPositionChars
- msgSRReplaceChars (if replacement is possible)

6) If your component manages its own embedees, support:

- msgMarkPositionAtChild
- msgMarkNextChild
- msgMarkGetChild

7) If you component is not a descendant of **clsEmbeddedWin** or **clsApp** then it must support the following messages:

- msgMarkGetParent
- msgMarkGetUUIDs

How to be a Driver that Uses Marks

1) Send **msgNewDefaults** and **msgNew** to **clsMark**. This creates the initial mark and sets up the component for the mark.

2) Send the appropriate **msgMarkPosition...** message. This sets the mark at the place where you want it. You are free to define new kinds of positioning messages, so long the components you work with support them. As a back-up, you should always be prepared to deal with **stsMsgNotUnderstood** as a response from a message sent to a component. In that case, do the default action (try **msgMarkPositionAtEdge**).

3) If you need to manipulate the mark, send messages via **msgMarkDeliver**, **msgMarkDeliverPos**, and/or **msgMarkDeliverNext**. These will instruct the component to take the appropriate action on the target and the mark. Again, be prepared to deal with **stsMsgNotUnderstood**. Try to use standardized messages, such as **msgSRNextChars**, when your specific ones fail. Remember: an embedded document may not know the protocol the enclosing document does and vice versa.

4) You can file and unfile the mark as you would with any other object. The mark will remain connected to the target. Note that once a mark has been filed it is now permanent; this will likely consume resources at the component that has the target.

5) Send **msgDestroy** to the mark when you are done with it.

```
#ifndef MARK_INCLUDED
#define MARK_INCLUDED 1
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UUID_INCLUDED
#include <uuid.h>
#endif
#ifndef GWIN_INCLUDED
#include <gwin.h>
#endif
```

Statuses

```
#define stsMarkNoUUIDs              MakeStatus(clsMark, 1)
#define stsMarkRedirectMark         MakeStatus(clsMark, 2)
#define stsMarkNoWin                MakeStatus(clsMark, 3)
#define stsMarkNoComponent          MakeStatus(clsMark, 4)

#define stsMarkComponentsDiffer     MakeWarning(clsMark, 10)
#define stsMarkTokensEqual          MakeWarning(clsMark, 11)
#define stsMarkTokenAfter           MakeWarning(clsMark, 12)
#define stsMarkTokenBefore          MakeWarning(clsMark, 13)

#define stsMarkEnterChild           MakeWarning(clsMark, 20)
#define stsMarkRetry                MakeWarning(clsMark, 21)
#define stsMarkSkipChild            MakeWarning(clsMark, 22)
#define stsMarkNotActive            MakeWarning(clsMark, 23)
```

Common #defines and Types

```
typedef OBJECT      MARK, * P_MARK;

typedef struct MARK_TOKEN {
    CLASS           classLevel;     // which class level is the data at
    U32             index;          // index to the data item
    U32             index2;         // secondary index if needed
} MARK_TOKEN, * P_MARK_TOKEN;

typedef struct MARK_COMPONENT {
    UUID            appUUID;
    UUID            compUUID;
    UID             compUID;
} MARK_COMPONENT, * P_MARK_COMPONENT;
```

MARK_FLAGS

These flags are used when creating a mark. They indicate what kind of mark is to be created.

markDocRelative makes the mark save its component reference relative to OSThisApp. This means that if the mark is saved, and both the document that contains the mark and the document it refers to are copied in a single operation, the new set will refer to within itself correctly. This is what goto buttons do.

markForSelection automatically positions the mark at the selection, including finding out who the selection holding component is. If you set this, then you don't need to set any other fields in the new struct.

markAlwaysDelete once a mark has been saved, it remembers that it can never delete the token because it has no idea how many copies of the file it was saved in have been made. This flag forces marks to always delete the token no matter what. If you manage the reference of this mark and you can guarantee that what ever happens to the saved mark happens to the component it refers to, then set this flag.

markRelaxActivate this keeps a mark from activating the component on entering and exiting. If the component isn't active on entering, it will be skipped if possible or it will be referred to in its entirety. If the component is not active on exiting, then it will miss the delete token message. Note that this can cause resource leaks at the expense of keeping the UI snappy. This takes precedence over **markAlwaysDelete**.

```
typedef U32 MARK_FLAGS, * P_MARK_FLAGS;
#define markDocRelative     flag1       // if saved, document relative
#define markForSelection    flag2       // make mark for the selection
#define markAlwaysDelete    flag3       // if you manage the destination
#define markRelaxActivate   flag4       // don't always activate
typedef U16 MARK_MSG_FLAGS, * P_MARK_MSG_FLAGS;
```

These flags are only valid with **msgMarkDeliverPos** & **msgMarkDeliverNext**

```
#define markMsgNormal   0       // standard message send
#define markMsgTry      1       // one in a sequence of possible messages
#define markMsgLastTry  2       // last in a sequence of messages
#define markMsgMode     3       // '&' with flags to extract flag field
```

These flags are only valid with **msgMarkDeliverNext**

```
#define markBackward    flag8           // direction of movement is reversed
#define markEnterNone   0               // enter no children
#define markEnterAll    flag9           // enter all children
#define markEnterOpen   flag10          // enter only open children
#define markEnterMode   (flag9|flag10)  // '&' with flags to extract Enter
                                        // field
#define markExitUp      flag11          // at end, move up to parents
// default flag settings:
#define markDefaultMsgFlags         0
#define markDefaultPosMsgFlags      markMsgNormal
#define markDefaultNextMsgFlags     \
    (markMsgNormal | markEnterOpen | markExitUp)
```

MARK_MSG_HEADER must be the start of the argument structure for any message delivered via **msgMarkDeliver**, **msgMarkDeliverPos**, or **msgMarkDeliverNext**. It allows **clsMark** to insert the token information into the message arguments to indicate which part of the component is to be operated on.

```
typedef struct MARK_MSG_HEADER {
    MARK_TOKEN      token;      // Supplied by mark: the token
    MESSAGE         msg;        // In: the message to send
    SIZEOF          lenArgs;    // In: length of the whole structure
    MARK_MSG_FLAGS  flags;      // In: flags as appropriate
} MARK_MSG_HEADER, * P_MARK_MSG_HEADER;
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
typedef U16 MARK_LOCATION;
#define markLocWhole        0
#define markLocBeginning    1
#define markLocEnd          2
```

The following location codes are only valid for **msgMarkPositionAtGesture** These may be or'd together and in with the above codes...

```
#define markLocWholeWord    flag4   // use the whole word under the gesture
#define markLocUseSelection flag5   // use the selection if the gesture was
                                    // over it
```

Important: all message handlers for messages sent via **msgMarkDeliver**, **msgMarkDeliverPos**, or **msgMarkDeliverNext**, must have the following as its first statement. Replace "clsYourClassHere" with the uid of your class.

```
    MarkHandlerForClass(clsYourClassHere);
#define MarkHandlerForClass(cls)    \
    if (WKNValue(((P_MARK_TOKEN)pArgs)->classLevel) != WKNValue(cls)) \
        return ObjectCallAncestor(msg, self, pArgs, ctx);
```

Messages

msgNew

Creates a new mark, initialized to the given component (if any).

Takes P_MARK_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct MARK_NEW_ONLY {
    MARK_FLAGS      flags;
    MARK_COMPONENT  component;
    U16             reserved[2];
} MARK_NEW_ONLY, * P_MARK_NEW_ONLY;
#define markNewFields       \
    objectNewFields         \
    MARK_NEW_ONLY       mark;
typedef struct MARK_NEW {
    markNewFields
} MARK_NEW, * P_MARK_NEW;
```

The fields you might typically set are pArgs->mark.flags: or in **markForSelection** to refer to the selection object, or in **markDocRelative** if you ever plan on saving the mark object **pArgs**->mark.component.**compUID**: the object to refer to (not needed if you set **markForSelection** above)

msgNewDefaults

Initializes the MARK_NEW structure to default values.

Takes P_MARK_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct MARK_NEW {
    markNewFields
} MARK_NEW, * P_MARK_NEW;
```

Comments

Zeroes out **pNew**->mark. Specifically, this includes:

```
MakeNilUUID(pArgs->mark.component.appUUID);
MakeNilUUID(pArgs->mark.component.compUUID);
pArgs->mark.component.compUID = objNull;
```

msgMarkDeliver

Delivers a message to the target that does not move the token.

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkDeliver          MakeMsg(clsMark, 1)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

Comments

The message in **pArgs**->header.msg is sent to the component after the mark fills in the token field. Note that the **pArgs** for the sent message are the same as the **pArgs** that are passed in to **msgMarkDeliver**. Various messages that are sent to components have extra fields tacked on to this structure. Therefore, all messages delivered with **msgMarkDeliver** MUST have a **pArgs** structure that starts with same fields as MARK_DELIVER. Furthermore, the **lenArgs** field must be set to the size of the WHOLE structure.

msgMarkDeliverPos

Delivers a message to the target that moves the token but does not change the component.

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkDeliverPos       MakeMsg(clsMark, 2)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

Comments

This is just like **msgMarkDeliver**, only it is used to deliver a message that will potentially reposition the mark elsewhere in the component. It is chiefly used with the **msgMarkPosition...** messages.

The additional flags argument is used to determine how the holder wants to interpret the response from the client. Normally you use **markMsgNormal**, which automatically deals with certain client response codes that the holder doesn't need to be aware of.

For example, if a holder wants to use **msgMarkPositionAtEdge** the code would be:

```
MARK_POSITION_EDGE      edgeArgs;

edgeArgs.msg        = msgMarkPositionAtEdge;
edgeArgs.lenArgs    = SizeOf(MARK_POSITION_EDGE);
edgeArgs.flags      = markMsgNormal;
edgeArgs.location   = markLocBeginning;
ObjCallRet(msgMarkDeliverPos, aMark, &edgeArgs);
```

However, if the holder wishes to try a different positioning message if the first one fails, then the holder must use the flag setting **markMsgTry** on all except the last message which uses **markMsgLastTry**. Furthermore, these must be in a while loop and repeated if **stsMarkRetry** is ever returned.

For example, if a holder would like to use the (hypothetical) message **msgPositionAtVowel**, and if that fails use **msgPositionAtLetter**, and if that fails try **msgPositionAtCharacter**; then it the code would be:

```
POS_VOWEL       posVowel;
POS_LETTER      posLetter;
POS_CHAR        posChar;
STATUS          s;
while (true) {
    posVowel.msg        = msgPositionAtVowel;
    posVowel.lenArgs    = SizeOf(POS_VOWEL);
    posVowel.flags      = markMsgTry;
    posVowel. ...       = ...               // other arguments
    s = ObjectCall(msgMarkDeliverPos, aMark, &posVowel);
    if (s == stsMarkRetry) continue;
    if (s != stsMsgNotUnderstood) break;    // some error occurred
    posLetter.msg       = msgPositionAtLetter;
    posLetter.lenArgs   = SizeOf(POS_LETTER);
    posLetter.flags     = markMsgTry;
    posLetter. ...      = ...               // other arguments
    s = ObjectCall(msgMarkDeliverPos, aMark, &posLetter);
    if (s == stsMarkRetry) continue;
    if (s != stsMsgNotUnderstood) break;    // some error occurred
    posChar.msg         = msgPositionAtCharacter;
    posChar.lenArgs     = SizeOf(POS_CHAR);
    posChar.flags       = markMsgLastTry;
    posChar. ...        = ...               // other arguments
    s = ObjectCall(msgMarkDeliverPos, aMark, &posChar);
    if (s == stsMarkRetry) continue;
    if (s != stsMsgNotUnderstood) break;    // some error occurred
    //do what you do if none were understood
}
```

While this code is a little complicated, it allows the holder to deal with a variety of components that may know different messages. The while loop and **stsMarkRetry** are necessary for the handling of inherited component data and behavior. (Specifically, while the mark takes care of most of the chore of moving from level to level in a components class hierarchy, only the holder knows the sequence of messages to try at each level, so the **stsMarkRetry** acts as a sentinel to the holder to retry the full sequence again.)

msgMarkDeliverNext

Delivers a message to the target that moves the token and sometimes (but not always) changes the component.

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkDeliverNext      MakeMsg(clsMark, 3)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

Comments

This is the same as **msgMarkDeliverPos**, only it is used when the repositioning of the token may result moving to a new component. This may happen in messages like **msgSRNextChars** where the next string to search is in an embedded component.

The flags field is used the same way as in **msgMarkDeliverPos**. The flags field also carries some additional flags: These indicate which direction the movement is in, and what to do about embedded components and what to do at the end of a component.

All components that respond to messages sent via **msgMarkDeliverNext** are responsible for two things:

-: They must check the **markBackward** flag to determine the direction of motion.

-: If they encounter a child window as the next item, regardless of what the message is looking for, then the token needs to be set to refer to that child and **stsMarkEnterChild** needs to be returned.

msgMarkSend

Sends a message to a component with no further processing.

Takes P_MARK_SEND, returns STATUS.

```
#define msgMarkSend             MakeMsg(clsMark, 9)
```

Arguments

```
typedef struct MARK_SEND {
    MESSAGE         msg;        // the message to send
    P_ARGS          pArgs;      // pointer to the arguments
    SIZEOF          lenArgs;    // length of those arguments
} MARK_SEND, * P_MARK_SEND;
```

Comments

Sends a message to the component. Note that this allows you to send any arbitrary message. However, unlike the **msgMarkDeliver** messages, **msgMarkSend** doesn't copy the token value of the mark into the argument structure passed to the component. Hence, no indication of what the target is goes with the message. This is rarely what you want.

The rule is: any message designed to be used with marks should use one of the **msgMarkDeliver** forms. Any message NOT designed to work with marks (and thus has no specific target) should use **msgMarkSend**.

msgMarkSetComponent

Sets the mark to refer to the given component.

Takes P_MARK_COMPONENT, returns STATUS.

```
#define msgMarkSetComponent     MakeMsg(clsMark, 4)
```

Message Arguments

```
typedef struct MARK_COMPONENT {
    UUID            appUUID;
    UUID            compUUID;
    UID             compUID;
} MARK_COMPONENT, * P_MARK_COMPONENT;
```

Comments

You set the fields of the MARK_COMPONENT one of three ways (zeroing the unused fields):

- Set **pArgs**->compUID to refer to a specific component object
- Set **pArgs**->appUUID to refer to an application object by UUID
- Set **pArgs**->appUUID and **pArgs**->compUUID to refer to a component in an application by UUIDs

This will delete the previous mark, if necessary and send a **msgMarkCreateToken** to the new component.

To make the mark point at nothing, pass it a pointer to an all-zero structure; do NOT pass it a null pointer!

msgMarkGetComponent

Returns the UUID of the app the contains the token and the UUID and UID of the component that contain the token.

Takes P_MARK_COMPONENT, returns STATUS.

```
#define msgMarkGetComponent     MakeMsg(clsMark, 5)
```

Message Arguments

```
typedef struct MARK_COMPONENT {
    UUID            appUUID;
    UUID            compUUID;
    UID             compUID;
} MARK_COMPONENT, * P_MARK_COMPONENT;
```

Comments

If the app is not open, then **pArgs**->compUID will be **objNull**. If the target is in the app object, then **pArgs**->compUUID will be zeros.

msgMarkCompareMarks

Determines if two marks refer to the same component, and, if so, what order their targets are in.

Takes MARK, returns STATUS.

```
#define msgMarkCompareMarks     MakeMsg(clsMark, 6)
```

Return Value

stsMarkTokensEqual the targets of the marks are the same

stsMarkTokenAfter the target of the receiver is after the argument

stsMarkTokenBefore the target of the receiver is before the argument

msgMarkCopyMark

Creates a new mark, identical to this mark.

Takes P_MARK, returns STATUS.

```
#define msgMarkCopyMark          MakeMsg(clsMark, 7)
```

Comments

Because marks can't easily reverse direction across components, it's sometimes desirable to save the original position. Since the duplicate mark is independent of the original, it doesn't move when the original does.

msgMarkGotoMark

Causes a mark to be selected and displayed to the user.

Takes P_MARK_GOTO, returns STATUS.

```
#define msgMarkGotoMark          MakeMsg(clsMark, 8)
```

Arguments

```
typedef struct MARK_GOTO {
    BOOLEAN noSelect    : 1,    //inhibits the selection of the target
            noDisplay   : 1,    //inhibits the display of the target
            turnTo      : 1,    //if closed, will do a turn to
            bringTo     : 1,    //if closed, will do a bring to
            reserved    : 12;
} MARK_GOTO, * P_MARK_GOTO;
```

Comments

By default, the target is selected and scrolled on screen, provided the document is on screen. Optionally, the document can be activated and either turned to or floated on screen.

Messages Sent to Components

Important: message handlers for the first three messages (**msgMarkCreateToken**, **msgMarkDeleteToken**, and **msgMarkCompareTokens**) must have the following as its first statement. Replace "clsYourClassHere" with the uid of your class.

```
MarkHandlerForClass(clsYourClassHere);
```

msgMarkCreateToken

Instructs a component to create a token for its data items, and start the token pointing at before all data items.

Takes P_MARK_TOKEN, returns STATUS.

```
#define msgMarkCreateToken          MakeMsg(clsMark, 40)
```

Message Arguments

```
typedef struct MARK_TOKEN {
    CLASS           classLevel;     // which class level is the data at
    U32             index;          // index to the data item
    U32             index2;         // secondary index if needed
} MARK_TOKEN, * P_MARK_TOKEN;
```

Comments

You can only forget about the token associated with a mark when a corresponding **msgMarkDeleteToken** is received, or the target data is deleted. In the later case you must be careful never to generate that token again as there still might be outstanding tokens for it.

msgMarkDeleteToken

Tells a component that the given token will no longer be in use.

Takes P_MARK_TOKEN, returns STATUS.

```
#define msgMarkDeleteToken          MakeMsg(clsMark, 41)
```

Message Arguments

```
typedef struct MARK_TOKEN {
    CLASS           classLevel;     // which class level is the data at
    U32             index;          // index to the data item
    U32             index2;         // secondary index if needed
} MARK_TOKEN, * P_MARK_TOKEN;
```

Comments

See **msgMarkCreateToken**.

msgMarkCompareTokens

Asks a component to compare the ordering of two tokens.

Takes P_MARK_COMPARE_TOKENS, returns STATUS.

```
#define msgMarkCompareTokens        MakeMsg(clsMark, 42)
```

Arguments

```
typedef struct MARK_COMPARE_TOKENS {
    MARK_TOKEN      firstToken;
    MARK_TOKEN      secondToken;
} MARK_COMPARE_TOKENS, * P_MARK_COMPARE_TOKENS;
```

Return Value

stsMarkTokensEqual the two tokens point to the same place

stsMarkTokenAfter the first token comes after the second

stsMarkTokenBefore the first token comes before the second

msgMarkGetDataAncestor

Asks for the next higher superclass that contains traversable data.

Takes P_CLASS, returns STATUS.

```
#define msgMarkGetDataAncestor          MakeMsg(clsMark, 46)
```

Comments

Asks a component what the next ancestor the argument inherits data from. The component's response should is based on what the argument is. Assuming the class of the component is **clsMyThing**:

objNull respond with **clsMyThing**

clsMyThing respond with the next class **clsMyThing** gets data from, typically **clsEmbeddedWin** or **objNull** (if none).

otherwise call the ancestor

Example

```
if      (*pArgs == objNull)     *pArgs = clsMyThing;
else if (*pArgs == clsMyThing)  *pArgs = clsEmbeddedWin;
else                            ObjCallAncestorCtxRet(ctx);
return stsOK;
```

If your code doesn't inherit data then you'll do the following:

```
if      (*pArgs == objNull)     *pArgs = clsMyThing;
else                            *pArgs = objNull;
return stsOK;
```

msgMarkGetParent

Asks a component to set the argument to its parent (embedding) component.

Takes P_MARK_COMPONENT, returns STATUS.

```
#define msgMarkGetParent            MakeMsg(clsMark, 43)
```

Message Arguments

```
typedef struct MARK_COMPONENT {
    UUID            appUUID;
    UUID            compUUID;
    UID             compUID;
} MARK_COMPONENT, * P_MARK_COMPONENT;
```

Comments

Either the UID or the UUIDs should be filled in, mark will take care of the rest. If the component is descended from **clsEmbeddedWin** or **clsApp**, it already inherits the correct response and implementation is necessary.

msgMarkGetUUIDs

Asks a component to set the argument to its own app and component UUIDs if it can.

Takes P_MARK_COMPONENT, returns STATUS.

```
#define msgMarkGetUUIDs             MakeMsg(clsMark, 45)
```

Message Arguments

```
typedef struct MARK_COMPONENT {
    UUID            appUUID;
    UUID            compUUID;
    UID             compUID;
} MARK_COMPONENT, * P_MARK_COMPONENT;
```

Comments

If it can't it should return **stsMarkNoUUIDs**. If your component is a descendant of **clsApp** or **clsEmbeddedWin** then you inherit the correct implementation.

msgMarkValidateComponent

Asks a component to verify that it is okay to traverse it.

Takes P_MARK_COMPONENT, returns STATUS.

```
#define msgMarkValidateComponent    MakeMsg(clsMark, 44)
```

Message Arguments

```
typedef struct MARK_COMPONENT {
    UUID            appUUID;
    UUID            compUUID;
    UID             compUID;
} MARK_COMPONENT, * P_MARK_COMPONENT;
```

Comments

This message is sent to objects before a mark refers to them. This gives an object a chance to point the mark at a different object as the component. Typically, a driver might create a mark with the selection holder as the component. However, the selection holder might not be the desired component for a mark (the selection could be a data object, but the mark component should be the app object). Mark sends this message to the proposed component. The proposed component then can either not implement the message (or return **stsOK**) or set the argument to another component object and return **stsMarkRedirectMark**. In the first case the proposed component becomes the used component, in the second the returned component becomes the new proposed component.

Messages Sent to Components via msgMarkDeliver

Note: As these are defined in **clsMark**, these messages may be sent to the mark directly without using **msgMarkDeliver**, **msgMarkDeliverPos**, or **msgMarkDeliverNext** (with mode = **markMsgNormal**) as appropriate. As usual, the mark and token fields will be filled in by the mark, and then the message passed on.

In addition special processing will be done for some of the messages which would NOT be done if the message was sent via standard delivery messages. This processing is noted for those messages under the heading: 'If sent directly to mark'

Important: all message handlers for these messages must have the following as its first statement. Replace "clsYourClassHere" with the uid of your class.

```
MarkHandlerForClass(clsYourClassHere);
```

msgMarkPositionAtEdge

Asks a component to reposition the token to one end or the other of the data.

Takes P_MARK_POSITION_EDGE, returns STATUS.

```
#define msgMarkPositionAtEdge   MakeMsg(clsMark, 80)
```

Arguments

```
typedef struct MARK_POSITION_EDGE {
    MARK_MSG_HEADER header;
    MARK_LOCATION   location;       // either markLocBeginning or markLocEnd
} MARK_POSITION_EDGE, * P_MARK_POSITION_EDGE;
```

msgMarkPositionAtToken

Asks a component to reposition the token to the same position as another token for the same component.

Takes P_MARK_POSITION_TOKEN, returns STATUS.

```
#define msgMarkPositionAtToken  MakeMsg(clsMark, 81)
```

Arguments

```
typedef struct MARK_POSITION_TOKEN {
    MARK_MSG_HEADER header;
    MARK            otherMark;      // In; the other mark
    MARK_TOKEN      otherToken;     // In: the token to copy
} MARK_POSITION_TOKEN, * P_MARK_POSITION_TOKEN;
```

Comments

If sent directly to mark: you only need to fill in the **otherMark** field, the mark will take care of the rest & will check to see that both marks point at the same component. Since you'd have no idea what the other Token is, this is the only sensible way to send this message (via **msgMarkDeliver** won't work).

msgMarkPositionAtChild

Asks a component to reposition the token to the given child component which is given as a UUID/UID pair.

Takes P_MARK_POSITION_CHILD, returns STATUS.

```
#define msgMarkPositionAtChild  MakeMsg(clsMark, 82)
```

Arguments

```
typedef struct MARK_POSITION_CHILD {
    MARK_MSG_HEADER header;
    MARK_COMPONENT  child;      // In: the child to position to;
} MARK_POSITION_CHILD, * P_MARK_POSITION_CHILD;
```

Comments

The UID may be null if it is unknown, but the UUID will always be valid.

msgMarkPositionAtGesture

Asks a component to reposition the token at the given gesture.

Takes P_MARK_POSITION_GESTURE, returns STATUS.

```
#define msgMarkPositionAtGesture    MakeMsg(clsMark, 83)
```

Arguments

```
typedef struct MARK_POSITION_GESTURE {
    MARK_MSG_HEADER header;
    GWIN_GESTURE    gesture;
    MARK_LOCATION   location;
} MARK_POSITION_GESTURE, * P_MARK_POSITION_GESTURE;
```

Comments

The location parameter indicates how to position relative to the gesture. Note that there are a variety of location codes that might be or'd together.

msgMarkPositionAtSelection

Asks a component to reposition the token to the selection, which it presumably owns.

Takes P_MARK_POSITION_SELECTION, returns STATUS.

```
#define msgMarkPositionAtSelection  MakeMsg(clsMark, 85)
```

Arguments

```
typedef struct MARK_POSITION_SELECTION {
    MARK_MSG_HEADER header;
    MARK_LOCATION   location;
} MARK_POSITION_SELECTION, * P_MARK_POSITION_SELECTION;
```

Comments

If the component doesn't own the selection, then return **stsFailed**.

msgMarkNextChild

Requests the component to move the token to the next child.

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkNextChild        MakeMsg(clsMark, 86)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

Comments

If a child is found and the token moved to it, return **stsMarkEnterChild**, not **stsOK**. If return, the mark is likely (but may not) send **msgMarkGetChild** to find out who the child actually is.

msgMarkGetChild

Requests the component to fill in the component at the current token.

Takes P_MARK_GET_CHILD, returns STATUS.

```
#define msgMarkGetChild         MakeMsg(clsMark, 90)
```

Arguments

```
typedef struct MARK_GET_CHILD {
    MARK_MSG_HEADER header;
    MARK_COMPONENT  child;          //Out: fill in uid or uuids
    BOOLEAN         childIsDoc;     //Out: is the child is a document?
    BOOLEAN         childIsOpen;    //Out: is the child open?
} MARK_GET_CHILD, * P_MARK_GET_CHILD;
```

Comments

This is sent because, presumable, the response to some other move message was **stsMarkEnterChild**. If the token doesn't point at a child, return **stsFailed**.

pArgs->childIsDoc should set true if the child is an embedded document. If the child is just an embedded component that is to be considered part of the receiving component, then set this field false. This field is used by **clsMark** to determine if it should apply the **markEnterMode** bits that control entering embedded documents (they don't control entering embedded components, this is always done.)

If **pArgs**->childIsDoc is set true, then **childIsOpen** must be set to reflect the "open" status of the embedded doc.

If your component is managing its own embedees, typically your component will only deal with the embedded instances of **clsAppWin**. These are components that are part of your component: you should set **pArgs**->childIsDoc to false (**pArgs**->childIsOpen doesn't matter in this case). When the **appWin** is entered, it will handle the proper reporting of the embedded document. (**clsAppWin** sets **pArgs**->childIsDoc to true and **pArgs**->childIsOpen appropriately.)

msgMarkSelectTarget

Requests the component to select the target data item.

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkSelectTarget     MakeMsg(clsMark, 89)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

msgMarkShowTarget

Request the component to return the window that contains the graphical view of the target.

```
Takes P_MARK_SHOW_TARGET, returns STATUS.
#define msgMarkShowTarget           MakeMsg(clsMark, 88)
```

Arguments

```
typedef struct MARK_SHOW_TARGET {
    MARK_MSG_HEADER header;
    WIN             win;
    RECT32          rect;
} MARK_SHOW_TARGET, * P_MARK_SHOW_TARGET;
```

Comments

The rectangle returned is the area within the window that encloses the target.

Some components may not have a viewable representations of the target, in which case they can return **stsMarkNoWin**, or simply not implement this message. Other components may have a graphical view only part of the time. In this case, it should ensure that the target has a graphical representation, otherwise return **stsMarkNoWin** if the target isn't right now.

Note that this message requests that the target be scrolled into view. That should be done by sending **msgEmbeddedWinShowChild** to the win showing the target (usually the win that is returned in **pArgs**->win).

Messages Sent Internally

msgMarkEnterChild

Sent when a component requests the mark to enter a child (usually via returning **stsMarkEnterChild** to a message send with **msgMarkDeliverNext**).

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkEnterChild       MakeMsg(clsMark, 120)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

Comments

This message sends **msgMarkGetChild** to the component to get the child at the token and then enters the child if appropriate.

msgMarkEnterLevel

Sent when a component requests the mark to bump up a level in its class chain, or when a position or next message fails and the mark tries the next class level.

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkEnterLevel       MakeMsg(clsMark, 121)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

Comments

This message sends **msgMarkGetDataAncestor** to the component and resets the token.

msgMarkEnterParent

Sent when a component runs out of data altogether and the mark needs to move on (and up).

Takes P_MARK_MESSAGE, returns STATUS.

```
#define msgMarkEnterParent      MakeMsg(clsMark, 122)
```

Message Arguments

```
typedef struct MARK_MESSAGE {
    MARK_MSG_HEADER header;
} MARK_MESSAGE, * P_MARK_MESSAGE;
```

Comments

This message may send **msgMarkGetParent** to the component to find out who the parent is.

msgMarkGetToken

Sent from one mark to another to get the other's token.

Takes P_MARK_TOKEN, returns STATUS.

```
#define msgMarkGetToken         MakeMsg(clsMark, 123)
```

Message Arguments

```
typedef struct MARK_TOKEN {
    CLASS           classLevel;     // which class level is the data at
    U32             index;          // index to the data item
    U32             index2;         // secondary index if needed
} MARK_TOKEN, * P_MARK_TOKEN;
```

Comments

This is not intended to be used by clients of mark.

PRFRAME.H

This file contains the API for **clsPrintFrame.**

clsPrFrame inherits from **clsCustomLayout.**

Provides the page outline during printing.

```
#ifndef PRFRAME_INCLUDED
#define PRFRAME_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef PRINT_INCLUDED
#include <print.h>
#endif
```

Common #defines and typedefs

Window Tags for Child Windows

```
#define tagPrFrameLeftHeader          MakeTag(clsPrFrame, 255)
#define tagPrFrameCenterHeader        MakeTag(clsPrFrame, 254)
#define tagPrFrameRightHeader         MakeTag(clsPrFrame, 253)
#define tagPrFrameLeftFooter          MakeTag(clsPrFrame, 252)
#define tagPrFrameCenterFooter        MakeTag(clsPrFrame, 251)
#define tagPrFrameRightFooter         MakeTag(clsPrFrame, 250)
#define tagPrFrameMarginWin           MakeTag(clsPrFrame, 249)
#ifndef NO_NEW
#ifndef prFrameNewFields
#include <clayout.h>
```

Messages

msgNewDefaults

Initializes the PRFRAME_NEW_ONLY structure to default values.

Takes P_PRFRAME_NEW, returns STATUS. Category: class message.

```
typedef PRINT_SETUP PRFRAME_NEW_ONLY, *P_PRFRAME_NEW_ONLY;
#define prFrameNewFields            \
    customLayoutNewFields           \
    PRFRAME_NEW_ONLY prFrame;
```

Arguments

```
typedef struct PRFRAME_NEW {
    prFrameNewFields
} PRFRAME_NEW, *P_PRFRAME_NEW;
```

msgNewDefaults

Initializes the default new arguments.

Takes P_PRFRAME_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct PRFRAME_NEW {
    prFrameNewFields
} PRFRAME_NEW, *P_PRFRAME_NEW;
```

Comments

no header or footer text
headerMargin.top = 500 Mils
headerMargin.left = 750 Mils
headerMargin.right = 750 Mils
headerMargin.bottom = 0 Mils
footerMargin.top = 0 Mils
footerMargin.left = 750 Mils
footerMargin.right = 750 Mils
footerMargin.bottom = 500 Mils
mainMargin.top = 750 Mils
mainMargin.left = 750 Mils
mainMargin.right = 750 Mils
mainMargin.bottom = 750 Mils

msgNew

Creates a new print frame object.

Takes P_PRFRAME_NEW, returns STATUS. Category: class message.

```
#endif
#endif
```

Message Arguments

```
typedef struct PRFRAME_NEW {
    prFrameNewFields
} PRFRAME_NEW, *P_PRFRAME_NEW;
```

msgPrFrameSend

Sends the tagged window the message.

Takes P_PRFRAME_SEND, returns STATUS.

Arguments

```
typedef struct PRFRAME_SEND {
    U32 tag;                // window tag
    MESSAGE msg;            // message to send
    P_ARGS pArgs;           // arguments to pass
    SIZEOF lenSend;         // argument length
} PRFRAME_SEND, *P_PRFRAME_SEND;
#define msgPrFrameSend          MakeMsg(clsPrFrame, 1)
```

msgPrFrameSetup

Sets the print frame values/fields to the setup information.

Takes P_PRINT_SETUP, returns STATUS.

```
#define msgPrFrameSetup         MakeMsg(clsPrFrame, 2)
```

msgPrFrameExpand

Expand any abbreviated labels for the current page/date/doc name.

Takes P_PRFRAME_EXPAND, returns STATUS.

Arguments

```
typedef struct PRFRAME_EXPAND {
    char page[nameBufLength];   // printing page number (pg.)
    char date[nameBufLength];   // date string (dt.)
    char name[nameBufLength];   // doc name (nm.)
    char reserved[nameBufLength];
} PRFRAME_EXPAND, *P_PRFRAME_EXPAND;
#define msgPrFrameExpand        MakeMsg(clsPrFrame, 3)
```

PRINT.H

This file contains the API for **clsPrint**.

clsPrint inherits from **clsApp**.

Provides a wrapper to guide PenPoint documents through the printing process.

To print a document, the Application Framework creates a wrapper document (an instance of **clsPrint**) that embeds the document to be printed in itself. To print the document, the wrapper first opens the document to the printer (rather than to the screen). The wrapper then uses and instance of **clsPrLayout** to send printing-related messages to the document and any of its embedded documents.

Developers: You should not subclass **clsPrint**. However, to support printing, your application needs to handle many of the messages defined by **clsPrint**.

Pagination

There are two basic styles of pagination: flow and nonflow. The printing wrapper sends **msgPrintGetProtocols** to a document to ask it what style of pagination it supports.

For more information on pagination, please refer to the chapter on Printing in the PenPoint Architectural Reference.

Option Cards for Printing

The Application Framework provides a Print Setup option sheet, which allows the user to change margins and the running headers and footers that are printed with a document.

If your application has other printing options that you want the user to change, you should add your option cards to the Print Setup sheet. To do so, your application should handle **msgAppAddCards** and should add your cards when the tag passed in is **tagAppPrintSetupOptSheet**.

```
#ifndef PRINT_INCLUDED
#define PRINT_INCLUDED
#ifndef UUID_INCLUDED
#include <uuid.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
#ifndef SYSFONT_INCLUDED
#include <sysfont.h>
#endif
#ifndef WIN_INCLUDED
#include <win.h>
#endif
#ifndef EMBEDWIN_INCLUDED
#include <embedwin.h>
#endif
```

Common #defines and typedefs

Status Codes

```
#define stsPrintErrorCheckPrinter   MakeStatus(clsPrint, 1)
```

Print Option Sheet Tags

```
#define tagPrJobDialog              MakeTag(clsPrint, 255)
#define tagPrOption                 MakeTag(clsPrint, 254)
#define tagPrPrinterLabel           MakeTag(clsPrint, 253)
#define tagPrEnabledLabel           MakeTag(clsPrint, 252)
#define tagPrPaperSizeLabel         MakeTag(clsPrint, 251)
#define tagPrPagesLabel             MakeTag(clsPrint, 250)
#define tagPrStartingPageLabel      MakeTag(clsPrint, 249)
#define tagPrPrinter                MakeTag(clsPrint, 128)
#define tagPrStatus                 MakeTag(clsPrint, 140)
#define tagPrEnabledOn              MakeTag(clsPrint, 141)
#define tagPrEnabledOff             MakeTag(clsPrint, 142)
#define tagPrPages                  MakeTag(clsPrint, 129)
#define tagPrPagesAll               MakeTag(clsPrint, 160)
#define tagPrPagesRange             MakeTag(clsPrint, 161)
#define tagPrPagesFrom              MakeTag(clsPrint, 162)
#define tagPrPagesTo                MakeTag(clsPrint, 163)
#define tagPrPaperSize              MakeTag(clsPrint, 131)
#define tagPrPaperWidth             MakeTag(clsPrint, 174)
#define tagPrPaperHeight            MakeTag(clsPrint, 175)
#define tagPrStartingPage           MakeTag(clsPrint, 132)
```

Print Margins

This structure contains the margin offsets (in Mils) measured from the top, bottom, left, and right edges of the paper.

```
typedef struct PRINT_MARGINS {
    S32     top;                    // offset for top margin
    S32     bottom;                 // offset for bottom margin
    S32     left;                   // offset for left margin
    S32     right;                  // offset for right margin
} PRINT_MARGINS, *P_PRINT_MARGINS;
```

Header and Footer Strings

This structure contains the strings for either a header or a footer.

```
typedef struct PRINT_HFDATA {
    U8      reserved;               // reserved - must be 0
    char    leftData[nameBufLength];    // string on left side
    char    centerData[nameBufLength];  // string in center
    char    rightData[nameBufLength];   // string on right side
} PRINT_HFDATA,  *P_PRINT_HFDATA;
```

Print Setup

This structure contains setup information for printing.

```
typedef struct PRINT_SETUP {
    OBJECT          frame;          // reserved
    PRINT_MARGINS   mainMargins;    // print margins for the document
    PRINT_MARGINS   headerMargins;  // print margins for the header
    PRINT_MARGINS   footerMargins;  // print margins for the footer
    PRINT_HFDATA    headerInfo;     // strings to display in the header
    PRINT_HFDATA    footerInfo;     // strings to display in the footer
    SYSDC_FONT_SPEC fontSpec;       // header/footer font data
    U16             fontSize;       // header/footer font size, in points
} PRINT_SETUP, *P_PRINT_SETUP;
```

Embeddee Print Info

Users can decide:

- to not print an embedded document;
- to print the visible portion of an embedded document in the place in the parent document where it is embedded;
- to print the entire embedded document at the end of the parent.

This structure contains information for printing embedded documents. Note: **expandInPlace** and **printBorders** are not currently implemented.

```
typedef struct EMBEDDEE_PRINT_INFO {
    U16 expandInPlace    : 1;    // TRUE to print entire contents in place
    U16 expandAtEnd      : 1;    // TRUE to print entire contents at end
                                 // FALSE to print visible portion in place
    U16 invisible        : 1;    // TRUE to not print
    U16 printBorders     : 1;    // TRUE to show borders around the window
    U16 reserved         : 12;   // reserved
    U16 reserved2        : 16;   // reserved
} EMBEDDEE_PRINT_INFO, *P_EMBEDDEE_PRINT_INFO;
```

Spool mode values

Note: Spooling is not implemented.

```
#define prModeCopy          0       // to copy the doc for spooling
#define prModeLock          1       // to lock the doc for spooling
```

Print Metrics

This structure defines the public instance data that **clsPrint** maintains for a document. You get a copy of this structure when you send **msgPrintGetMetrics** to a document.

```
typedef struct PRINT_METRICS {
    U32     reserved1;          // reserved
    U16     pageRangeStart;     // start page # (not used if pageAll is TRUE)
    U16     pageRangeEnd;       // end page # (not used if pageAll is TRUE)
    U16     startingPage;       // starting page # (to be printed on pages)
    U16     copies;             // not used
    U16     collating:      2;  // not used
    U16     orientation:    2;  // either prOrientPortraitNormal or
                                // pdOrientLandscapeNormal (see win.h)
    U16     pageAll:        1;  // TRUE to print all pages
    U16     spoolMode:      2;  // see spool mode values
    U16     firstPageHeader:1;  // TRUE to enable first page headers
    U16     reserved2:      8;  // reserved
    U8      paperSizeType;      // Popular paper type (see clsPrn.h)
    SIZE32  paperSize;          // Size of paper in Mils
    PRINT_SETUP firstPageSetup;         // not used
    PRINT_SETUP pageSetup;              // page setup information
    char        printer[nameBufLength]; // name of printer to use
    EMBEDDEE_PRINT_INFO embedding;      // how to print embedded documents
    U32         reservedData[6];        // reserved
} PRINT_METRICS, *P_PRINT_METRICS;
```

Print Embeddee Action

This structure is used by **msgPrintEmbeddeeAction** and **msgPrintExamineEmbeddee** to pass information about the child being processed.

```
typedef struct PRINT_EMBEDDEE_ACTION {
    WIN                 embeddedWin;        // embedded win to act on
    U16                 action;             // proposed embeddee action flag
    EMBEDDEE_PRINT_INFO embedPrintInfo;     // embeddee print properties
    U32                 reserved[3];        // reserved
} PRINT_EMBEDDEE_ACTION, *P_PRINT_EMBEDDEE_ACTION;
```

Embeddee Action Flags

```
#define prEmbedActionAsIs           0   // visible part printed in place (default)
#define prEmbedActionExpandInPlace  1   // not supported
#define prEmbedActionExtract        2   // invisible or moved to end; either
                                        // way, child removed from parent
```

Print Page

This structure is used by **msgPrintStartPage** and **msgPrintLayoutPage** to pass information about what page needs to be printed next.

```
typedef struct PRINT_PAGE {
    U16     pageNumber;         // In:  #pages printed when this one is done
    U16     displayPageNumber;  // In:  page number to display on page
    U16     logicalPageNumber;  // In:  #times msgPrintStartPage has been sent
    OBJECT  jobUID;             // In:  print layout driver object
    OBJECT  appLayoutUID;       // Out: obj to receive msgPrintEmbeddeeAction
    U32     reserved[3];        // reserved
} PRINT_PAGE, *P_PRINT_PAGE;
```

Messages

msgPrintStartPage

Advance the document to its next logical page.

Takes P_PRINT_PAGE, returns STATUS.

```
#define msgPrintStartPage           MakeMsg(clsPrint, 1)
```

Message Arguments

```
typedef struct PRINT_PAGE {
    U16     pageNumber;         // In:  #pages printed when this one is done
    U16     displayPageNumber;  // In:  page number to display on page
    U16     logicalPageNumber;  // In:  #times msgPrintStartPage has been sent
    OBJECT  jobUID;             // In:  print layout driver object
    OBJECT  appLayoutUID;       // Out: obj to receive msgPrintEmbeddeeAction
    U32     reserved[3];        // reserved
} PRINT_PAGE, *P_PRINT_PAGE;
```

Comments

This message is sent to a document as a signal to initialize its internal pagination data to a new page. When the document has no more pages to print it should return **stsEndOfData** in response to this message. Note: the document does not return **stsEndOfData** when it paginates its last page; it waits until the next time this message is sent (when it has no data left to paginate). If the document does have more pages to print, the following happens:

- the document receives **msgPrintGetProtocols**
- the **mainWin** of document receives **msgWinLayout** at least once
- the document receives **msgPrintLayoutPage**

If **appLayoutUID** is **objNull**, the print layout driver will send any messages regarding embeddee actions (**msgPrintEmbeddeeAction**) to the document; otherwise it will send them to the **appLayoutUID** object set by the document in this structure.

Developers: Your application should handle this message to support pagination.

msgPrintLayoutPage

Document lays out its logical page.

Takes P_PRINT_PAGE, returns STATUS.

```
#define msgPrintLayoutPage          MakeMsg(clsPrint, 12)
```

Message Arguments

```
typedef struct PRINT_PAGE {
    U16     pageNumber;         // In:  #pages printed when this one is done
    U16     displayPageNumber;  // In:  page number to display on page
    U16     logicalPageNumber;  // In:  #times msgPrintStartPage has been sent
    OBJECT  jobUID;             // In:  print layout driver object
    OBJECT  appLayoutUID;       // Out: obj to receive msgPrintEmbeddeeAction
    U32     reserved[3];        // reserved
} PRINT_PAGE, *P_PRINT_PAGE;
```

Comments

The wrapper sends this message to the document after it sends **msgPrintStartPage** and **msgPrintGetProtocols**. This message can be thought of as a substitute for **msgWinLayout**. However, unlike **msgWinLayout**, it is sent only once per page.

Developers: Your application should handle this message to support pagination.

msgPrintGetMetrics

Gets the application's print metrics.

Takes P_PRINT_METRICS, returns STATUS.

```
#define msgPrintGetMetrics          MakeMsg(clsPrint, 2)
```

Message Arguments

```
typedef struct PRINT_METRICS {
    U32     reserved1;          // reserved
    U16     pageRangeStart;     // start page # (not used if pageAll is TRUE)
    U16     pageRangeEnd;       // end page # (not used if pageAll is TRUE)
    U16     startingPage;       // starting page # (to be printed on pages)
    U16     copies;             // not used
    U16     collating:      2;  // not used
    U16     orientation:    2;  // either prOrientPortraitNormal or
                                // pdOrientLandscapeNormal (see win.h)
    U16     pageAll:        1;  // TRUE to print all pages
    U16     spoolMode:      2;  // see spool mode values
    U16     firstPageHeader:1;  // TRUE to enable first page headers
    U16     reserved2:      8;  // reserved
    U8      paperSizeType;      // Popular paper type (see clsPrn.h)
    SIZE32  paperSize;          // Size of paper in Mils
    PRINT_SETUP firstPageSetup;         // not used
    PRINT_SETUP pageSetup;              // page setup information
    char        printer[nameBufLength]; // name of printer to use
    EMBEDDEE_PRINT_INFO embedding;      // how to print embedded documents
    U32         reservedData[6];        // reserved
} PRINT_METRICS, *P_PRINT_METRICS;
```

Comments

You can send this message to OSThisApp() to get the current application's print metrics. During printing you can send this message to the **jobUID** (given in the **pArgs** of **msgPrintStartPage**) to get EFFECTIVE print metrics. EFFECTIVE print metrics are those from the original top-level document

in this print job. Deferred embedded documents print with effective margins, headers and footers, and orientation; the values in their own print metrics are ignored.

Developers: Your application does not need to handle this message.

msgPrintSetMetrics

Sets the application's print metrics.

Takes P_PRINT_METRICS, returns STATUS.

```
#define msgPrintSetMetrics          MakeMsg(clsPrint, 3)
```

Message Arguments

```
typedef struct PRINT_METRICS {
    U32     reserved1;          // reserved
    U16     pageRangeStart;     // start page # (not used if pageAll is TRUE)
    U16     pageRangeEnd;       // end page # (not used if pageAll is TRUE)
    U16     startingPage;       // starting page # (to be printed on pages)
    U16     copies;             // not used
    U16     collating:      2;  // not used
    U16     orientation:    2;  // either prOrientPortraitNormal or
                                // pdOrientLandscapeNormal (see win.h)
    U16     pageAll:        1;  // TRUE to print all pages
    U16     spoolMode:      2;  // see spool mode values
    U16     firstPageHeader:1;  // TRUE to enable first page headers
    U16     reserved2:      8;  // reserved
    U8      paperSizeType;      // Popular paper type (see clsPrn.h)
    SIZE32  paperSize;          // Size of paper in Mils
    PRINT_SETUP firstPageSetup;         // not used
    PRINT_SETUP pageSetup;              // page setup information
    char        printer[nameBufLength]; // name of printer to use
    EMBEDDEE_PRINT_INFO embedding;      // how to print embedded documents
    U32         reservedData[6];        // reserved
} PRINT_METRICS, *P_PRINT_METRICS;
```

Comments

You can send this message to OSThisApp() to set the current application's print metrics.

Developers: Your application does not need to handle this message.

msgPrintApp

Prints a document.

Takes P_PRINT_DATA, returns STATUS..

```
#define msgPrintApp                 MakeMsg(clsPrint, 4)
```

Arguments

```
typedef struct PRINT_DATA {
    OBJECT  appUID;                 // In: UID if this is the active app
    UUID    appUUID;                // In: application UUID
    U32     reserved[2];            // reserved
} PRINT_DATA, *P_PRINT_DATA;
```

Comments

This message prints the document. If you want to invoke printing, you send this message to **thePrintManager**, using ObjectSend or ObjectPost.

Developers: Your application does not need to handle this message.

msgPrintPaperArea

Passes back the width and height of the printing area on the paper.

Takes P_PRINT_AREA, returns STATUS..

```
#define msgPrintPaperArea           MakeMsg(clsPrint, 7)
```

Arguments

```
typedef struct PRINT_AREA {
    P_PRINT_METRICS pMetrics;       // In: pNull or metrics for computation
    SIZE32          area;           // Out: size of print area, in Mils.
} PRINT_AREA, *P_PRINT_AREA;
```

Comments

thePrintManager returns the size of the printing area on a sheet of paper, adjusted to take into account margin values and interpreted relative to the orientation. Thus, **thePrintManager** swaps the computed width and height values if the page orientation is landscape vs portrait.

The size of the printing area is in Mils. It does not account for printer hardware limitations, i.e., the "unprintable area" on a page.

You can send this message to **thePrintManager** at any time to get the the current document's printing area. You can either pass in the metrics from which to compute the area or set **pMetrics** = **pNull**. If **pMetrics** is **pNull**, **thePrintManager** will obtain the print metrics from **theProcessResList**.

Developers: Your application does not need to handle this message.

---

msgPrintGetProtocols

Gets the pagination and embeddee printing protocols for the document.

Takes P_PRINT_PROTOCOLS, returns STATUS.

```
#define msgPrintGetProtocols            MakeMsg(clsPrint, 9)
```

Arguments

```
typedef struct PRINT_PROTOCOLS {
    U16 paginationMethod;       //  Out: paginationMethod value
    U16 embeddeeSearch;         //  Out: embeddeeSearch value
} PRINT_PROTOCOLS, *P_PRINT_PROTOCOLS;
```

Comments

The wrapper sends this message to the document after each **msgPrintStartPage**.

Developers: Your application needs to handle this message and pass back the pagination method (see "paginationMethod Values" below) and the embeddee searching method (see "embeddeeSearch Values").

paginationMethod Values

```
#define prPaginationTile    1       // tile pagination style
#define prPaginationFlow    2       // flow pagination style
#define prPaginationScale   3       // scale pagination style
```

embeddeeSearch Values

```
#define prEmbeddeeSearchByPrintJob  1   // print layout driver finds children
                                        // for the application
#define prEmbeddeeSearchByApp       2   // app finds children while paginating
```

---

msgPrintEmbeddeeAction

Asks the document for permission to perform an action on an embeddee.

Takes P_PRINT_EMBEDDEE_ACTION, returns STATUS.

```
#define msgPrintEmbeddeeAction  MakeMsg(clsPrint, 10)
```

Message Arguments

```
typedef struct PRINT_EMBEDDEE_ACTION {
    WIN                 embeddedWin;        // embedded win to act on
    U16                 action;             // proposed embeddee action flag
    EMBEDDEE_PRINT_INFO embedPrintInfo;     // embeddee print properties
    U32                 reserved[3];        // reserved
} PRINT_EMBEDDEE_ACTION, *P_PRINT_EMBEDDEE_ACTION;
```

Comments

The wrapper sends this message to the (top-level) document being printed; it requests permission to perform an action on an embeddee.

Developers: You should handle this message and return **stsOK** for yes, **stsRequestDenied** for no.

In parameters:

embeddedWin embedded win to act on

action proposed embeddee action

embedPrintInfo embeddee print properties

msgPrintExamineEmbeddee

Sent to the print layout driver to interpret an embedded window's print properties.

Takes P_PRINT_EMBEDDEE_ACTION, returns STATUS.

```
#define msgPrintExamineEmbeddee MakeMsg(clsPrint, 11)
```

Message Arguments

```
typedef struct PRINT_EMBEDDEE_ACTION {
    WIN                 embeddedWin;        // embedded win to act on
    U16                 action;             // proposed embeddee action flag
    EMBEDDEE_PRINT_INFO embedPrintInfo;     // embeddee print properties
    U32                 reserved[3];        // reserved
} PRINT_EMBEDDEE_ACTION, *P_PRINT_EMBEDDEE_ACTION;
```

Comments

Documents that are being printed (or their layout objects) can send this message to the wrapper. It tells the print layout driver to interpret the embedded win's print properties and propose an action via **msgPrintEmbeddeeAction**. **msgPrintEmbeddeeAction** is sent subsequently even if no action is necessary.

In parameters:

embeddedWin embedded win to examine

Out parameters:

action proposed embeddee action

embedPrintInfo embeddee print properties

Developers: You do not need to handle this message.

msgPrintSetPrintableArea

Sent to the **printJob** to adjust margins for the "unprintable area".

Takes PRINTABLE_AREA, returns STATUS.

```
#define msgPrintSetPrintableArea    MakeMsg(clsPrint, 13)
#define prAdjustActualForUnprintable flag0  // make sure actual margins
                                            // account for hardware limits
```

Arguments

```
typedef struct PRINTABLE_AREA {
    U16             flags;
    PRINT_MARGINS   printMetricsMargins;    // user-set margins
    PRINT_MARGINS   unprintableMargins;     // hardware limitations
    PRINT_MARGINS   actualMargins;          // actual margins used by print
                                            // layout driver
} PRINTABLE_AREA, *P_PRINTABLE_AREA;
```

Comments

A (top-level) document can send this to the **printJob** during printing as a request to adjust margins to account for printer hardware limitations (i.e., an unprintable area on the page). It affects only the current page. You typically first send **msgPrintGetPrintableArea** to get the margins that the **printJob** is

currently using. Then you can set the flags argument to **prAdjustActualForUnprintable**, and send the structure on to this message.

Automatic tiling by the **printJob** always adjusts the user-set (print metrics) margins to account for the unprintable area on the page.

Typically graphics (non-flow) applications will desire this type of adjustment, while word processing (flow) apps won't since it may cause data reformatting. Sometimes, as with text, it is more user-friendly not to adjust (and let the data get clipped) so that the source of the problem is obvious to the user. Auto adjustment may induce unwanted visual changes and obscure their source.

Developers: You do not need to handle this message.

msgPrintGetPrintableArea

Sent to the print job during printing to request margin information.

Takes PRINTABLE_AREA, returns STATUS.

```
#define msgPrintGetPrintableArea    MakeMsg(clsPrint, 14)
```

Message Arguments

```
typedef struct PRINTABLE_AREA {
    U16             flags;
    PRINT_MARGINS   printMetricsMargins;    // user-set margins
    PRINT_MARGINS   unprintableMargins;     // hardware limitations
    PRINT_MARGINS   actualMargins;          // actual margins used by print
                                            // layout driver
} PRINTABLE_AREA, *P_PRINTABLE_AREA;
```

Comments

Flags are ignored.

Developers: You do not need to handle this message.

PRLAYOUT.H

This file contains the API definition for **clsPrLayout**.

clsPrLayout inherits from **clsObject**.

A **prLayout** object makes a document paginate.

A print layout object guides the top-level document through the pagination process and assists it in implementing its embeddees' print properties.

```
#ifndef PRLAYOUT_INCLUDED
#define PRLAYOUT_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef PRINT_INCLUDED
#include <print.h>
#endif
```

Common #defines and typedefs

```
typedef struct PRLAYOUT_METRICS {
    OBJECT      topLevelApp;    // outermost document printed
    OBJECT      currentApp;     // current document being printed
                                // as top-level
    OBJECT      prFrame;        // instance of clsPrFrame
    OBJECT      winDev;         // printer is bound to this window device
    OBJECT      printJob;       // "owner" of this object
    U32         reserved;
} PRLAYOUT_METRICS, *P_PRLAYOUT_METRICS;
```

Messages

msgNew

Create a new object.

Takes P_PRLAYOUT_NEW, returns STATUS.

Arguments

```
typedef struct PRLAYOUT_NEW_ONLY {
    OBJECT      topLevelApp;
    OBJECT      prFrame;
    OBJECT      winDev;
    OBJECT      printJob;
    U32         reserved;
} PRLAYOUT_NEW_ONLY, *P_PRLAYOUT_NEW_ONLY;
#define prLayoutNewFields   \
    objectNewFields     \
    PRLAYOUT_NEW_ONLY       prLayout;
typedef struct PRLAYOUT_NEW {
    prLayoutNewFields
} PRLAYOUT_NEW, *P_PRLAYOUT_NEW;
```

msgPrLayoutGetMetrics

Get PrLayout metrics.

Takes P_PRLAYOUT_METRICS, returns STATUS.

```
#define msgPrLayoutGetMetrics                MakeMsg(clsPrLayout, 1)
```

Message Arguments

```
typedef struct PRLAYOUT_METRICS {
    OBJECT      topLevelApp;    // outermost document printed
    OBJECT      currentApp;     // current document being printed
                                // as top-level
    OBJECT      prFrame;        // instance of clsPrFrame
    OBJECT      winDev;         // printer is bound to this window device
    OBJECT      printJob;       // "owner" of this object
    U32         reserved;
} PRLAYOUT_METRICS, *P_PRLAYOUT_METRICS;
```

msgPrLayoutSetMetrics

Set PrLayout metrics.

Takes P_PRLAYOUT_METRICS, returns STATUS.

```
#define msgPrLayoutSetMetrics                MakeMsg(clsPrLayout, 2)
```

Message Arguments

```
typedef struct PRLAYOUT_METRICS {
    OBJECT      topLevelApp;    // outermost document printed
    OBJECT      currentApp;     // current document being printed
                                // as top-level
    OBJECT      prFrame;        // instance of clsPrFrame
    OBJECT      winDev;         // printer is bound to this window device
    OBJECT      printJob;       // "owner" of this object
    U32         reserved;
} PRLAYOUT_METRICS, *P_PRLAYOUT_METRICS;
```

msgPrLayoutNextPage

Get next page.

Takes PRLAYOUT_PAGE, returns STATUS.

```
#define msgPrLayoutNextPage                  MakeMsg(clsPrLayout, 3)
```

Arguments

```
typedef struct PRLAYOUT_PAGE {
    U16 pageNumber;             // In:  paper sheets
    U16 displayPageNumber;      // In:  number displayed on page
    U16 logicalPageNumber;      // Out: num times msgPrintStartPage sent
    OBJECT  currentApp;         // Out: top level app supplying current page
    BOOLEAN appChanged;         // Out: true if first page from currentApp
} PRLAYOUT_PAGE, *P_PRLAYOUT_PAGE;
```

Comments

Uses print protocol messages defined in print.h to get the next page from the document being printed.

PRMARGIN.H

This file contains the API for **clsPrMargin**.

clsPrMargin inherits from **clsWin.**

Provides clipping of children.

```
#ifndef PRMARGIN_INCLUDED
#define PRMARGIN_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef CLAYOUT_INCLUDED
#include <clayout.h>
#endif
```

Common #defines and typedefs

msgNew

Create a new object.

Takes P_PRMARGIN_NEW, returns STATUS.

Arguments

```
typedef struct PRMARGIN_NEW_ONLY {
    OBJECT          client;     // object to adjust layout
} PRMARGIN_NEW_ONLY, *P_PRMARGIN_NEW_ONLY;
#define prMarginNewFields               \
    customLayoutNewFields               \
    PRMARGIN_NEW_ONLY       prMargin;
typedef struct PRMARGIN_NEW {
    prMarginNewFields
} PRMARGIN_NEW, *P_PRMARGIN_NEW;
```

Comments

The prmargin object handles **msgCstmLayoutGetChildSpec** and then sends it on to the client for adjustment of default layout behavior.

msgPrMarginSetMetrics

Set the **prMargin** metrics.

Takes P_PRMARGIN_METRICS, returns STATUS.

Arguments

```
typedef struct PRMARGIN_METRICS {
    OBJECT  client;
} PRMARGIN_METRICS, *P_PRMARGIN_METRICS;
#define msgPrMarginSetMetrics       MakeMsg(clsPrMargin, 1)
```

RCAPP.H

This file contains the API definition for **clsRootContainerApp**.

clsRootContainerApp inherits from **clsApp.**

Abstract class for root containers.

This class defines the API for all root container applications. Root containers are expected to respond to this API as part of their implementation.

PenPoint includes one implementation of a root container: the notebook. The messages defined in this class allow programatic control of a root container application.

To get the uid of the root container of interest use **msgAppGetRoot** (see app.h) or **msgAppMgrGetRoot** (see appmgr.h).

```
#ifndef RCAPP_INCLUDED
#define RCAPP_INCLUDED
#include <clsmgr.h>
#include <uuid.h>
```

Common #defines and typedefs

```
typedef OBJECT RCAPP, *P_RCAPP;
```

Messages

Sequential Access Messages

The next four messages provide sequential access to documents within the target root container.

---

msgRCAppNextDoc

Increments a root container's internal pointer to the next document.

Takes nothing, returns STATUS.

```
#define msgRCAppNextDoc                 MakeMsg(clsRootContainerApp, 1)
```

Comments

This message is sent to a root container to cause it to move to the next page. This message does not actually cause the page turn to occur. After one or more **msgRCAppNextDoc**, you must send **msgRCAppExecuteGotoDoc** to actually force the page turn to happen.

---

msgRCAppPrevDoc

Decrements a root container's internal pointer to the previous document.

Takes nothing, returns STATUS.

```
#define msgRCAppPrevDoc                 MakeMsg(clsRootContainerApp, 2)
```

Comments

This message is sent to a root container to cause it to move to the previous page. This message does not actually cause the page turn to occur. After one or more **msgRCAppPrevDoc**, you must send **msgRCAppExecuteGotoDoc** to actually force the page turn to happen.

---

msgRCAppExecuteGotoDoc

Turns a root container to the page pointed to by its internal pointer.

Takes nothing, returns STATUS.

```
#define msgRCAppExecuteGotoDoc          MakeMsg(clsRootContainerApp, 3)
```

Comments

Send this message after a series of **msgRCAppNextDoc** or **msgRCAppPrevDoc** calls to force the page turn to happen.

---

msgRCAppCancelGotoDoc

Resets a root container's internal pointer to the current document.

Takes P_UUID, returns STATUS.

```
#define msgRCAppCancelGotoDoc           MakeMsg(clsRootContainerApp, 4)
```

Comments

Send this message after a series of **msgRCAppNextDoc** or **msgRCAppPrevDoc** calls to cancel the calls reset the root contaner's internal pointer to the current page.

Random Access Messages

The next two messages provide random access to documents within the target root container.

---

msgRCAppGotoContents

Turns a root container to its contents page.

Takes nothing, returns STATUS.

```
#define msgRCAppGotoContents            MakeMsg(clsRootContainerApp, 5)
```

Comments

Send this message to a root container to force it to turn to its table of contents.

---

msgRCAppGotoDoc

Turns a root container to a document, or floats the document over the current page.

Takes P_RCAPP_GOTO_DOC, returns STATUS.

```
#define msgRCAppGotoDoc                 MakeMsg(clsRootContainerApp, 6)
```

Arguments

```
typedef struct RCAPP_GOTO_DOC {
    BOOLEAN     gotoDoc;                    // True=turn to, False=float.
    UUID        docUUID;                    // UUID of target document.
    UUID        reserved1;                  // Reserved.
    U32         reserved2[2];               // Reserved.
    char        reserved3[nameBufLength];   // Reserved.
    U32         reserved4[4];               // Reserved.
} RCAPP_GOTO_DOC, *P_RCAPP_GOTO_DOC;
```

Comments

Send this message to a root container to turn to or float a document. The specified document must be within the root container.

VIEW.H

This file contains the API definition for **clsView**.

clsView inherits from **clsCustomLayout.**

clsView is an abstract class that defines an association between a data object and a view onto that data.

Since **clsView** is an abstract class it should never be directly instantiated.

```
#ifndef VIEW_INCLUDED
#define VIEW_INCLUDED
#ifndef CLAYOUT_INCLUDED
#include <clayout.h>
#endif
```

Common #defines and typedefs

```
typedef OBJECT VIEW, *P_VIEW;
```

Messages

msgNew

Creates a new view.

Takes P_VIEW_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct VIEW_NEW_ONLY {
    OBJECT      dataObject;         // Data object to view.
    BOOLEAN     createDataObject;   // Auto-create data object?
} VIEW_NEW_ONLY, *P_VIEW_NEW_ONLY;
#define viewNewFields           \
    customLayoutNewFields       \
    VIEW_NEW_ONLY               view;
typedef struct VIEW_NEW {
    viewNewFields
} VIEW_NEW, *P_VIEW_NEW;
```

Comments

If **pArgs->**view.**dataObject** is non-null, the new view object becomes an observer of the data object.

clsView does not act on the value of **pArgs->**view.**createDataObject**. It is up to descendants of **clsView** to act on this field, typically by creating a new data object if the field is true. This behavior may not be appropriate of all descendants, however.

Descendants: You should never handle **msgNew** directly. Instead, handle **msgInit** by initializing your instance data. The ancestor must be called before your **msgInit** handler.

msgNewDefaults

Initializes the VIEW_NEW structure to default values.

Takes P_VIEW_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct VIEW_NEW {
    viewNewFields
} VIEW_NEW, *P_VIEW_NEW;
```

Comments

In response to this message, **clsView** does the following:

```
pArgs->embeddedWin.style.embeddor   = true;
pArgs->embeddedWin.style.embeddee   = true;
pArgs->view.dataObject              = objNull;
pArgs->view.createDataObject        = false;
```

Descendants: You should handle **msgNewDefaults** by initializing your _NEW structure to default values. The ancestor must be called before your handler.

---

msgFree

Defined in clsmgr.h.

Takes OBJ_KEY, returns STATUS.

Comments

In addition to standard **msgFree** behavior, the view removes itself as an observer of its data object. It does NOT send **msgFree** to the data object.

Descendants: You should handle **msgFree** by destroying all objects and resources you have created. It may be appropriate for you to destroy the data object if your view is the only observer of it. The ancestor must be called after your handler.

---

msgSave

Defined in clsmgr.h.

Takes P_OBJ_SAVE, returns STATUS.

Comments

In response to this message, the view sends **msgResPutObject** to **pArgs**->file with the data object as the value of **pArgs**. In effect, this means that saving the view also saves the data object. (If the data object is null, this writes the "null object" id into the resource file.)

Descendants: You should handle **msgSave** by saving your instance data. The ancestor must be called before your handler.

---

msgRestore

Defined in clsmgr.h.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

In response to this message, the view sends **msgResGetObject** to **pArgs**->file. In effect, this means that restoring the view also restores the data object. (If the data object was null when the view was saved, the data object is null after **msgRestore** is handled.)

If the restored data object is non-null, the view becomes an observer of the data object.

Descendants: You should handle **msgSave** by restoring your instance data. The ancestor must be called before your handler.

msgFreePending

Defined in clsmgr.h.

Takes OBJECT, returns STATUS.

Comments

If the object being freed is the view's data object, the view sets its data object to **objNull**.

Descendants: If you maintain instance data on the data object, you may need to handle this message by updating your instance data to reflect the impending destruction of the data object. The ancestor should be called before your handler. It is recommended, however, that your view not keep any information on the data object, thus maintaining a strict view/data separation. In such cases, you will not need to handle **msgFreePending**.

msgViewSetDataObject

Specifies a view's data object.

Takes OBJECT, returns STATUS.

```
#define msgViewSetDataObject                MakeMsg(clsView, 1)
```

Comments

If the current data object is non-null, the view removes itself as an observer of the current data object. It then sets the current data object to **pArgs** and, if the new data object is non-null, becomes an observer of it.

Descendants: If you maintain instance data on the data object, you may need to handle this message by updating your instance data to reflect the changed data object. The ancestor may be called before or after your handler. It is recommended, however, that your view not keep any information on the data object, thus maintaining a strict view/data separation. In such cases, you will not need to handle **msgViewSetDataObject**.

msgViewGetDataObject

Passes back a view's current data object

Takes P_OBJECT, returns STATUS.

```
#define msgViewGetDataObject                MakeMsg(clsView, 2)
```

Comments

Descendants: You do not normally handle this message.

Part 3 / Windows and Graphics

BITMAP.H

This file contains the API for **clsBitmap**.

clsBitmap inherits from **clsObject**.

Support class for **clsIcon** (see icon.h). Serves as data object for the Bitmap Editor. Based on cached images (see sysgraf.h).

clsBitmap takes a sampled image description, and optionally a mask, and a hotspot. It will file this description. It also provides messages to modify the bitmap appearance. The Bitmap Editor treats bitmaps as data objects. It creates a bitmap, files it, and will export it as resource file. This resource file can be processed further by SDK utility programs (see resappnd).

A bitmap will prepare an argument structure for use by **msgDcCacheImage** so that the sampled image data in the bitmap can be converted to a cached image for quick rendering. See **msgBitmapCacheImageDefaults**.

```
#ifndef BITMAP_INCLUDED
#define BITMAP_INCLUDED
#ifndef SYSGRAF_INCLUDED
#include <sysgraf.h>
#endif
```

Typedefs, #defines, and Status Values

```
#define bitmapResId             MakeTag(clsBitmap, 1)
#define bmEncodeNone            0               // no data
#define bmEncodeRunLength       1               // run length encoded
#define bmEncode1BPS            2               // 1 bit  per sample
#define bmEncode2BPS            3               // 2 bits per sample
#define bmEncode4BPS            4               // 4 bits per sample
#define bmEncode8BPS            5               // 8 bits per sample
#define bmEncode16BPS           6               // unused (reserved)
#define bmEncode24BPS           7               // unused (reserved)
#define bmMono                  0               // default
#define bmColorMap              1               // Not Working (reserved)
#define bmDirectColor           2               // Not Working (reserved)
typedef struct BITMAP_STYLE
{
  U16  pixEncoding     : 4,
       maskEncoding    : 4,
       colorEncoding   : 3,
       version         : 5;                     // currently 0
} BITMAP_STYLE, *P_BITMAP_STYLE;
```

Messages

msgNew

Creates a bitmap.

Takes P_BITMAP_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct BITMAP_NEW_ONLY
{
  BITMAP_STYLE  style;          // overall style
  SIZE16        size;           // # of source samples
  P_U8          pPixels;        // actual samples
  P_U8          pMask;          // mask (must be bmEncode1BPS) or pNull
  XY16          hotSpot;        // lower-left corner relative hot spot
  U32           spare1;
  U32           spare2;
} BITMAP_NEW_ONLY, *P_BITMAP_NEW_ONLY,
  BITMAP_METRICS, *P_BITMAP_METRICS;
#define bitMapNewFields         \
        objectNewFields         \
        BITMAP_NEW_ONLY bitmap;
typedef struct BITMAP_NEW
{
  bitMapNewFields
} BITMAP_NEW, *P_BITMAP_NEW;
```

msgNewDefaults

Initializes the BITMAP_NEW structure to default values.

Takes P_BITMAP_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct BITMAP_NEW
{
  bitMapNewFields
} BITMAP_NEW, *P_BITMAP_NEW;
 bitmap.style.pixEncoding   = bmEncode8BPS;
 bitmap.style.maskEncoding  = bmEncode1BPS;
 bitmap.style.colorEncoding = bmMono;
 bitmap.style.version       = 0;
 bitmap.size.w              = 0;
 bitmap.size.h              = 0;
 bitmap.pPixels             = pNull;
 bitmap.pMask               = pNull;
 bitmap.hotSpot.x           = 0;
 bitmap.hotSpot.y           = 0;
```

msgBitmapGetMetrics

Gets bitmap metrics.

Takes P_BITMAP_GET_METRICS, returns STATUS.

```
#define msgBitmapGetMetrics             MakeMsg(clsBitmap, 0)
```

msgBitmapSetMetrics

Sets bitmap metrics.

Takes P_BITMAP_METRICS, returns STATUS.

```
#define msgBitmapSetMetrics             MakeMsg(clsBitmap, 1)
```

msgBitmapSetSize

Sets bitmap size, resizing heap block if necessary.

Takes P_SIZE16, returns STATUS.

```
#define msgBitmapSetSize                MakeMsg(clsBitmap, 2)
```

msgBitmapInvert

Inverts the colors of the bitmap.

Takes nothing, returns STATUS.

```
#define msgBitmapInvert                 MakeMsg(clsBitmap, 3)
```

msgBitmapLighten

Lightens the colors of the bitmap by 1/4.

Takes nothing, returns STATUS.

```
#define msgBitmapLighten                MakeMsg(clsBitmap, 4)
```

msgBitmapFill

Fills bitmap pixels with RGB value leaving mask alone.

Takes RGB value, returns STATUS.

```
#define msgBitmapFill                   MakeMsg(clsBitmap, 6)
```

msgBitmapCacheImageDefaults

Prepares argument structure for **msgDcCacheImage**.

Takes P_SYSDC_CACHE_IMAGE, returns STATUS.

```
#define msgBitmapCacheImageDefaults     MakeMsg(clsBitmap, 43)
```

Comments

After sending this message to the bitmap, **pArgs** is ready to be sent to a DC via using **msgDcCacheImage** (see sysgraf.h).

Messages sent to observers

msgBitmapPixChange

Sent to observing objects if a pixel is dirty.

Takes P_BITMAP_PIX_CHANGE, returns STATUS. Category: observer notification.

```
#define msgBitmapPixChange              MsgNoError(MakeMsg(clsBitmap, 5))
```

Arguments

```
typedef struct BITMAP_PIX_CHANGE
{
  XY16              pix;
  OBJECT            sourceObject;
  P_BITMAP_METRICS  pBitmap;
} BITMAP_PIX_CHANGE, *P_BITMAP_PIX_CHANGE;
```

msgBitmapChange

Sent to observing objects if bitmap has changed.

Takes nothing, returns STATUS. Category: observer notification.

```
#define msgBitmapChange                 MsgNoError(MakeMsg(clsBitmap, 10))
```

msgBitmapMaskChange

Sent to observing objects if bitmap's mask has changed.

Takes nothing, returns STATUS. Category: observer notification.

```
#define msgBitmapMaskChange             MsgNoError(MakeMsg(clsBitmap, 11))
```

CCITT.H

CCITT Fax Group 3, one-dimensional data encoding and decoding routines. The functions described in this file are contained within CCITT.LIB.

```
#ifndef CCITT_INCLUDED
#define CCITT_INCLUDED
typedef struct ENCODE31          // Structure for use by function CcittEncode31
{
    U16         pixCnt;          // In:  How many pixels in the scanline.
    BOOLEAN     photoNegative;   // In:  Input bitmap's palette:
                                 //      true:  0 = white, 1 = black.
                                 //      false: 1 = white, 0 = black.
    P_U8        pScanLine;       // In:  Scanline data to encode.
                                 //      Note: A scanline must be
                                 //            a multiple of words.
    BOOLEAN     writeEol;        // In:  EOL code is to be written at
                                 //      the beginning of the scanline.
    BOOLEAN     writeRtc;        // In:  6 EOLs are to be written at
                                 //      the end of the scan line.
    P_U8        pOutBuf;         // In:  Starting byte at which to put data.
                                 //      The buffer size must accomodate a
                                 //      worst case encoding for one scanline.
                                 //      2*pixCnt, +2 w/EOL, +9 w/RTC.
    U16         inBitPos;        // In:  Bit # in pOutBuf to start encoding
                                 //      Bit 0 = MSB, Bit 7 = LSB
    P_U8        pOutLast;        // Out: Last byte where data was put
    U16         byteUsed;        // Out: Number of bytes used for encoding,
                                 //      including the last partial byte.
    U16         outBitPos;       // out: Bit # in pOutLast where last bit
                                 //      was put + 1.
} ENCODE31, *P_ENCODE31;
#define ccittDecodeToPacked     0   // Decode to Packed bitmap.
#define ccittDecodeToRunLen     1   // Decode to sample image operator Run-Length.
#define ccittDecodeToGroup3_1D  2   // Decode to Group 3 1-Dimension fax encoding.
typedef struct DECODE31          // Structure for use by fuction CcittDecode31
{
    S16         format;          // in:  ccittDecodeToPacked,RunLen, or Group3_1D.
    S16         pixCnt;          // in:  How many pixels comprise a scanline.
    BOOLEAN     readEolRtc;      // in:  EOL or RTC string is to be read
                                 //      at the end of each scanline.
    BOOLEAN     photoNegative;   // in:  Output palette:
                                 //      true:  0 = white, 1 = black
                                 //      false: 1 = white, 0 = black.
    BOOLEAN     newLine;         // in/out:  Must be set to true at the
                                 //          start of each scanline and left
                                 //          alone for remainder of scanline.
    P_U8        pInBuf;          // in:  Input buffer:
                                 //      Starting byte of data to decode.
    U16         inBitPos;        // in:  Bit # in pInBuf to start decoding.
                                 //      Bit 0 = MSB, Bit 7 = LSB
    S16         inBufSz;         // in:  # of data bytes within input buffer.
    P_U8        pOutBuf;         // in:  Output buffer:
                                 //      This field should be initialized once
                                 //      at the beginning of each scanline and
                                 //      left alone for the rest of the line.
                                 //      The size of the output buffer must
```

```
                                //      accomodate for the worst case decoding
                                //      pixCnt for decodeToRunLength,
                                //      2*((pixCnt+15)/16) for ccittDecodeToPacked,
                                //      ((9*pixCnt)/16)+2 for ccittDecodeToGroup3_1D.
    S16         decodedSz;      // out: The number of bytes of decoded output
                                //      placed into *pOutBuf.
    BOOLEAN     done;           // out: A complete scanline has been decoded.
    BOOLEAN     rtcRead;        // out: RTC detected (6 consecutive EOLs).
    P_U8        pInLast;        // out: Points to last data byte within
                                //      *pInBuf that was decoded.
    S16         lastBitPos;     // out: Next bit # within *pInLast byte
                                //      that will be decoded.
    S16         outBitPos;      // private: Bit # within pOutBuf at which next
                                //      bit of decoded data will be placed.
    BOOLEAN     curIs0;         // private: Last run was zero bits/pixels.
    S16         nDecoded;       // private: # of scanline pixels decoded.
    S16         nEolRead;       // private: # of EOLs read with scanline.
    BOOLEAN     resyncToNextEol;// private: Resync to next EOL - data error.
    S16         adjacentZeros;  // private: Consecutive zero bit run count.
} DECODE31, *P_DECODE31;
```

CcittEncode31

Encode one scanline of a packed bitmap into fax group 3 T.4 1-D format.

Returns nothing.

Function Prototype

```
void EXPORTED CcittEncode31 (
   P_ENCODE31 pEncode );
```

CcittDecode31

Decode one scanline worth of fax group 3 T.4 1-D image data.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED CcittDecode31 (
   P_DECODE31 pDecode );
```

Output can be either the packed bitmap format, sampled image operatorlength encoded format, or Group 3 1 dimensional image format without. Function returns true if successful, false if the input datanot valid fax data. The interface to this function is such thatcalls may be needed to decode a complete scanline. As such,states are kept in the interface structure. Fields labeledprivate are not to be molested by the caller.

Example of decoding a TIFF CCITT/3 image (where there is no EOL or RTCand the number of scanlines is known a priori, using a decodedof our run length format:

```
decode.format       = ccittDecodeToRunLen;
decode.pixCnt       = 1024;
decode.readEolRtc   = false;

for (all scanlines)
{
    decode.inBitPos = 0;
    decode.pOutBuf  = whatever;
    decode.pInBuf   = whatever;
    decode.inBufSz  = whatever;
    decode.newLine  = true;

    while(true)
    {
        if (!CcittDecode31(&decode))
```

```
            break;      // ------ the input data is screwed up.
        if (decode.done)
            break;      // ------ done decoding current scanline.

        //  Supply new bits for next call. Note that there may be
        //  partial bits left undecoded within the last decoded byte.
        //  The next call to decode must start with any undecoded bits.
        /   If you buffer the source bits, then copy all undecoded bits
        //  into the new buffer. The pInLast and lastBitPos fields tell
        //  you the amount left undecoded.

        decode.pInBuf   = pInLast;              //  Or your new buffer.
        decode.inBufSz  = whatever;             //  # of bytes w/in buffer.
        decode.inBitPos = decode.lastBitPos;    //  Assuming that you copy
                                                //  *decode.pInLast to new
    }                                           //  buffer.

    //  Done decoding a scanline.

}
```

Example of decoding a raw fax input where there is EOLs and RTCand the number of scanlines is not known a priori, using aformat of packed bit output:

```
decode.format       = ccittDecodeToPacked;
decode.inBitPos     = 0;
decode.pInBuf       = whatever;
decode.inBufSz      = whatever;
decode.readEolRtc   = true;
decode.rtcRead      = false;

while (!decode.rtcRead)
{
    decode.newLine  = true;
    decode.pOutBuf  = whatever;
    decode.pixCnt   = whatever;     // # of pixels of packed data
                                    //  *pOutBuf can accomodate.
    while(true)
    {
        if (!CcittDecode31(&decode))
            break;      // ------ the input data is screwed up.

        if (decode.done)
            break;      // ------ done decoding current scanline.

        //  Supply new bits for next call. Note that there may be
        //  partial bits left undecoded within the last decoded byte.
        //  The next call to decode must start with any undecoded bits.
        /   If you buffer the source bits, then copy all undecoded bits
        //  into the new buffer. The pInLast and lastBitPos fields tell
        //  you the amount left undecoded.

        decode.pInBuf   = pInLast;              //  Or your new buffer.
        decode.inBufSz  = whatever;             //  # of bytes w/in buffer.
        decode.inBitPos = decode.lastBitPos;    //  Assuming that you copy
                                                //  *decode.pInLast to new
    }                                           //  buffer.

    //  Done decoding a scanline.

}
```

GEO.H

This file contains the API definition for PenPoint's geometry package. The package provides points, rectangles, matrices, etc., and is used by the graphics and windowing software.

Typical application software will only need the types defined in this file and not need to use the functions.

The functions described in this file are contained in WIN.LIB.

```
#ifndef GEO_INCLUDED
#define GEO_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
```

Typedefs, #defines, and Status Values

```
typedef S32 COORD32;
typedef S16 COORD16;
typedef S16 ANGLE;              // Foley/VanDam counter clockwise angles
typedef struct
{
  FIXED    x,
           y;
} SCALE, * P_SCALE;
typedef struct
{
  COORD32  x,
           y;
} XY32, * P_XY32;
typedef struct
{
  COORD32  w,
           h;
} SIZE32, * P_SIZE32;
typedef struct
{
  XY32    origin;
  SIZE32  size;
} RECT32, * P_RECT32;
typedef struct
{
  COORD16  x,
           y;
} XY16, * P_XY16;
typedef struct
{
  COORD16  w,
           h;
} SIZE16, * P_SIZE16;
```

```
typedef struct
{
  XY16    origin;
  SIZE16  size;
} RECT16, * P_RECT16;
```

Type MAT represents a 3x3 matrix; however m13, m23 and m33 are constant and so they are not stored.

```
    m11    m12    m13
    m21    m22    m23
    m31    m32    m33

    sX     a      0
    a      sY     0
    tX     tY     1
typedef struct
{
   FIXED m11,
         m12,
         m21,
         m22;
   S32   m31,
         m32;
} MAT, * P_MAT;
Enum16(GEO_MAT_MULT) {geoPreMultiply,geoPostMultiply};
```

Handy macros

```
#define Coord32To16(c) ((c>0)?(COORD16)Min(c,maxS16):(COORD16)Max(c,minS16))
#define Coord16from32(c) Coord32To16(c)
#define RectInit(r, _x, _y, _w, _h) \
    { (r)->origin.x = (_x); (r)->origin.y = (_y); \
    (r)->size.w = (_w); (r)->size.h = (_h); }
#define RectRight(r)    ((r)->origin.x + (r)->size.w)
#define RectTop(r)      ((r)->origin.y + (r)->size.h)
```

Functions

Rect16To32

Take a RECT16 and produce a RECT32.

Returns nothing.

Function Prototype

```
void EXPORTED Rect16To32 (
    P_RECT32 p32,  // Out
    P_RECT16 p16   // In
);
```

Rect32To16

Take a RECT32 and produce a RECT16 with rounding.

Returns nothing.

Function Prototype

```
void EXPORTED Rect32To16 (
    P_RECT16 p16,  // Out
    P_RECT32 p32   // In
);
```

Comments

Each 32-bit number is rounded to 16-bits using Coord32To16.

Rect32Intersect

Take two RECT32's and produce their intersection.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED Rect32Intersect (
    P_RECT32 pA,    // In
    P_RECT32 pB,    // In
    P_RECT32 pRet   // Out: the intersection
);
```

Comments

Returns whether the two rectangles intersect. When TRUE, the rectangle returned will always have positive width and height, even though either of the parameter rectangles may have negative width or height.

Rect32sIntersect

Test if two RECT32's intersect.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED Rect32sIntersect (
    P_RECT32 pA,    // In
    P_RECT32 pB     // In
);
```

Comments

Either of the parameter rectangles may have negative width or height.

Rect32EnclosesRect32

Test if a RECT32 encloses another RECT32.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED Rect32EnclosesRect32 (
    P_RECT32 pA,    // In
    P_RECT32 pB     // In
);
```

Comments

Returns true if rect A completely encloses rect B. Either of the parameter rectangles may have negative width or height.

Rect16Intersect

Take two RECT16's and produce their intersection.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED Rect16Intersect (
    P_RECT16 pA,    // In
    P_RECT16 pB,    // In
    P_RECT16 pRet   // Out: the intersection
);
```

Comments

Returns whether the two rectangles intersect. When TRUE, the rectangle returned will always have positive width and height, even though either of the parameter rectangles may have negative width or height.

XY32inRect32

Test if an XY32 point is inside a RECT32.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED XY32inRect32 (
    P_RECT32 pRect, // In
    P_XY32   pXY    // In
);
```

Rect32Empty

Test if a RECT32 has a width or height that is zero.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED Rect32Empty (
    P_RECT32 pRect  // In
);
```

Comments

Also, if **pRect** is **pNull** then this function returns true.

Rect16Empty

Test if a RECT16 has a width or height that is zero.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED Rect16Empty (
    P_RECT16 pRect  // In
);
```

Comments

Also, if **pRect** is **pNull** then this function returns true.

MatCreate

Create a MAT given a translate, rotate, and scale.

Returns nothing.

Function Prototype

```
void EXPORTED MatCreate (
    P_MAT   pMat,     // Out
    COORD32 tX,       // In
    COORD32 tY,       // In
    ANGLE   angle,    // In
    FIXED   sX,       // In
    FIXED   sY        // In
);
```

Comments

pMat is set to identity. Then the three transformation are post-multiplied in the order (1) translate, (2) rotate, and (3) scale.

MatIdentity

Set a MAT to the identity matrix.

Returns nothing.

Function Prototype

```
void EXPORTED MatIdentity (
    P_MAT  // Out
);
```

MatRotate

Rotate a MAT.

Returns nothing.

Function Prototype

```
void EXPORTED MatRotate (
    GEO_MAT_MULT    order,   // In: {geoPreMultiply,geoPostMultiply}
    P_MAT           pMat,    // In-Out:
    ANGLE           angle    // In: 0-359 degrees
);
```

MatTranslate

Translate a MAT.

Returns nothing.

Function Prototype

```
void EXPORTED MatTranslate (
    GEO_MAT_MULT    order,   // In: {geoPreMultiply,geoPostMultiply}
    P_MAT           pMat,    // In-Out:
    P_XY32          xy       // In:
);
```

MatScale

Scale a MAT.

Returns nothing.

Function Prototype

```
void EXPORTED MatScale (
    GEO_MAT_MULT    order,   // In: {geoPreMultiply,geoPostMultiply}
    P_MAT           pMat,    // In-Out:
    P_SCALE         scale    // In:
);
```

MatInvert

Invert a MAT.

Returns nothing.

Function Prototype

```
void EXPORTED MatInvert (
    P_MAT     pDest,   // Out:
    P_MAT     pSource  // In:
);
```

Comments

pSource is inverted and placed in **pDest**. **pSource** and **pDest** can be the same matrix.

MatMultiply

Multiply two MAT's.

Returns nothing.

Function Prototype

```
void EXPORTED MatMultiply (
    GEO_MAT_MULT    order,   // In: {geoPreMultiply,geoPostMultiply}
    P_MAT           answer,  // Out
    P_MAT           left,    // In
    P_MAT           right    // In
);
```

Comments

If order is **geoPreMultiply**, then answer = right * left. If order is **geoPostMultiply**, then answer = left * right;

MatXYTransform16

Transform a XY32 producing a XY16 result.

Returns nothing.

Function Prototype

```
void EXPORTED MatXYTransform16 (
    P_MAT    pMat,     // In
    P_XY32   pSource,  // In
    P_XY16   pDest     // Out
);
```

Comments

Each 32-bit number is rounded to 16-bits using Coord32To16.

MatXYTransform32

Transform a XY32 producing a XY32 result.

Returns nothing.

Function Prototype

```
void EXPORTED MatXYTransform32 (
    P_MAT    pMat,     // In
    P_XY32   pSource,  // In
    P_XY32   pDest     // Out
);
```

MatWHTransform16

Transform a SIZE32 producing a SIZE16 result.

Returns nothing.

Function Prototype

```
void EXPORTED MatWHTransform16 (
    P_MAT      pMat,     // In
    P_SIZE32   pSource,  // In
    P_SIZE16   pDest     // Out
);
```

Comments

This transformation is similar to MatXYTransform16 except the translation components of the matrix are ignored and the values returned are always positive.

Each 32-bit number is rounded to 16-bits using Coord32To16.

MatWHTransform32

Transform a SIZE32 producing a SIZE32 result.

Returns nothing.

Function Prototype

```
void EXPORTED MatWHTransform32 (
    P_MAT      pMat,     // In
    P_SIZE32   pSource,  // In
    P_SIZE32   pDest     // Out
);
```

Comments

This transformation is similar to MatXYTransform32 except the translation components of the matrix are ignored and the values returned are always positive.

MatTransformRECT32

Transform a RECT32.

Returns nothing.

Function Prototype
```
void EXPORTED MatTransformRECT32 (
    P_MAT      pMat,     // In
    P_RECT32   pSource   // In-Out
);
```

Debugging Functions

MatDump

Prints the fields of a matrix.

Returns nothing.

Function Prototype
```
void    EXPORTED MatDump(P_MAT pm);
```

Comments This function may not work unless the debugging version of win.dll is being used.

DumpRect

Prints the fields of a rectangle.

Returns nothing.

Function Prototype
```
void    EXPORTED DumpRect(P_RECT32 pRect);
```

Comments This function may not work unless the debugging version of win.dll is being used.

Special Functions

WARNING: The functions in this section (MatXTransform16, MatYTransform16, MatWTransform16, and MatHTransform16) work only in a limited set of cases: NO translation, NO rotation, and they perform NO rounding and thus can overflow the 16 bit result.

These functions should not normally be used by application software.

Function Prototype
```
COORD16 EXPORTED MatXTransform16(P_MAT pi, COORD16 x);
COORD16 EXPORTED MatYTransform16(P_MAT pi, COORD16 y);
COORD16 EXPORTED MatWTransform16(P_MAT pi, COORD16 w);
COORD16 EXPORTED MatHTransform16(P_MAT pi, COORD16 h);
```

PICSEG.H

This file contains the API definition for **clsPicSeg** (Picture Segments).

clsPicSeg inherits from **clsSysDrwCtx.**

clsPicSeg provides a database and storage for drawing primitives.

A Picture Segment creates a display list from the stream of messages defined by drawing context. The graphic elements in a PicSeg are called grafics. The display list can repaint to the same window or store the grafics and later repaint it to another window. It also provides a move/copy transfer type for grafics.

The Picture Segment stores the following shapes as defined by **clsSysDrwCtx**: rectangle, ellipse, Bezier, polyline, polygon, sector rays, arc rays, chord rays, text. In addition, it defines a spline, and object types as an enhancement to the drawing context. It doesn't store images or raster operations such as CopyRect and XOR. Raster operations like XOR, AND, dynamic and fast modes defined by the drawing context apply to the whole display list. Similarly, transformations scale, translate, rotate and units apply to the PicSeg before drawing the list. The PicSeg stores the grafics in Logical Unit Coordinates as defined by the drawing context.

PicSeg's provide display query messages allowing changes to grafic shapes it stores. The grafics in a picture segment are ordered; it keeps track of the current grafic. You can retrieve, alter, reorder, and delete individual grafics.

Common uses of PicSeg's:

PicSeg's generally used as the Data Object of a View (**clsView**). A drawing View (like **clsGrafPaper**) translates the input strokes into grafics and draws them to the PicSeg, treating the PicSeg just like a Drawing Context. When the View gets **msgWinRepaint** it sends **msgPicSegPaint** to the PicSeg.

The PicSeg's file data as an Object so they can be used as resources. A Drawing View could file many PicSegs with different resource ids to the same file. Latter a display View could look up the different PicSegs in the resource file and display them.

PicSeg's are used to Move/Copy grafic data between Views. The transfer (xfer) mechanism uses an intermedate global PicSeg for grafics.

```
#ifndef PICSEG_INCLUDED
#define PICSEG_INCLUDED
#ifndef SYSGRAF_INCLUDED
#include <sysgraf.h>
#endif
```

Common #defines and typedefs

Data Collection and Drawing Modes

The PicSeg flags deterimine what to do with a draw messages. By default a message like **msgDcDrawRectangle** causes the PicSeg to store the rectangle in the display list and draw it on the window set by **msgDcSetWindow**. The following flags can prevent one or both of these thing from happening (picseg.flags).

```
#define picSegAdd           flag0       // on if PicSeg should add grafics.
#define picSegDraw          flag1       // on if PicSeg should draw grafics
#define picSegSendDestroy   flag2       // on ObjectCall(msgDestroy, ...)
                                        // to an object grafic when it is
                                        // deleted from the PicSeg or if the
                                        // PicSeg is freed.
```

The first grafic in the display list is 0. The last can be set by using **msgPicSegSetCurrent** with **picSegTopGrafic** or asking for the current number of grafics and then setting the current grafic.

```
#define picSegTopGrafic 0x7FFFFFFF  // theoretical maximum number of grafics
```

OpCodes

Each grafic in the PicSeg is given an OpCode that idenifies what type of data is stored in the **pData** member of PIC_SEG_GRAFIC.

```
typedef U16                     OP_CODE;
typedef P_U16                   P_OP_CODE;
#define opCodeMaskInvisible     0x1000
                                            // grafic.pData
#define opCodePolyline          100         // PIC_SEG_POLYLINE
#define opCodeRectangle         101         // PIC_SEG_RECT
#define opCodeEllipse           102         // PIC_SEG_ELLIPSE
#define opCodePolygon           103         // PIC_SEG_POLYGON
#define opCodeSpline            104         // PIC_SEG_SPLINE
#define opCodeArcRays           105         // PIC_SEG_ARC_RAYS
#define opCodeSectorRays        106         // PIC_SEG_ARC_RAYS
#define opCodeChordRays         107         // PIC_SEG_ARC_RAYS
#define opCodeText               55         // PIC_SEG_TEXT
#define opCodeObject            150         // PIC_SEG_OBJECT
```

The basic grafic used with **msgPicSegGetGrafic**. The **pData** allocated in the a heap and must be freed by creator of the PicSeg.

```
typedef struct {
    OP_CODE         opCode;             // the type of grafic stored in pData
    P_UNKNOWN       pData;              // pointer to the grafic data
}PIC_SEG_GRAFIC, * P_PIC_SEG_GRAFIC;
```

Every grafic provides the basic painting attributes.

```
typedef struct {
    SYSDC_PATTERN   linePat,                // the line pattern
                    fillPat;                // the fill pattern
    SYSDC_RGB       foregroundRGB,          // the foreground color
                    backgroundRGB;          // the background color
    U16             lineThickness;          // the line width
} PIC_SEG_PAINT, * P_PIC_SEG_PAINT;
```

The polyline, polygon, and spline grafics provide line attributes.

```
typedef struct {
    U8 join;
    U8 cap;
    U8 miterLimit;
    U8 spare;
} PIC_SEG_PLINE_TYPE, * P_PIC_SEG_PLINE_TYPE;
```

Text style attributes.

```
typedef struct PIC_SEG_FONT_STYLE{
    U16                 alignChr    : 3,    // see sysDcAlignChr???
                        underline   : 2,    // 0, 1, 2
                        strikeout   : 2,    // 0, 1
                        spare       : 9;    // spare - default 0
} PIC_SEG_FONT_STYLE, P_PIC_SEG_FONT_STYLE;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodeText**.

```
typedef struct PIC_SEG_TEXT{
    PIC_SEG_PAINT       paint;
    RECT32              rectangle;
    SYSDC_FONT_SPEC     fontSpec;       // unique font
    PIC_SEG_FONT_STYLE  style;
    SIZE16              size;           // size of text
    XY32                cp;             // text position
    U16                 length;         // length of text
    U8                  text[1];        // null terminated text
} PIC_SEG_TEXT, * P_PIC_SEG_TEXT;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodeEllipse**.

```
typedef struct {
    PIC_SEG_PAINT       paint;
    RECT32              ellipse;
} PIC_SEG_ELLIPSE, * P_PIC_SEG_ELLIPSE;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodeRectangle**.

```
typedef struct {
    PIC_SEG_PAINT       paint;
    RECT32              rectangle;
    S16                 radius;             // The rectangle radius
                                            // 0 for square corners.
} PIC_SEG_RECT, * P_PIC_SEG_RECT;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodePolyline**. The **pData** is of variable size depending on the number of points (**pData**->count). For Example, the third point is **pData**->points[3]. The size of **pData** is: (sizeof(PIC_SEG_POLYLINE) + sizeof(XY32) * ((**pData**->count)-1)).

```
typedef struct {
    PIC_SEG_PAINT       paint;
    PIC_SEG_PLINE_TYPE  type;
    U16                 count;          // number of points
    XY32                points[1];      // variable number of points
} PIC_SEG_POLYLINE, * P_PIC_SEG_POLYLINE;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodePolygon**. The **pData** is of varible size depending on the number of points (**pData**->count). For Example, the third point is **pData**->points[3]. The size of **pData** is: (sizeof(PIC_SEG_POLYGON) + sizeof(XY32) * ((**pData**->count)-1)).

```
typedef struct {
    PIC_SEG_PAINT       paint;
    PIC_SEG_PLINE_TYPE  type;
    U16                 count;          // number of points
    XY32                points[1];      // variable number of points
} PIC_SEG_POLYGON, * P_PIC_SEG_POLYGON;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodeSpline**. A spline is a continuous number of four point Bezier curves. The first Bezier is defined by the first four points in **pData**->points. The second Bezier starts at **pData**->points[3]. The count minus one is a multiple of three. **msgDcDrawBezier** stores as a spline. The **pData** is of varible size depending on the number of points (**pData**->count). For Example, the third point is **pData**->points[3]. The size of **pData** is: (sizeof(PIC_SEG_SPLINE) + sizeof(XY32) * ((**pData**->count)-1)).

```
typedef struct {
    PIC_SEG_PAINT       paint;
    PIC_SEG_PLINE_TYPE  type;
    U16                 count;          // number of points
    XY32                points[1];      // variable number of points
} PIC_SEG_SPLINE, * P_PIC_SEG_SPLINE;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodeArcRays**, **opCodeChordRays**, or **opCodeSectorRays**.

```
typedef struct {
    PIC_SEG_PAINT       paint;
    RECT32              bounds;
    XY32                rays[2];
} PIC_SEG_ARC_RAYS, * P_PIC_SEG_ARC_RAYS;
```

The grafic.**pData** provided with grafic.**opCode** == **opCodeObject**.

```
typedef struct {
    PIC_SEG_PAINT       paint;
    RECT32              rectangle;
    OBJECT              object;
} PIC_SEG_OBJECT, * P_PIC_SEG_OBJECT;
#define maxPolylineSize ((0xFFFF / sizeof(XY32)) - sizeof(PIC_SEG_POLYLINE))
typedef struct PIC_SEG_METRICS {
    U16                 flags;
    MESSAGE             units;                  // information only
    S32                 numberGrafics;          // information only
    S32                 currentGrafic;          // information only
    SYSDC_PATTERN       fillPat;                // attributes of the next
    SYSDC_PATTERN       linePat;                // drawn grafic
    SYSDC_RGB           foregroundRGB;
    SYSDC_RGB           backgroundRGB;
    SYSDC_LINE          line;
    SYSDC_PATTERN       clearFillPat;           // clear
    SYSDC_PATTERN       clearLinePat;
    SYSDC_RGB           clearForegroundRGB;
    SYSDC_RGB           clearBackgroundRGB;
    SYSDC_FONT_SPEC     fontSpec;               // font stuff
    SIZE16              fontSize;
    PIC_SEG_FONT_STYLE  fontStyle;
    S32                 reserved[5];
    S32                 spare[8];               // reserved
} PIC_SEG_NEW_ONLY, PIC_SEG_METRICS,
  *P_PIC_SEG_NEW_ONLY, *P_PIC_SEG_METRICS;
```

Messages

msgDump

Dumps a PicSeg. Debug version only!

Takes S32, returns STATUS. Category: class message.

Comments

pArgs == 0 everything and dc. **pArgs** == 1 PicSeg and metrics and does not Dump ancestor. **pArgs** == 2 PicSeg metrics only and does not Dump ancestor. **pArgs** == 3 PicSeg database only and does not Dump ancestor.

msgNew

Creates a new PicSeg.

Takes P_PIC_SEG_NEW, returns STATUS. Category: class message.

```
#define picSegNewFields     \
    sysdcNewFields          \
    PIC_SEG_NEW_ONLY    picSeg;
```

Arguments

```
typedef struct PIC_SEG_NEW {
    picSegNewFields
} PIC_SEG_NEW, *P_PIC_SEG_NEW;
```

msgNewDefaults

Initializes a PIC_SEG_NEW structure to default values.

Takes P_PIC_SEG_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct PIC_SEG_NEW {
    picSegNewFields
} PIC_SEG_NEW, *P_PIC_SEG_NEW;
```

Comments

Defaults:

```
picSeg.flags = picSegDraw | picSegAdd | picSegSendDestroy
picSeg.units = msgDcUnitsPoints
picSeg.currentGrafic = -1
picSeg.fillPat = sysDcPatBackground
picSeg.linePat = sysDcPatForeground
picSeg.backgroundRGB.all = SysDcGrayRGB(255)
picSeg.foregroundRGB.all = SysDcGrayRGB(0)

picSeg.line.cap = 0
picSeg.line.join = 0
picSeg.line.miterLimit = 10
picSeg.line.radius = 0
picSeg.line.thickness = 1

picSeg.clearFillPat = sysDcPatNil
picSeg.clearLinePat = sysDcPatNil
picSeg.clearForegroundRGB = SysDcGrayRGB(255)
picSeg.clearBackgroundRGB = SysDcGrayRGB(0)

picSeg.fontSpec.id = Nil
picSeg.fontSpec.attr.group = sysDcGroupDefault
picSeg.fontSpec.attr.weight = sysDcWeightNormal
picSeg.fontSpec.attr.aspect = sysDcAspectNormal
picSeg.fontSpec.attr.italic = false
picSeg.fontSpec.attr.monospaced = false
picSeg.fontSpec.attr.encoding = sysDcEncodeHWX850

picSeg.fontSize.w = 1
picSeg.fontSize.h = 1
picSeg.fontStyle.alignChr = 0
picSeg.fontStyle.underline = sysDcAlignChrBaseline
picSeg.fontStyle.strikeout = 0
picSeg.fontStyle.spare = 0
```

msgRestore

Restores the PicSeg metrics and grafics and sets the DC state.

Takes P_OBJ_RESTORE, returns STATUS. Category: class message.

Comments

The Restore doesn't connect the PicSeg to a window. Before using the PicSeg it must be set to a window with **msgDcSetWindow**.

msgSave

Saves the PicSeg metrics and grafics and the DC units and LUC matrix.

Takes P_OBJ_SAVE, returns STATUS. Category: class message.

Comments

The Save doesn't save the window connected to the PicSeg.

Drawing Messages

Messages of **clsSysDrwCtx** used by **clsPicSeg**: All of the following messages draw the shape and add it as a grafic to end of the of the PicSeg display list, provided the add and draw flags are turned on.

msgDcDrawEllipse, msgDcDrawRectangle, msgDcDrawPolyline, msgDcDrawPolygon, msgDcDrawSectorRays, msgDcDrawArcRays, msgDcDrawChordRays, msgDcDrawBezier, msgDcDrawText

PicSeg text defaults: **spaceChar, spaceExtra, otherExtra**

All of the following messages change the DC and also the PicSeg state. PicSeg converts the x,y font scale to 16 bits dc units.

msgDcSetForegroundRGB, msgDcSetBackgroundRGB, msgDcSetLinePat, msgDcSetFillPat, msgDcSetLine, msgDcSetLineThickness, msgDcOpenFont msgDcScaleFont, msgDcIdentityFont, msgDcUnits...

msgPicSegPaint

Paints the grafics in the PicSeg.

Takes **pNull**, returns STATUS.

```
#define msgPicSegPaint                          MakeMsg(clsPicSeg, 7)
```

Comments

Object Call either **msgWinBeginPaint** or **msgWinBeginRepaint** before using this message.

msgPicSegDrawSpline

Adds and draws the grafic to the end of the display list.

Takes P_PIC_SEG_SPLINE, returns STATUS.

```
#define msgPicSegDrawSpline                     MakeMsg(clsPicSeg, 104)
```

Message Arguments

```
typedef struct {
    PIC_SEG_PAINT       paint;
    PIC_SEG_PLINE_TYPE  type;
    U16                 count;          // number of points
    XY32                points[1];      // variable number of points
} PIC_SEG_SPLINE, * P_PIC_SEG_SPLINE;
```

msgPicSegDrawObject

Adds and draws an object to the PicSeg display list.

Takes P_PIC_SEG_OBJECT, returns STATUS.

```
#define msgPicSegDrawObject                     MakeMsg(clsPicSeg, 121)
```

Message Arguments

```
typedef struct {
    PIC_SEG_PAINT       paint;
    RECT32              rectangle;
    OBJECT              object;
} PIC_SEG_OBJECT, * P_PIC_SEG_OBJECT;
```

msgPicSegPaintObject

Sent by the PicSeg to objects in its database so they can draw themselves.

Takes P_PIC_SEG_PAINT_OBJECT, returns STATUS.

```
#define msgPicSegPaintObject                    MakeMsg(clsPicSeg, 46)
```

Arguments

```
typedef struct {
    PIC_SEG_PAINT       paint;
    RECT32              rectangle;
    OBJECT              object;
    OBJECT              picSeg;
    S32                 reserved[6];
} PIC_SEG_PAINT_OBJECT, * P_PIC_SEG_PAINT_OBJECT;
```

msgPicSegDrawGrafic

Draws a grafic from the PicSeg.

Takes P_PIC_SEG_GRAFIC, returns STATUS.

```
#define msgPicSegDrawGrafic                     MakeMsg(clsPicSeg, 10)
```

Message Arguments

```
typedef struct {
    OP_CODE         opCode;             // the type of grafic stored in pData
    P_UNKNOWN       pData;              // pointer to the grafic data
}PIC_SEG_GRAFIC, * P_PIC_SEG_GRAFIC;
```

Comments

The grafic **opCode** must be set to one of the **opCode**'s defined by PicSeg's. Can be used for HitTest on a specific grafic. Never adds the grafic to the PicSeg. Responds to flags **picSegDraw**.

msgPicSegDrawGraficIndex

Sets the current grafic to index and draws it.

Takes S32 index, returns STATUS.

```
#define msgPicSegDrawGraficIndex                MakeMsg(clsPicSeg, 11)
```

Can be used for HitTest on a specific grafic.

msgPicSegDrawGraficList

Draws all the grafics indexed by the list.

Takes P_PIC_SEG_LIST, returns STATUS.

```
#define msgPicSegDrawGraficList                 MakeMsg(clsPicSeg, 8)
```

Arguments

```
typedef struct {
    S32     count;          // number of grafic in list to draw
    P_S32   pIndex;         // pointer to the list of grafics
}PIC_SEG_LIST, * P_PIC_SEG_LIST;
```

msgPicSegAddGrafic

Adds a grafic to the PicSeg and Draws the grafic.

Takes P_PIC_SEG_GRAFIC, returns STATUS.

```
#define msgPicSegAddGrafic                      MakeMsg(clsPicSeg, 9)
```

Message Arguments

```
typedef struct {
    OP_CODE         opCode;             // the type of grafic stored in pData
    P_UNKNOWN       pData;              // pointer to the grafic data
}PIC_SEG_GRAFIC, * P_PIC_SEG_GRAFIC;
```

Comments

The grafic **opCode** must be set to one of the **opCode**'s defined by PicSeg's. Responds to flags **picSegAdd** and **picSegDraw**.

msgPicSegGetMetrics

Passes back the metrics of the PicSeg.

Takes P_PIC_SEG_METRICS, returns STATUS.

```
#define msgPicSegGetMetrics                    MakeMsg(clsPicSeg, 3)
```

msgPicSegSetMetrics

Sets the metrics of the PicSeg.

Takes P_PIC_SEG_METRICS, returns STATUS.

```
#define msgPicSegSetMetrics                    MakeMsg(clsPicSeg, 4)
```

omments

You cannot set picseg.**numberGrafics**.

msgPicSegSetFlags

Sets the PicSeg flags.

Takes S32, returns STATUS.

```
#define msgPicSegSetFlags                      MakeMsg(clsPicSeg, 5)
```

msgPicSegGetFlags

Gets the PicSeg flags.

Takes P_S32, returns STATUS.

```
#define msgPicSegGetFlags                      MakeMsg(clsPicSeg, 6)
```

Hit Test

msgPicSegHitTest

Performs a hit test on the PicSeg, passing back a single grafic index.

Takes P_PIC_SEG_HIT_LIST, returns STATUS.

```
#define msgPicSegHitTest                MakeMsg(clsPicSeg, 23)
```

Arguments

```
typedef struct {
    RECT32          rect;       // rectangle for the hit test
    S32             index;      // in start grafic - out end grafic
} PIC_SEG_HIT_LIST, * P_PIC_SEG_HIT_LIST;
```

Comments

index - in: First grafic to start hit test hit stops at grafic 0. Use **picSegTopGrafic** for starting at the top most grafic. out: The grafic hit if status is **stsDcHitOn** or **stsDcHitIn**. Otherwise 0.

STATUS return:

stsDcHitOn if the line intersects the hit rectangle

stsDcHitIn if the rectangle is inside a closed figure

stsDcHitOut if there was no hit

msgWinBeginPaint must be sent to the window first. **msgWinEndPaint** must be sent to the window after.

Editing the PicSeg Display List

msgPicSegErase

Deletes all grafics.

Takes nothing, returns STATUS.

```
#define msgPicSegErase                          MakeMsg(clsPicSeg, 24)
```

msgPicSegDelete

Deletes a grafic, takes a grafic Index. Sends **msgDestroy** to objects in the PicSeg.

Takes S32, returns STATUS.

```
#define msgPicSegDelete                         MakeMsg(clsPicSeg, 26)
```

msgPicSegRemove

Deletes a grafic, takes a grafic Index. Does not send **msgDestroy** to objects in the PicSeg.

Takes S32, returns STATUS.

```
#define msgPicSegRemove                         MakeMsg(clsPicSeg, 45)
```

msgPicSegDelta

Changes the current grafic.

Takes P_PIC_SEG_GRAFIC, returns STATUS.

```
#define msgPicSegDelta                          MakeMsg(clsPicSeg, 27)
```

Message Arguments

```
typedef struct {
    OP_CODE         opCode;             // the type of grafic stored in pData
    P_UNKNOWN       pData;              // pointer to the grafic data
}PIC_SEG_GRAFIC, * P_PIC_SEG_GRAFIC;
```

msgPicSegGetGrafic

Gets the current grafic.

Takes P_PIC_SEG_GRAFIC, returns STATUS.

```
#define msgPicSegGetGrafic                      MakeMsg(clsPicSeg, 28)
```

Message Arguments

```
typedef struct {
    OP_CODE         opCode;             // the type of grafic stored in pData
    P_UNKNOWN       pData;              // pointer to the grafic data
}PIC_SEG_GRAFIC, * P_PIC_SEG_GRAFIC;
```

Comments

Data must be freed by caller.

msgPicSegSetCurrent

Sets the current grafic index.

Takes S32, returns STATUS.

```
#define msgPicSegSetCurrent                     MakeMsg(clsPicSeg, 30)
```

Comments

Specifying **picSegTopGrafic** sets the current grafic to the last grafic in the list.

msgPicSegGetCurrent

Gets the index of the current grafic.

Takes P_S32, returns STATUS.

```
#define msgPicSegGetCurrent                    MakeMsg(clsPicSeg, 31)
```

msgPicSegGetCount

Gets the number of grafics in the PicSeg.

Takes P_S32, returns STATUS.

```
#define msgPicSegGetCount                      MakeMsg(clsPicSeg, 32)
```

msgPicSegMakeInvisible

Makes the given grafic invisible.

Takes S32, returns STATUS.

```
#define msgPicSegMakeInvisible                 MakeMsg(clsPicSeg, 33)
```

Comments Changes the grafics **opCode** by oring in **opCodeMaskInvisible**.

msgPicSegMakeVisible

Makes the given grafic visible.

Takes S32, returns STATUS.

```
#define msgPicSegMakeVisible                   MakeMsg(clsPicSeg, 34)
```

Comments Changes the grafics **opCode** by masking out **opCodeMaskInvisible**.

msgPicSegChangeOrder

Changes the order of the grafics in the display, Moving the current grafic to the given index.

Takes S32, returns STATUS.

```
#define msgPicSegChangeOrder                   MakeMsg(clsPicSeg, 35)
```

If the given index is less than the current index, then the grafics in between shift forward.

If the given index is greater than the current index, then the grafics in between shift backward.

msgPicSegSizeof

Returns the size of the (PIC_SEG_GRAFIC).**pData** in bytes.

Takes P_PIC_SEG_GRAFIC, returns S32.

```
#define msgPicSegSizeof                        MakeMsg(clsPicSeg, 39)
```

Message Arguments

```
typedef struct {
    OP_CODE         opCode;             // the type of grafic stored in pData
    P_UNKNOWN       pData;              // pointer to the grafic data
}PIC_SEG_GRAFIC, * P_PIC_SEG_GRAFIC;
```

Messages Used For Move Copy

You can move and copy grafics in picture segments using the selection manager XFER mechanism type **xferPicSegObject**. The PicSeg is a data object and only helps define the method. The PicSeg itself does not have the selection. Usually the View, using the PicSeg as its data object, responds to move and copy messages. The selected View puts **xferPicSegObject** on the list when it receives **msgXferList**. With a match the receiving View creates a global heap PicSeg and sets up the XFER_OBJECT:

```
XFER_OBJECT         xferObject;
OBJECT              picSeg;
MAT                 matrix;

memset(&xferObject, 0, sizeof(XFER_OBJECT));
xferObject.id = xferPicSegObject;
xferObject.receiver = self;

StsJmp(ObjectSendUpdate(msgXferGet, sel, &xferObject,\
  (U32)sizeof(XFER_OBJECT)), sts, error);

xferPicSeg = xferObject.uid;
ObjectCall(msgDcSetWindow, xferPicSeg, (P_ARGS)self);
ObjectCall(msgPicSegScaleUnits, xferPicSeg, (P_ARGS)psMetrics.units);
matrix.m31 = pTip->x - bounds.origin.x;
matrix.m32 = pTip->y - bounds.origin.y;
MatIdentity(matrix);
ObjectCall(msgPicSegTransform, xferPicSeg, &matrix);
ObjectCall(msgPicSegCopy, picSeg, (P_ARGS)xferPicSeg);
ObjectCall(msgDestroy, xferPicSeg, pNull);
```

The receiving View then ObjectSends **msgXferGet** to the selection. The selected View takes **msgXferGet** sets the xfer PicSeg's metrics to its own and puts the selected grafics into the global PicSeg. The receiving View must rebind the xfer PicSeg to a window using **msgDcSetWindow**. Then transform the xfer PicSeg with **msgPicSegScaleUnits** and **msgPicSegTransform**. The **xferPicSeg** is copied into the receiving View's PicSeg with **msgPicSegCopy**. The global PicSeg is then freed by the receiving View.

```
#define tagPicSeg                       MakeTag(clsPicSeg,0)
```

msgPicSegScaleUnits

Scales all coordinates in the PicSeg from the old units to the new units, then sets the units of the PicSeg to the new units.

Takes MESSAGE, returns STATUS.

```
#define msgPicSegScaleUnits                     MakeMsg(clsPicSeg, 36)
```

Comments

Valid arguments: **msgDcUnitsMetric**, **msgDcUnitsMil**, **msgDcUnitsPoints**, **msgDcUnitsTwips**, **msgDcUnitsPen**, **msgDcUnitsPen**, **msgDcUnitsDevice**, **msgDcUnitsLayout**.

Invalid arguments: **msgDcUnitsWorld**.

msgPicSegTransform

Transforms all coordinates in the PicSeg database with the provided matrix.

Takes MAT, returns STATUS.

```
#define msgPicSegTransform                      MakeMsg(clsPicSeg, 37)
```

Comments

Doesn't change line thickness, text size and rect radius. Thus this message is best used for Rotation and Translation only.

msgPicSegCopy

Copies the contents of the specified PicSeg to self.

Takes OBJECT, returns STATUS.

```
#define msgPicSegCopy                    MakeMsg(clsPicSeg, 38)
```

Comments

Takes no account for units, scale, rotate and translate differences.

SYSFONT.H

This file provides font related definitions used by sysgraf.h.

Overview

This file defines the values you give Sysgraf if you want to set the font parameters. See sysgraf.h, starting with **msgSysDcFontId**.

```
#ifndef SYSFONT_INCLUDED
#define SYSFONT_INCLUDED
```

Font Attributes

```
#define  sysDcGroupDefault          0  // also "system" font
#define  sysDcGroupUserInput        1
#define  sysDcGroupVenetian         2
#define  sysDcGroupOldStyle         3
#define  sysDcGroupTransitional     4
#define  sysDcGroupModernRoman      5
#define  sysDcGroupEgyptian         6
#define  sysDcGroupSansSerif        7
#define  sysDcGroupDisplayRoman     8
#define  sysDcGroupScript           9
#define  sysDcGroupGraphic          10
#define  sysDcGroupTypewriter       11
#define  sysDcSoftwareDefined       15 // subclass must draw glyphs

#define  sysDcWeightLight           0
#define  sysDcWeightNormal          1
#define  sysDcWeightBold            2
#define  sysDcWeightExtraBold       3

#define  sysDcAspectCondensed       0
#define  sysDcAspectNormal          1
#define  sysDcAspectExtended        2

#define  sysDcEncodeLinear          0
#define  sysDcEncodeAdobeStandard   1
#define  sysDcEncodeAdobeSymbol     2   // not implemented
#define  sysDcEncodeIBM850          3   // MiniText and MiniNote expect this
#define  sysDcEncodeGoSystem        4
#define  sysDcEncodeHWX850          5
#define  sysDcEncodeUnicode         6

#define  sysDcAlignChrTop           0
#define  sysDcAlignChrCenter        1
#define  sysDcAlignChrBaseline      2
#define  sysDcAlignChrDescender     3
```

Font Specification

To open a font a SYSDC_FONT_SPEC is used. This is a 32 bit number which may be interesting to file as a compact representation of a particular font specification (family, styles, etc., size is another matter).

It consists of two major fields, an "id", which is a 16-bit number that identifies a family, like Times Roman, or Futura.

This number can be derived from a four-byte string like "TR55" using the function SysDcFontId (defined in sysgraf.h). However, it is better to query the system as to the list of currently available fonts. Support for this exists in tktable.h (see TkTableFillArrayWithFonts) and fontlbox.h (see **clsFontListBox**).

The second field contains attributes like boldness, italic, etc. Also, it contains a field called group. The group is a redundant encoding of information in the id. If the id, which identifies a specific font or font family, is not available, the group is used to locate a font with similar characteristics.

Another interesting field is encoding. This field serves to identify the "character set" of the bytes passed to **msgDcDrawText**.

Thus, if you file this 32-bit number along with a string of text the following will hold true:

1 The "interpretation" of the characters in the string is noted.

2 The "font family" is noted

3 If the "font family" is not available the next time the string is diplayed (perhaps on a different machine), then an acceptable substitute can be found.

```
typedef struct
{
  U16     group      : 4,      // use sysDcGroup...
          weight     : 2,      // use sysDcWeight...
          aspect     : 2,      // use sysDcAspect...
          italic     : 1,      // use TRUE for italic
          monospaced : 1,      // use TRUE for monospaced
          encoding   : 6;      // use sysDcEncode...
} SYSDC_FONT_ATTR, * P_SYSDC_FONT_ATTR;
typedef struct
{
  U16              id;         // for now 0 binds to "default" font
  SYSDC_FONT_ATTR  attr;
} SYSDC_FONT_SPEC, * P_SYSDC_FONT_SPEC;
typedef struct
{
  SYSDC_FONT_SPEC     spec;                // actual
  CHAR                name[80];
  COORD16             spaceWidth,
                      underThickness,
                      underPos,            // usually a small negative number
                      xPos,
                      ascenderPos,
                      descenderPos;        // usually a small negative number
  SIZE16              em;
  COORD16             maxY,
                      minY;
} SYSDC_FONT_METRICS, * P_SYSDC_FONT_METRICS;
typedef struct
{
  COORD16             widths[256];         // per spec.encoding
} SYSDC_FONT_WIDTHS, * P_SYSDC_FONT_WIDTHS;
```

```
typedef struct
{
  U16        alignChr;    // use sysDcAlignChr...
  U16        underline;   // use 0,1, or 2
  U16        strikeout;   // use 0 or 1
  P_CHAR     pText;
  U16        lenText;     // in (and out for measure)
  XY32       cp;          // in and out, where to place string
  COORD32    stop;        // used by msgDcMeasureText
  U16        spaceChar;   // code for space, usually 32
  COORD16    spaceExtra,  // added to width of space
             otherExtra;  // added to width of every char
} SYSDC_TEXT_OUTPUT, * P_SYSDC_TEXT_OUTPUT;
typedef struct
{
  XY16     min,
           max;
  COORD16  width;
} SYSDC_EXTENTS16, * P_SYSDC_EXTENTS16;
typedef struct
{
  P_SYSDC_EXTENTS16  pExtents;
  P_CHAR             pText;
  U16                len;
} SYSDC_CHAR_METRICS, * P_SYSDC_CHAR_METRICS;
```

SYSGRAF.H

This file provides the API for **clsSysDrwCtx**.

clsSysDrwCtx inherits from **clsDrwCtx**, an abstract class.

Defines the fundamental drawing services. An instance of **clsSysDrwCtx**, often called a "DC", is an object that is used to draw onto windows. After a DC is created, it is bound to a window (see **msgDcSetWindow**). After this step, drawing messages sent to the DC will result in drawing onto the bound window. While a DC may remain bound to a window forever, such drawing messages are only effective inside an "update episode" bracketed by **msgWinBeginRepaint** and **msgWinEndRepaint**.

There are a number of other DC messages that do not have to be sent inside an "update episode"; for instance **msgDcLWCtoLUC_XY32**. However, many of these messages implicitly require device or window metrics to produce the correct results. Thus, as a rule, a DC should be bound to a window before it is used.

Terminology:

DU4 -- Device Units, 4th Quadrant. A 4th quadrant coordinate system; device space, device units. This is used internally, but not seen by application software.

LWC -- Logical Window Coordinates. A 1st quadrant coordinate system. The lower-left-hand corner of the window is 0,0. The units are device pixels.

LUC -- Logical Unit Coordinates. A 1st quadrant coordinate system provided by the DC. The default units can be a real-world measure like points or mils; and they can be translated, rotated and scaled.

A number of font-related data structures are defined in sysfont.h.

```
#ifndef SYSGRAF_INCLUDED
#define SYSGRAF_INCLUDED

#ifndef GO_INCLUDED
#include <go.h>
#endif

#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif

#ifndef GEO_INCLUDED
#include <geo.h>
#endif

#ifndef WIN_INCLUDED
#include <win.h>
#endif

#ifndef SYSFONT_INCLUDED
#include <sysfont.h>
#endif
```

Overview

Sysgraf (aka **clsSysDrawCtx** aka ImagePoint) is the lowest level drawing interface PenPoint provides above the bit level. The division of labor here is that Windows worry about parceling out screen real-estate while Sysgraf worries about drawing on the screen. If you want to draw things in a window, you create a drawing context (an instance of **clsSysDrawCtx**), bind it to the window you want to draw in (by sending **msgDcSetWindow** to the drawing context), and send messages to the drawing context.

If you plan to use a drawing context to render text, you should understand the use of **msgDcMeasureText**, which lets you determine how large a piece of text will be before you actually draw it. It is also important to know that although sysgraf allows you to set many different parameters, including font, rotation, line thickness, etc. you may only change these between drawing calls. That is, if you want to render plain text, a word in italics, and more plain text, you need to send three separate **msgDcDrawText** messages, changing to italics after the first one and back to normal after the second.

If you plan to use **sysGraf** at all, it will be well worth your while to browse all the messages below.

```
// Message numbers available: 7, 8, 9, 34, 35, 36, 37, 38; next up: 110
```

msgNew

Creates a system drawing context.

Takes P_SYSDC_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct SYSDC_NEW_ONLY {
    U32     reserved;
} SYSDC_NEW_ONLY, *P_SYSDC_NEW_ONLY;
#define sysdcNewFields  \
    objectNewFields     \
    SYSDC_NEW_ONLY      sysDc;
typedef struct
{
  sysdcNewFields
} SYSDC_NEW, * P_SYSDC_NEW;
```

msgNewDefaults

Initializes the SYSDC_NEW structure to default values.

Takes P_SYSDC_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct
{
  sysdcNewFields
} SYSDC_NEW, * P_SYSDC_NEW;
    sysDc.reserved = 0;
```

Binding to a Window

msgDcSetWindow

Binds a window to the receiver and returns the previously bound window.

Takes WIN, returns WIN.

```
#define msgDcSetWindow              msgDrwCtxSetWindow
```

Comments All output through the DC will now appear on this window. A DC must be bound to a window before most messages will work.

msgDcGetWindow

Gets the window to which the drawing context is bound.

Takes **pNull**, returns WIN.

```
#define msgDcGetWindow              msgDrwCtxGetWindow
```

Graphic State Control

msgDcInitialize

Sets graphics state to initial values.

Takes **pNull**, returns **stsOK**.

```
#define msgDcInitialize             MakeMsg(clsSysDrwCtx, 50)
```

Comments The initial values are:

```
units in (LUC)    = msgDcUnitsPoints
units out         = msgDcUnitsDevice
matrix            = identity, 1st quadrant
premultiply       = FALSE
clipping          = none, except to window
raster op         = sysDcRopCopy
drawing mode      = sysDcDrawNormal | sysDcHoldDetail
plane mask        = see msgDcPlaneNormal
line.cap          = sysDcCapButt
line.join         = sysDcJoinMiter
line.thickness    = 1 unit (point)
line.miterLimit   = 10
line.radius       = 0
foreground color  = sysDcRGBBlack
background color  = sysDcRGBWhite
fill pattern      = sysDcPatBackground
fill mode         = even/odd (see sysDcWindingFill)
line pattern      = sysDcPatForeground
logical font      = default font, size is 1 unit (point)
```

msgDcPush

Gets the graphics state and stores it.

Takes P_SYSDC_STATE, returns **stsOK**.

```
#define msgDcPush                   MakeMsg(clsSysDrwCtx, 31)
```

Arguments

```
typedef  struct
{
  U8  state[448];
} SYSDC_STATE, * P_SYSDC_STATE;
```

Comments While the names **msgDcPush/msgDcPop** imply a stack-like use for these messages (as is their intended application); this is not a requirement. There is no stack internal to the DC. State is copied in and out of the argument buffer.

One application is to pre-stage frequently needed combinations of state (fonts, colors, etc.) in an array of these buffers; and then pop them into a single DC as needed. This is more memory efficient than having several DC's, and nearly as fast.

SYSDC_STATE is an opaque data type. There is no value in examining the bytes therein. It can be stored temporarily; but, it should not be filed, as it may change from release to release of the software.

msgDcPop

Sets the graphics state from one saved by **msgDcPush**.

Takes P_SYSDC_STATE, returns **stsOK**.

```
#define msgDcPop                    MakeMsg(clsSysDrwCtx, 32)
```

Message Arguments

```
typedef  struct
{
  U8  state[448];
} SYSDC_STATE, * P_SYSDC_STATE;
```

msgDcPushFont

Gets the font state and stores it.

Takes P_SYSDC_FONT_STATE, returns **stsOK**.

```
#define msgDcPushFont               MakeMsg(clsSysDrwCtx, 51)
```

Arguments

```
typedef  struct
{
  U8  state[256];
} SYSDC_FONT_STATE, * P_SYSDC_FONT_STATE;
```

Comments

The same comments made under **msgDcPush** apply to **msgDcPushFont**.

msgDcPopFont

Sets the font state from one saved by **msgDcPushFont**.

Takes P_SYSDC_FONT_STATE, returns **stsOK**.

```
#define msgDcPopFont                MakeMsg(clsSysDrwCtx, 52)
```

Message Arguments

```
typedef  struct
{
  U8  state[256];
} SYSDC_FONT_STATE, * P_SYSDC_FONT_STATE;
```

msgDcSetMode

Sets the drawing mode and returns the old SYSDC_MODE.

Takes SYSDC_MODE, returns SYSDC_MODE.

```
#define msgDcSetMode                MakeMsg(clsSysDrwCtx,  2)
```

Arguments

```
Enum16(SYSDC_MODE)
{
  sysDcDrawNormal     = 0,
  sysDcDrawFast       = flag0,  // draw faster with gross loss of fidelity
  sysDcDrawDynamic    = flag1,  // sets up XOR style drawing
  sysDcHoldDetail     = flag2,  // keeps lines from vanishing
  sysDcWindingFill    = flag3,
  sysDcHitTest        = flag4,  // must set with msgDcHitTest
  sysDcAccumulate     = flag7,  // must set with msgDcAccumulateBounds
  sysDcHoldLine       = flag5,  // must set with msgDcHoldLine
  sysDcPreMultiply    = flag6   // can  set with msgDcSetPreMultiply
};
```

msgDcGetMode

Gets the drawing mode.

Takes **pNull**, returns SYSDC_MODE.

```
#define msgDcGetMode                MakeMsg(clsSysDrwCtx, 65)
```

msgDcSetPreMultiply

Sets the pre-multiply state and returns the old state.

Takes BOOLEAN, returns BOOLEAN.

```
#define msgDcSetPreMultiply         MakeMsg(clsSysDrwCtx, 96)
```

Comments

This affects the matrix arithmetic implicit in **msgDcScale**, **msgDcRotate** and **msgDcTranslate**. The default mode is post-multiply. The default for PostScript is pre-multiply; so when borrowing algorithms from PostScript sources this could be useful.

msgDcSetRop

Sets the raster op and returns the old rop.

Takes SYSDC_ROP, returns SYSDC_ROP.

```
#define msgDcSetRop                 MakeMsg(clsSysDrwCtx,  1)
```

Arguments

```
Enum16(SYSDC_ROP)
{
  sysDcRopCOPY,
  sysDcRopAND,
  sysDcRopOR,
  sysDcRopXOR,
  sysDcRopNCOPY,
  sysDcRopNAND,
  sysDcRopNOR,
  sysDcRopNXOR
};
```

Comments

Note that there are not many good reasons to be using this message; the results are rather device dependent. If you need to draw with an XOR raster op, use **msgDcSetMode** to set the **sysDcDrawDynamic** flag instead.

msgDcPlaneNormal

Sets the plane mask to the normal plane(s), returning the old mask.

Takes nothing, returns SYSDC_PLANE_MASK.

```
#define msgDcPlaneNormal            MakeMsg(clsSysDrwCtx, 41)
typedef U16 SYSDC_PLANE_MASK;
```

msgDcPlanePen

Sets the plane mask to the plane(s) for pen ink, returning the old mask.

Takes nothing, returns SYSDC_PLANE_MASK.

```
#define msgDcPlanePen               MakeMsg(clsSysDrwCtx, 42)
```

Comments

In most situations it is better to use **clsTrack** to draw on the pen plane(s). See track.h.

msgDcPlaneMask

Sets an arbitrary plane mask, returning the old mask.

Takes SYSDC_PLANE_MASK, returns SYSDC_PLANE_MASK.

```
#define msgDcPlaneMask              MakeMsg(clsSysDrwCtx, 43)
```

Comments

This interface is NOT RECOMMENDED for application software. It is inherently non-portable.

msgDcGetLine

Gets all line attributes if **pArgs** is P_SYSDC_LINE. Returns line thickness.

Takes P_SYSDC_LINE, returns COORD16.

```
#define msgDcGetLine                MakeMsg(clsSysDrwCtx, 62)
```

Comments

If P_SYSDC_LINE is **pNull** then only line thickness is returned.

msgDcSetLine

Sets all line attributes. Returns old line thickness.

Takes P_SYSDC_LINE, returns COORD16.

```
#define msgDcSetLine                MakeMsg(clsSysDrwCtx,  4)
```

Arguments

```
Enum16(SYSDC_CAP)
{ sysDcCapSquare   = 0,
  sysDcCapButt     = 1,
  sysDcCapRound    = 2,
};
Enum16(SYSDC_JOIN)
{ sysDcJoinMiter   = 0,
  sysDcJoinBevel   = 1,
  sysDcJoinRound   = 2,
};
typedef struct
{
  SYSDC_CAP          cap;
  SYSDC_JOIN         join;
  COORD16            thickness;
  U16                miterLimit;   // Choose + number, 10 recommended.
  S16                radius;       // For rounded corner rectangles
                                   //   use + number or sysDcRadiusAuto.
                                   // For square corner rectangles use 0.
                                   // This number is in LUC.
} SYSDC_LINE, * P_SYSDC_LINE;
#define sysDcRadiusAuto         (-1)
```

Comments

Both line thickness and the radius value for creating rounded corner rectangles are in LUC.

msgDcSetLineThickness

Sets line thickness to new value; returns old line thickness.

Takes COORD16, returns COORD16.

```
#define msgDcSetLineThickness       MakeMsg(clsSysDrwCtx, 79)
```

Comments

This is the best message for quickly changing line thickness and restoring it back.

msgDcHoldLine

Turns hold line thickness mode on/off; returns old hold mode.

Takes BOOLEAN, returns BOOLEAN.

```
#define msgDcHoldLine                MakeMsg(clsSysDrwCtx, 63)
```

Comments

msgDcHoldLine(TRUE) causes the current line thickness to be made immune from the effects of scaling (**msgDcScale**, **msgDcUnitsXXXX**). **msgDcHoldLine**(FALSE) will cancel hold mode.

msgDcSetLine/Thickness messages will cause the line thickness to change, but having changed, it will still be immune from the effects of scaling until hold mode is canceled.

The DC must be bound to a window when this message is sent.

Device Independent Color

```
#define sysDcRGBTransparent ((U32)0)
#define sysDcRGBBlack       (SysDcGrayRGB(0))
#define sysDcRGBGray66      (SysDcGrayRGB(85))
#define sysDcRGBGray33      (SysDcGrayRGB(170))
#define sysDcRGBWhite       (SysDcGrayRGB(255))
typedef union
{
  U32    all;
  struct
  {
    U8   red,
         green,
         blue,
         transparency;
  }      rgb;
} SYSDC_RGB, * P_SYSDC_RGB;
#define  SysDcGrayRGB(v)     MakeU32(MakeU16(v,v),MakeU16(v,255))
```

These messages set and get the foreground and background colors by RGB specification. The "set" messages take an RGB specification (cast to a U32) and return **stsOK**.

The "get" messages store the current value into a U32 (or SYSDC_RGB) pointed to by **pArgs**.

The structure SYSDC_RGB is a union of the four r-g-b-t fields and a U32. This allows RGB values to be compared easily as U32 values. The transparency byte should always be 255 for opaque color. It can be 0 when setting the background color to transparent (in which case the red, green, blue values are not examined). Intermediate transparency values are not supported.

The macro SysDcGrayRGB takes a value between 0..255 and returns a U32 with the r-g-b bytes set to the value, and the transparency byte set to 255. The value 0 can be used for a pure transparent RGB.

The set messages find the closest matching color to the RGB specification; they do not create new colors. To create new colors see **msgDcMixRGB** (which is not implemented yet).

Unlike the palette oriented messages (**msgDcSetForegroundColor**, **msgDcSetBackgroundColor**) colors set using these RGB messages are portable across a variety of devices and are automatically retranslated when the DC is connected to a different device.

msgDcSetForegroundRGB

Sets foreground color using an RGB specification.

Takes U32, returns stsOK.

```
#define msgDcSetForegroundRGB       MakeMsg(clsSysDrwCtx, 75)
```

Comments — When using this interface, see the constants **sysDcRGB...** for the standard colors.

msgDcSetBackgroundRGB

Sets background color using an RGB specification.

Takes U32, returns stsOK.

```
#define msgDcSetBackgroundRGB       MakeMsg(clsSysDrwCtx, 76)
```

Comments — When using this interface, see the constants **sysDcRGB...** for the standard colors.

msgDcInvertColors

Swaps foreground and background colors.

Takes pNull, returns stsOK.

```
#define msgDcInvertColors           MakeMsg(clsSysDrwCtx, 64)
```

msgDcGetForegroundRGB

Returns foreground RGB value.

Takes P_U32 or P_SYSDC_RGB, returns stsOK.

```
#define msgDcGetForegroundRGB       MakeMsg(clsSysDrwCtx, 77)
```

msgDcGetBackgroundRGB

Returns background RGB value.

Takes P_U32 or P_SYSDC_RGB, returns stsOK.

```
#define msgDcGetBackgroundRGB       MakeMsg(clsSysDrwCtx, 78)
```

Device Dependent Color

```
typedef U16 SYSDC_COLOR;
#define sysDcInkTransparent ((SYSDC_COLOR)0x8000)
#define sysDcInkBlack       ((SYSDC_COLOR)0x0000)
#define sysDcInkGray66      ((SYSDC_COLOR)0x0001)
#define sysDcInkGray33      ((SYSDC_COLOR)0x0002)
#define sysDcInkWhite       ((SYSDC_COLOR)0x0003)
```

msgDcMatchRGB

Returns palette entry that best matches an RGB.

Takes U32, returns SYSDC_COLOR.

```
#define msgDcMatchRGB               MakeMsg(clsSysDrwCtx, 10)
```

Comments — This interface is NOT RECOMMENDED for application software. Set colors directly using the **msgDcSetForegroundRGB** and **msgDcSetBackgroundRGB** messages.

msgDcSetForegroundColor

Sets foreground color using a hardware palette index, returning old color.

Takes SYSDC_COLOR, returns SYSDC_COLOR.

```
#define msgDcSetForegroundColor     MakeMsg(clsSysDrwCtx,  5)
```

Comments

This interface is NOT RECOMMENDED for application software. Use **msgDcSetForegroundRGB** instead of this message.

When using this interface, see the constants **sysDcInk...** for predefined palette index values.

msgDcSetBackgroundColor

Sets background color using a hardware palette index, returning old color.

Takes SYSDC_COLOR, returns SYSDC_COLOR.

```
#define msgDcSetBackgroundColor     MakeMsg(clsSysDrwCtx,  6)
```

Comments

This interface is NOT RECOMMENDED for application software. Use **msgDcSetBackgroundRGB** instead of this message.

When using this interface, see the constants **sysDcInk...** for predefined palette index values.

msgDcMixRGB

Programs a palette slot to a specific RGB.

Takes P_SYSDC_MIX_RGB, returns STATUS.

```
#define msgDcMixRGB                 MakeMsg(clsSysDrwCtx, 80)
```

Arguments

```
typedef struct
{
  SYSDC_COLOR  slot;
  SYSDC_RGB    spec;
} SYSDC_MIX_RGB, * P_SYSDC_MIX_RGB;
```

Comments

*** NOT IMPLEMENTED YET ***

This interface is NOT RECOMMENDED for application software. The type SYSDC_MIX_RGB is defined now to support **msgWinDevMixRGB**.

msgDcSetLinePat

Sets the line pattern; returns old value.

Takes SYSDC_PATTERN, returns SYSDC_PATTERN.

```
#define msgDcSetLinePat             MakeMsg(clsSysDrwCtx, 11)
typedef U16 SYSDC_PATTERN;
#define sysDcPat75      ((SYSDC_PATTERN)1)      //  75% fgnd  25% bgnd
#define sysDcPat50      ((SYSDC_PATTERN)2)      //  50% fgnd  50% bgnd
#define sysDcPat25      ((SYSDC_PATTERN)3)      //  25% fgnd  75% bgnd
#define sysDcPat12      ((SYSDC_PATTERN)4)      //  12% fgnd  88% bgnd
#define sysDcPat6       ((SYSDC_PATTERN)5)      //   6% fgnd  94% bgnd
#define sysDcPat3       ((SYSDC_PATTERN)6)      //   3% fgnd  97% bgnd
#define sysDcPat2       ((SYSDC_PATTERN)7)      //   2% fgnd  98% bgnd
#define sysDcPatLD50    ((SYSDC_PATTERN)8)      // darkest  left  diagonal
#define sysDcPatLD37    ((SYSDC_PATTERN)9)      //          left  diagonal
#define sysDcPatLD25    ((SYSDC_PATTERN)10)     //          left  diagonal
#define sysDcPatLD12    ((SYSDC_PATTERN)11)     // lightest left  diagonal
#define sysDcPatRD50    ((SYSDC_PATTERN)12)     // darkest  right diagonal
```

```
#define sysDcPatRD37    ((SYSDC_PATTERN)13)      //          right diagonal
#define sysDcPatRD25    ((SYSDC_PATTERN)14)      //          right diagonal
#define sysDcPatRD12    ((SYSDC_PATTERN)15)      // lightest right diagonal
#define sysDcPatBackground ((SYSDC_PATTERN)0)       //   0% fgnd 100% bgnd
#define sysDcPatForeground ((SYSDC_PATTERN)0xFFF1) // 100% fgnd   0% bgnd
#define sysDcPatNil        ((SYSDC_PATTERN)0xFFF0) //   0% fgnd   0% bgnd
#define sysDcPatRandom     ((SYSDC_PATTERN)0xFFF2) //  debugging aid
```

Comments The line pattern is used to draw lines around the edge of geometric figures when the line thickness is > 0.

When using this interface, see the constants **sysDcPat...** for predefined patterns.

msgDcSetFillPat

Sets the fill pattern; returns old value.

Takes SYSDC_PATTERN, returns SYSDC_PATTERN.

```
#define msgDcSetFillPat             MakeMsg(clsSysDrwCtx, 12)
```

Comments The fill pattern is used to draw the interior of closed geometric figures.

When using this interface, see the constants **sysDcPat...** for predefined patterns. **sysDcPatRandom** is unique for each window.

msgDcGetLinePat

Gets the line pattern.

Takes **pNull**, returns SYSDC_PATTERN.

```
#define msgDcGetLinePat             MakeMsg(clsSysDrwCtx, 13)
```

Comments *** NOT IMPLEMENTED YET ***

msgDcGetFillPat

Gets the fill pattern.

Takes **pNull**, returns SYSDC_PATTERN.

```
#define msgDcGetFillPat             MakeMsg(clsSysDrwCtx, 14)
```

Comments *** NOT IMPLEMENTED YET ***

msgDcMixPattern

Mixes a custom pattern.

Takes P_SYSDC_MIX_PAT, returns STATUS.

```
#define msgDcMixPattern             MakeMsg(clsSysDrwCtx, 15)
```

Arguments

```
typedef struct
{
  SYSDC_PATTERN  slot;
  U8             pattern[8];
} SYSDC_MIX_PAT, * P_SYSDC_MIX_PAT;
```

Comments *** NOT IMPLEMENTED YET ***

msgDcAlignPattern

Sets the pattern alignment in LUC.

Takes P_XY32, returns STATUS.

```
#define msgDcAlignPattern          MakeMsg(clsSysDrwCtx, 16)
```

Comments

Can be used to keep pattern tiling aligned to a particular point in LUC when pixels are moved (**msgWinCopyRect** or **wsGrow*** flags). This is most commonly used to preserve pattern alignment during "scrolling" when parts of an image are copied pixels, and parts are newly painted pixels.

The default alignment is 0,0 in LUC. If the image is scrolled by **msgDcTranslate** then this message may not be necessary, as the alignment point will move in device space too.

If P_XY32 is **pNull**, default alignment is set to 0,0.

LUC Space Transformations

msgDcUnitsMetric

Sets input units to 0.01 mm.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsMetric           MakeMsg(clsSysDrwCtx, 17)
```

msgDcUnitsMil

Sets input units to 0.001 inch.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsMil              MakeMsg(clsSysDrwCtx, 18)
```

msgDcUnitsPoints

Sets input units to points (1/72 of an inch).

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsPoints           MakeMsg(clsSysDrwCtx, 19)
```

msgDcUnitsTwips

Sets input units to 1/20 of a point.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsTwips            MakeMsg(clsSysDrwCtx, 20)
```

msgDcUnitsPen

Sets input units to pen sample units.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsPen              MakeMsg(clsSysDrwCtx, 71)
```

msgDcUnitsLayout

Sets input units to UI toolkit layout units.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsLayout            MakeMsg(clsSysDrwCtx, 85)
```

Comments

Note that the scale this implicitly computes is a function of the current system font size. However, if the system font size changes after this message is sent, the scale is not "reliably" reevaluated (because of caching it may or may not be reevaluated). Thus, you may need to observe **theSystemPreferences**. For a small performance cost you can just send this message prior to each operation that is affected by unit scaling.

msgDcUnitsRules

Sets input units to the 'rules' associated with the system font.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsRules             MakeMsg(clsSysDrwCtx, 3)
```

Comments

A 'rule' is 1/20 of the thickness of a line that aesthetically matches the weight of the system font, as specified by the font designer. Typically this will be the thickness of a single underline, and so a rule would be 1/20 of an underline.

Note that the scale this implicitly computes is a function of the current system font size. However, if the system font size changes after this message is sent, the scale is not "reliably" reevaluated (because of caching it may or may not be reevaluated). Thus, you may need to observe **theSystemPreferences**. For a small performance cost you can just send this message prior to each operation that is affected by unit scaling.

msgDcUnitsDevice

Sets input units to device pixels.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsDevice            MakeMsg(clsSysDrwCtx, 21)
```

msgDcUnitsWorld

Sets input units to an arbitrary number of device pixels.

Takes **pNull**, returns **stsOK**.

```
#define msgDcUnitsWorld             MakeMsg(clsSysDrwCtx, 25)
```

See Also

msgDcScaleWorld

msgDcUnitsOut

Sets output units produced by transformation of input units.

Takes MESSAGE, returns **stsOK**.

```
#define msgDcUnitsOut               MakeMsg(clsSysDrwCtx, 70)
```

Comments

Takes one of:

msgDcUnitsMetric

In general, this message should not be used. Reverse transformations, from device units to other units can be made by using the **msgDcLUCtoLWC...** messages.

This interface can be used to change from one logical unit system to another. Since most such transformations are known in advance this is generally useless; however, transformation to and from pen units to a known unit system is the real purpose of this interface. For instance, pen units to mils can be used to store pen units in a device independent form. Pen units can thus remain device dependent.

This interface cannot change a graphic device unit into a device independent unit. To do this, units IN must be the chosen target unit (e.g. points), units OUT must be device, and the reverse transformation, **msgDcLUCtoLWC** must be used.

msgDcIdentity

Sets LUC matrix to identity.

Takes **pNull**, returns **stsOK**.

```
#define msgDcIdentity          MakeMsg(clsSysDrwCtx, 22)
```

See Also **msgDcIdentityFont**

msgDcRotate

Rotates LUC matrix.

Takes ANGLE, returns **stsOK**.

```
#define msgDcRotate            MakeMsg(clsSysDrwCtx, 23)
```

msgDcScale

Scales LUC matrix.

Takes P_SCALE, returns **stsOK**.

```
#define msgDcScale             MakeMsg(clsSysDrwCtx, 26)
```

Comments If P_SCALE is **pNull** then operation is same as **msgDcIdentity**.

msgDcScaleWorld

Creates a world scale of window width/height.

Takes P_SIZE32, returns **stsOK**.

```
#define msgDcScaleWorld        MakeMsg(clsSysDrwCtx, 61)
```

Comments The window width/height is divided into SIZE32 width/height units. If the window is not physically square on the graphic device then the scale will not be uniform in x and y.

This message scales the LUC matrix. Typically, this matrix must be reset to identity (**msgDcIdentity**), and this message must be resent, whenever the window changes size (see **msgWinSized** for help).

The DC must be bound to a window when it receives this message.

msgDcTranslate

Translates LUC matrix.

Takes P_XY32, returns **stsOK**.

```
#define msgDcTranslate         MakeMsg(clsSysDrwCtx, 24)
```

Coordinate Conversion

These messages convert coordinates from LUC to LWC, or LWC to LUC. The DC must be bound to a window before it receives these messages.

msgDcLWCtoLUC_XY32

Transforms a point from window (device) space to logical space.

Takes P_XY32, returns stsOK.

```
#define msgDcLWCtoLUC_XY32          MakeMsg(clsSysDrwCtx, 27)
```

Comments

The DC transforms by:

LWC --> fractional LUC --> round to nearest integer LUC

msgDcLUCtoLWC_XY32

Transforms a point from logical space to window (device) space.

Takes P_XY32, returns stsOK.

```
#define msgDcLUCtoLWC_XY32          MakeMsg(clsSysDrwCtx, 39)
```

Comments

The DC transforms by:

LUC --> fractional LWC --> round to nearest integer LWC

msgDcLWCtoLUC_SIZE32

Transforms a size from window (device) space to logical space.

Takes P_SIZE32, returns stsOK.

```
#define msgDcLWCtoLUC_SIZE32        MakeMsg(clsSysDrwCtx, 44)
```

Comments

The DC transforms by:

LWC --> fractional LUC --> round to nearest integer LUC --> Abs()

msgDcLUCtoLWC_SIZE32

Transforms a size from logical space to window (device) space.

Takes P_SIZE32, returns stsOK.

```
#define msgDcLUCtoLWC_SIZE32        MakeMsg(clsSysDrwCtx, 45)
```

Comments

The DC transforms by:

LUC --> fractional LWC --> round to nearest integer LWC --> Abs()

msgDcLWCtoLUC_RECT32

Transforms a rectangle from window (device) space to logical space.

Takes P_RECT32, returns stsOK.

```
#define msgDcLWCtoLUC_RECT32        MakeMsg(clsSysDrwCtx, 46)
```

Comments

The DC transforms by:

1) converting the rectangle's origin and opposite corner (x+w, y+h)

into fractional LUC,

2) rounding each point to the nearest integer coordinate, and

3) using those coordinates to determine a rectangle (whose width and height may be positive or negative).

msgDcLUCtoLWC_RECT32

Transforms a rectangle from logical space to window (device) space.

Takes P_RECT32, returns **stsOK**.

```
#define msgDcLUCtoLWC_RECT32        MakeMsg(clsSysDrwCtx, 47)
```

Comments The DC transforms by:

1) converting the rectangle's origin and opposite corner (x+w, y+h) into fractional LWC,

2) rounding each point to the nearest integer coordinate, and

3) using those coordinates to determine a rectangle (whose width and height may be positive or negative).

msgDcGetMatrix

Returns the LWC matrix.

Takes P_MAT, returns **stsOK**.

```
#define msgDcGetMatrix              MakeMsg(clsSysDrwCtx, 40)
```

Comments The DC must be bound to a window when this message is sent. This matrix transforms LUC to LWC (first quadrant, but device dependent units) coordinates. These coordinates are suitable for positioning windows.

msgDcGetMatrixLUC

Returns the LUC matrix.

Takes P_MAT, returns **stsOK**.

```
#define msgDcGetMatrixLUC           MakeMsg(clsSysDrwCtx, 87)
```

Comments This matrix combines transformations to LUC space. It is identity unless **msgDcScale**, **msgDcRotate**, **msgDcTranslate**, **msgDcScaleWorld**, or **msgDcSetMatrixLUC** have been previously sent.

The default for these combinations is post-multiplication. See message **msgDcSetPreMultiply** for more on this subject.

msgDcSetMatrixLUC

Replaces the LUC matrix.

Takes P_MAT, returns **stsOK**.

```
#define msgDcSetMatrixLUC           MakeMsg(clsSysDrwCtx, 88)
```

Clipping

msgDcClipRect

Sets or clears clip rectangle.

Takes P_RECT32 or **pNull**, returns **stsOK**.

```
#define msgDcClipRect                MakeMsg(clsSysDrwCtx, 28)
```

Comments

If P_RECT32 is **pNull** then operation is same as **msgDcClipClear**.

msgDcClipClear

Returns clipping to entire window.

Takes **pNull**, returns **stsOK**.

```
#define msgDcClipClear               MakeMsg(clsSysDrwCtx, 29)
```

msgDcClipNull

Suspends all clipping (except to raw device).

Takes **pNull**, returns **stsOK**.

```
#define msgDcClipNull                MakeMsg(clsSysDrwCtx, 30)
```

Comments

The pen handler uses this to dribble ink anywhere on-screen (in the pen plane(s) only).

This interface is NOT RECOMMENDED for application software. It will protection fault if the caller does not have hardware privilege.

Hit Detection

msgDcHitTest

Turns hit testing on/off.

Takes P_RECT32 or **pNull**, returns **stsOK**.

```
#define msgDcHitTest                 MakeMsg(clsSysDrwCtx, 66)
```

Comments

To turn hit testing on supply a rectangle to test against. To turn hit testing off send **pNull**.

In general, drawing messages (**msgDcDraw...**) will return one of the status values **stsDcHit...** if hit testing is on:

stsDcHitOn if the line intersects the hit rectangleif the rectangle is inside a closed figureif there was no hit

The following drawing messages implement hit testing:

msgDcDrawPolyline

Bounds Accumulation

A region is available to accumulate the bounding rectangles of drawing operations. **msgDcAccumulateBounds(pNull)** clears this region to empty and turns on accumulation. At this point, as in hit testing, drawing operations will not be output; rather, their bounding rectangles will be added to the accumulation. At any time the accumulation can be retrieved by using **msgDcGetBounds**. It can

be retrieved with another call to **msgDcAccumulateBounds**(P_RECT32); which will both retrieve it, and turn off accumulation so normal drawing can resume.

Normally, bounds are accumulated for the purpose of repainting part of a window. **msgDcDirtyAccumulation** can be used to add the accumulation directly to the dirty region of the current window. This is more efficient than getting the bounds rectangle and then sending **msgWinDirtyRect**.

Bounds accumulation occurs in DU4 space; while the bounds rectangle is returned in LUC, it always represents a rectangle in DU4. Thus, drawing which is clipped because of windowing, or because it falls off the edges of the device, is not accumulated.

The bounds accumulation region itself is not part of the logical state, although the flag that determines whether drawing operations accumulate or draw is part of the logical state. Thus, while calls to push and pop the state may turn accumulation on or off, there are not separate copies of the accumulation region itself in the state.

Bounds accumulation and hit testing cannot be performed at the same time. If, through program error, both modes are enabled, bounds accumulation will take priority.

Neither bounds accumulation or hit testing should be used during repainting initiated by the window manager sending **msgWinRepaint**. Rather, they should be used within a **msgWinBeginPaint** **msgWinEndPaint** bracket.

msgDcAccumulateBounds

Starts or stops bounds accumulation; retrieve bounds.

Takes P_RECT or **pNull**, returns **stsOK**.

```
#define msgDcAccumulateBounds       MakeMsg(clsSysDrwCtx, 81)
```

Comments

If **pArgs** is **pNull**, clears current accumulation and turns accumulation on. If **pArgs** is P_RECT32, returns accumulated bounds, and turns bounds accumulation off.

The DC computes the LUC rectangle so that it:

1) mathematically includes all of the accumulated pixels, and

2) has non-negative width and height.

msgDcDirtyAccumulation

Marks accumulation dirty; turns accumulation off; retrieves bounds.

Takes P_RECT32 or **pNull**, returns **stsOK**.

```
#define msgDcDirtyAccumulation      MakeMsg(clsSysDrwCtx, 82)
```

Comments

Adds current bounds accumulation directly to the dirty region of the current window; then clears current bounds accumulation and turns accumulation off. If **pArgs** is P_RECT32, returns accumulated bounds as in **msgDcAccumulateBounds**.

msgDcGetBounds

Retrieves current accumulation bounds rectangle.

Takes P_RECT32, returns **stsOK**.

```
#define msgDcGetBounds              MakeMsg(clsSysDrwCtx, 83)
```

Arguments

```
typedef struct
{
  U16     count;    // number of points in points array
  P_XY32  points;   // pointer to array of at least 2 points
} SYSDC_POLYGON , * P_SYSDC_POLYGON ,
  SYSDC_POLYLINE, * P_SYSDC_POLYLINE;
typedef struct
{
  RECT32  bounds;
  XY32    rays[2];
} SYSDC_ARC_RAYS, * P_SYSDC_ARC_RAYS;
```

Comments

Does not clear accumulation or turn accumulation off. The DC computes the LUC rectangle as in **msgDcAccumulateBounds**.

Open Figures

msgDcDrawPolyline

Draws a line; needs at least 2 points. Returns either hit test or **stsOK**.

Takes P_SYSDC_POLYLINE, returns STATUS.

```
#define msgDcDrawPolyline          MakeMsg(clsSysDrwCtx,100)
```

Return Value

stsDcHitOn

msgDcDrawBezier

Draws a Bezier curve; needs exactly 4 points.

Takes P_XY32 (array of 4), returns STATUS.

```
#define msgDcDrawBezier            MakeMsg(clsSysDrwCtx,104)
```

Comments

Returns either hit test or **stsOK**.

Return Value

stsDcHitOn

msgDcDrawArcRays

Draws an arc using the two rays method. Returns either hit test or **stsOK**.

Takes P_SYSDC_ARC_RAYS, returns STATUS.

```
#define msgDcDrawArcRays           MakeMsg(clsSysDrwCtx,105)
```

Message Arguments

```
typedef struct
{
  RECT32  bounds;
  XY32    rays[2];
} SYSDC_ARC_RAYS, * P_SYSDC_ARC_RAYS;
```

Return Value

stsDcHitOn

Closed Figures

msgDcSetPixel

Sets a pixel with a value.

Takes P_SYSDC_PIXEL, returns STATUS.

```
#define msgDcSetPixel                MakeMsg(clsSysDrwCtx,108)
```

Comments If rgb is true, the color is interpreted as an RGB value; if not, color.all will be interpreted as a SYSDC_COLOR (a hardware palette index). If rgb is used then the transparency byte must be 255 (opaque) or the drawing will not take place.

msgDcGetPixel

Gets a pixel value.

Takes P_SYSDC_PIXEL, returns STATUS.

```
#define msgDcGetPixel                MakeMsg(clsSysDrwCtx,109)
```

Arguments

```
typedef struct
{
  BOOLEAN    rgb;
  SYSDC_RGB  color;
  XY32       xy;
} SYSDC_PIXEL, * P_SYSDC_PIXEL;
```

Comments If rgb is TRUE the color is returned as an RGB value; if not color.all will be a small number which should be interpreted as a SYSDC_COLOR (a hardware palette index). If rgb is used the transparency byte will always be returned as 255 (opaque).

msgDcDrawRectangle

Draws a rectangle. Returns either hit test or **stsOK**.

Takes P_RECT32, returns STATUS.

```
#define msgDcDrawRectangle           MakeMsg(clsSysDrwCtx,101)
```

Return Value stsDcHitOn

msgDcDrawEllipse

Draws an ellipse. Returns either hit test or **stsOK**.

Takes P_RECT32, returns STATUS.

```
#define msgDcDrawEllipse             MakeMsg(clsSysDrwCtx,102)
```

Return Value stsDcHitOn

msgDcDrawPolygon

Draws a polygon. Returns either hit test or **stsOK**.

Takes P_SYSDC_POLYGON, returns STATUS.

```
#define msgDcDrawPolygon             MakeMsg(clsSysDrwCtx,103)
```

Message Arguments

```
typedef struct
{
  U16     count;    // number of points in points array
  P_XY32  points;   // pointer to array of at least 2 points
} SYSDC_POLYGON , * P_SYSDC_POLYGON ,
```

Return Value stsDcHitOn

msgDcDrawSectorRays

Draws a sector (pie wedge) using the two rays method.

Takes P_SYSDC_ARC_RAYS, returns STATUS.

```
#define msgDcDrawSectorRays          MakeMsg(clsSysDrwCtx,106)
```

Message Arguments

```
typedef struct
{
  RECT32  bounds;
  XY32    rays[2];
} SYSDC_ARC_RAYS, * P_SYSDC_ARC_RAYS;
```

Comments

Returns either hit test or **stsOK**.

Return Value

stsDcHitOn

msgDcDrawChordRays

Draws a chord using the two rays method. Returns either hit test or **stsOK**.

Takes P_SYSDC_ARC_RAYS, returns STATUS.

```
#define msgDcDrawChordRays           MakeMsg(clsSysDrwCtx,107)
```

Message Arguments

```
typedef struct
{
  RECT32  bounds;
  XY32    rays[2];
} SYSDC_ARC_RAYS, * P_SYSDC_ARC_RAYS;
```

Return Value

stsDcHitOn

msgDcFillWindow

Frames window with a line and fills the window.

Takes **pNull**, returns **stsOK**.

```
#define msgDcFillWindow              MakeMsg(clsSysDrwCtx, 33)
```

Comments

Draws a rectangle exactly the size of the window. All line, fill and color attributes apply.

When drawing a rectangle, the first pixel of line thickness is painted "inside" the rectangle, the second "outside", and it alternates from there. Therefore, lines > 1 pixel thick will have 1/2 their thickness fall outside the window when using this message. If that drawing is clipped (as it normally is) the line will appear 1/2 as thick as one would expect.

Sampled Image Processing

msgDcDrawImage

Draws an image from sampled image data. The image will be scaled, rotated, translated, according to the current state.

Takes P_SYSDC_IMAGE_INFO, returns STATUS.

```
#define msgDcDrawImage               MakeMsg(clsSysDrwCtx, 48)
#define msgDcGetSrcRow               MakeMsg(clsSysDrwCtx, 49)
```

Arguments

```
Enum16(SYSDC_IMAGE_FLAGS)
{
  sysDcImageNoFilter      =  0,       // fast but poor fidelity
  sysDcImageLoFilter      =  flag0,   // use this for most image data
  sysDcImageHiFilter      =  flag1,   // use this for color image data
  sysDcImageRunLength     =  flag2,          // run length encoded
  sysDcImage1BPS          =  flag3,          // 1 bit  per sample
  sysDcImage2BPS          = (flag2|flag3),   // 2 bits per sample
  sysDcImage4BPS          =  flag4,          // 4 bits per sample
  sysDcImage8BPS          =  0,              // 8 bits per sample
  sysDcImageCallBack      =  flag8,   // callBack is a P_SYSDC_GETROW function
  sysDcImageCallObject    =  flag9,   // callBack is a OBJECT
  sysDcImageFillWindow    =  flag10,  // dstRect not provided
  sysDcImagePolarityFalse =  flag11   //      paint '0' w/ background color
                                      // else paint '1' w/ foreground color
};
typedef struct SYSDC_IMAGE_INFO * P_SYSDC_IMAGE_INFO;
typedef BOOLEAN FunctionPtr(P_SYSDC_GETROW)(P_SYSDC_IMAGE_INFO pCtx);
typedef struct SYSDC_IMAGE_INFO
{
  RECT32             dstRect;      // destination size and position
  SIZE16             srcSize;      // # of source samples
  SYSDC_IMAGE_FLAGS  flags;
  union
  {
    P_SYSDC_GETROW   function;
    OBJECT           object;
  }                  callBack;
  P_UNKNOWN          pBuffer;
  P_UNKNOWN          pClientData;
  P_UNKNOWN          reserved[3];
} SYSDC_IMAGE_INFO;
```

Comments

This message is similar to the PostScript image operator. Sample data, in the form of numbers ranging from 0..max are interpreted as grey values. 0 is black and max is white. The value of max is determined by the size of the input numbers, which can be 1, 2, 4 or 8 bits.

Because the sample data may be large, in a file, or incrementally decompressed, this message can work with a callback strategy. The callback can be either a function (flag **sysDcImageCallBack**), or an object (flag **sysDcImageCallObject**) to which **msgDcGetSrcRow** is sent. In both cases the argument is the same pointer to a SYSDC_IMAGE_INFO that is the argument to **msgDcDrawImage** itself. To support client context during the callback, the field **pClientData** is provided, for the callback to use as necessary.

The source sample data width and height is described by **srcSize**. The rectangle at the destination, which will be filled by the image, is **dstRect**; or optionally, the flag **sysDcImageFillWindow** can be used to fill the entire window.

During the callback, **pBuffer** will point to a buffer that needs to be filled with **srcSize.w** samples. If **pBuffer** is **pNull**, it means the operator is skipping a row (because of clipping perhaps). Thus, no samples need to be provided, but the context must be "advanced" to skip the row. If anything goes wrong, the callback can return FALSE (for a function), or a bad status code (for an object) to terminate the drawing.

If callback is not used at all, then **pBuffer** should be set by the caller to point to all of the sample data at the outset.

The result of the drawing is that **dstRect** is filled with an image. Since **dstRect** is in LUC space, its size and location is the same as if it were drawn with **msgDcDrawRectangle**.

Before using this interface to display "tiff" images, investigate **clsTiff** (tiff.h) for a much higher level service.

Return Value

stsDcHitOn

msgDcDrawImageMask

Draws a mask from sampled image data. Similar to **msgDcDrawImage**.

Takes P_SYSDC_IMAGE_INFO, returns STATUS.

```
#define msgDcDrawImageMask          MakeMsg(clsSysDrwCtx, 97)
```

Message Arguments

```
typedef struct SYSDC_IMAGE_INFO
{
  RECT32              dstRect;      // destination size and position
  SIZE16              srcSize;      // # of source samples
  SYSDC_IMAGE_FLAGS   flags;
  union
  {
    P_SYSDC_GETROW    function;
    OBJECT            object;
  }                   callBack;
  P_UNKNOWN           pBuffer;
  P_UNKNOWN           pClientData;
  P_UNKNOWN           reserved[3];
} SYSDC_IMAGE_INFO;
```

Comments

This message is similar to the PostScript imagemask operator and **msgDcDrawImage**. The input parameters are the same as for **msgDcDrawImage** with the addition of one flag, **sysDcImagePolarityFalse**, which would normally not be set (TRUE). However, the results of this message are visually different than **msgDcDrawImage**.

msgDcDrawImage reduces the input data to grey values and paints an opaque parallelogram. The values of the current foreground and background colors have no effect on the behavior of **msgDcDrawImage**.

msgDcDrawImageMask reduces the input data to the values '0' and '1'. The default behavior is for the '1' values to be painted with the current foreground color; the '0' values are not painted at all.

This behavior can be reversed by setting the **sysDcImagePolarityFalse** flag. In this case the '0' values are painted with the current background color and the '1' values are not painted.

Return Value

stsDcHitOn

msgDcCacheImage

Passes back a cached image in **pCache**, given a sampled image and an optional mask.

Takes P_SYSDC_CACHE_IMAGE, returns STATUS.

```
#define msgDcCacheImage             MakeMsg(clsSysDrwCtx, 91)
```

Arguments

```
typedef struct
{
  SYSDC_IMAGE_INFO    image[2];       // in  = [0] is image, [1] is mask
  BOOLEAN             hasMask;        // in  = if this is true
  XY16                hotSpot;        // in
  P_UNKNOWN           pCache;         // out = cache (segment)
} SYSDC_CACHE_IMAGE, * P_SYSDC_CACHE_IMAGE;
```

Comments

A "cached image" is a segment of memory (**pCache**) that contains the device-dependent (pixelmap) representation of a sampled image (see **msgDcDrawImage**), and optionally a mask.

This operator is intended to be used for cursors and icons. It currently does not work on printer devices.

Once cached, the image can be drawn (with hotspot adjustment) using **msgDcCopyImage**.

Because of its device dependent representation, a cached image becomes obsolete when the device rotation changes (landscape vs. portrait). Thus, you may need to observe **theSystemPreferences** and rebuild the cache when appropriate. When you are finished with the cached image you should free it with OSHeapBlockFree.

msgDcCopyImage

Copies a cached image to the bound window.

Takes P_SYSDC_COPY_IMAGE, returns STATUS.

```
#define msgDcCopyImage              MakeMsg(clsSysDrwCtx, 92)
```

Arguments

```
typedef struct
{
  XY32                xy;             // in = destination location
  P_UNKNOWN           pCache;         // in
} SYSDC_COPY_IMAGE, * P_SYSDC_COPY_IMAGE;
```

Comments

The image is copied, such that the hotspot aligns on xy.

Fonts

Some of the data structures used in the font interface are declared in sysfont.h.

All font metric information is currently computed in LUC space. However, because all the relevant numbers, except for scaling, are integers, significant round-off error can occur. For instance, at 10 or 12 points, a small feature, like x-height, will be a very small number. If LUC is relatively coarse, the error may be significant. The same holds true for the quality of inter-character spacing. Each character within a string of text output is positioned in LUC space, and the positioning will be no more accurate than the granularity of LUC. In general, the use of TWIPS units, or even finer units, is recommended if high quality text at small point sizes is required. Note that this may change in the future--read on.

While this approach produces less than perfect results on screen, it does have the benefit of maintaining very close correspondence between screen and printer; such that the same code can be used for both with no significant variance. In general, each character will be positioned to within one LUC unit or one device pixel (whichever is larger), of accuracy.

In future versions, the text measurement messages may change so that they advance character by character in an internal coordinate space that doesn't match LUC. This would allow accurate intercharacter spacing regardless of the granularity of LUC.

SysDcFontId

Takes a 4 byte string font description and returns a 16-bit font id number.

Returns U16.

```
U16 EXPORTED SysDcFontId(P_CHAR     // In: a string like "HE55"
                         );
```

SysDcFontString

Takes a 16-bit font id number and passes back a 4 char string.

Returns void.

```
void EXPORTED SysDcFontString(U16,      // In: a font id number
                              P_CHAR  // Out: a string like "HE55"
                             );
```

Comments

The string buffer should be at least 5 bytes long.

msgDcOpenFont

Opens a font.

Takes P_SYSDC_FONT_SPEC or **pNull**, returns **stsOK**.

```
#define msgDcOpenFont                MakeMsg(clsSysDrwCtx, 53)
```

Comments

Specifying **pNull** will open default font.

msgDcScaleFont

Scales font matrix.

Takes P_SCALE or **pNull**, returns **stsOK**.

```
#define msgDcScaleFont               MakeMsg(clsSysDrwCtx, 54)
```

Comments

If argument is **pNull** then behavior is same as **msgDcIdentityFont**. The default size of a newly opened font is 1 unit (LUC). Use this message to scale to the desired size.

Note that this scaling is cumulative (multiplicative). A scale of 10,10 followed by a scale of 12,12 will result in a scale of 120,120. When "switching to absolute sizes" a **msgDcIdentityFont** will usually be needed.

Note also that font scale is affected by the overall scale established by the **msgDcUnits...** messages, and **msgDcScale**.

msgDcIdentityFont

Sets font matrix scale to default of 1 unit (LUC).

Takes **pNull**, returns **stsOK**.

```
#define msgDcIdentityFont            MakeMsg(clsSysDrwCtx, 72)
```

msgDcDrawText

Draws text in the current font.

Takes P_SYSDC_TEXT_OUTPUT, returns **stsOK**.

```
#define msgDcDrawText                MakeMsg(clsSysDrwCtx, 55)
```

msgDcMeasureText

Computes size of text and advances **pArgs->cp** accordingly.

Takes P_SYSDC_TEXT_OUTPUT, returns **stsOK**.

```
#define msgDcMeasureText             MakeMsg(clsSysDrwCtx, 57)
```

Comments

Measuring stops when stop is exceeded. Stop will normally be a "right margin". This is used to measure out lines of text from a large buffer. Upon return **lenText** will be the number of characters that "fit". This information can then be used to break and justify lines.

To simply measure an entire string, set cp.x = 0 and stop = **maxS32**; upon return cp.x will be the length of the string in LUC.

During measuring, other parameters, like **spaceExtra** and **otherExtra** are significant.

---

msgDcDrawTextRun

Like **msgDcDrawText**, except run spacing applies.

Takes P_SYSDC_TEXT_OUTPUT, returns **stsOK**.

```
#define msgDcDrawTextRun          MakeMsg(clsSysDrwCtx, 73)
```

Comments

Run spacing is important when **spaceExtra** and **otherExtra** contain non-zero values; especially when underlining. For instance, if **otherExtra** is 10, then 10 units will be added after the last character when using run spacing. It would not be added when using the normal DrawText message. This affects the cp.x value returned, and is visually significant when underlining or strikethrough are performed (the 10 units would have the lines or not). It will also affect the result when centering or right-justifying text.

---

msgDcMeasureTextRun

Like **msgDcMeasureText**, except run spacing applies.

Takes P_SYSDC_TEXT_OUTPUT, returns **stsOK**.

```
#define msgDcMeasureTextRun       MakeMsg(clsSysDrwCtx, 74)
```

Comments

See comments about "run spacing" under **msgDcDrawTextRun**.

---

msgDcDrawTextDebug

Like **msgDcDrawText**, except text is drawn with debugging lines around each char.

Takes P_SYSDC_TEXT_OUTPUT, returns **stsOK**.

```
#define msgDcDrawTextDebug        MakeMsg(clsSysDrwCtx, 56)
```

Comments

This function may not work unless the debugging version of win.dll is being used.

---

msgDcPreloadText

Preloads **pText** into cache.

Takes P_SYSDC_TEXT_OUTPUT, returns **stsOK**.

```
#define msgDcPreloadText          MakeMsg(clsSysDrwCtx, 58)
```

Comments

If **pArgs** is **pNull** or **pArgs**->pText is **pNull** a default set is preloaded.

This message causes the characters to be rasterized into the font cache so that during a subsequent **msgDcDrawText** there are no hesitations during a cache miss. This is not normally necessary, but might be useful in a "slide show" application.

---

msgDcGetCharMetrics

Gets char metrics information for a string.

Takes P_SYSDC_CHAR_METRICS, returns **stsOK**.

```
#define msgDcGetCharMetrics       MakeMsg(clsSysDrwCtx, 84)
```

Comments

These character metrics are more precise in some ways than those returned by **msgDcGetFontMetrics**. For instance, the width of a character is a purely logical value. The character image may extend past its width to the right, and may extend to the left past its "left edge". Similarly, some characters will extend above the "ascender" line or below the "descender" lines (which are just imaginary lines that guide the letterforms in general).

For each character in the string, the information returned is the minimum and maximum x and y coordinates found in that glyph, as if the glyph were drawn at 0,0. There are no "string semantics" to the "string" (x is not accumulating left to right); rather, this is similar to a "width table" except values for a specific string only are returned.

See the caveat below for **msgDcGetFontWidths**.

msgDcGetFontMetrics

Gets the font metrics for the current font.

Takes P_SYSDC_FONT_METRICS, returns **stsOK**.

```
#define msgDcGetFontMetrics        MakeMsg(clsSysDrwCtx, 59)
```

msgDcGetFontWidths

Gets the font width table of the current font.

Takes P_SYSDC_FONT_WIDTHS, returns **stsOK**.

```
#define msgDcGetFontWidths         MakeMsg(clsSysDrwCtx, 60)
```

Comments

This width table is an array of 255 COORD16 values. Try to use the **msgDcMeasureText** interface instead; as width tables become less practical as character sets get larger and larger (e.g., Kanji).

Another important reason to use **msgDcMeasureText** instead is that the **measureText/drawText** interfaces may change in the future to advance character by character in an internal coordinate space that doesn't match LUC. This would allow accurate intercharacter spacing regardless of the granularity of LUC. In short, we do not guarantee that merely adding up widths obtained by **msgDcGetFontWidths** would match the results of using **msgDcMeasureText**. **msgDcMeasureText** always represents the correct behavior, while **msgDcGetFontWidths** should be thought of as an approximation.

Special Messages

msgDcDrawPageTurn

Draws a page turn effect over the bound window.

Takes P_SYSDC_PAGE_TURN, returns **stsOK**.

```
#define msgDcDrawPageTurn          MakeMsg(clsSysDrwCtx, 86)
```

Arguments

```
typedef struct
{
  P_RECT32  pBounds;       // may be pNull for entire window
  U16       fxNo,          // must be 0
            iterations;
  BOOLEAN   fxFwd,
            landscape;
} SYSDC_PAGE_TURN, * P_SYSDC_PAGE_TURN;
```

msgDcCopyPixels

Copies pixels from **srcWindow** to the bound window.

Takes P_SYSDC_PIXELS, returns **stsOK**.

```
#define msgDcCopyPixels            MakeMsg(clsSysDrwCtx, 89)
```

Arguments

```
typedef struct
{
  OBJECT    srcWindow;    // in=on a clsImgDev
  P_RECT32  pBounds;      // in=may be pNull for entire window
  XY32      xy;           // in=destination location
  BOOLEAN   dstDirty;     // in=
} SYSDC_PIXELS, * P_SYSDC_PIXELS;
```

Comments

The rectangle **pBounds** on **srcWindow** is copied to the destination (bound) window at location xy. If **dstDirty** is TRUE, "dirty" pixels from the **srcWindow** cause the corresponding pixels on the destination window to be marked dirty (however, the dirty pixels ARE copied anyway).

The **srcWindow** must be on an "image device". See **clsImgDev**.

Return Value

stsTruncatedData source rectangle not entirely on the window device; some dest pixels not affected.

msgDcDrawPixels

Draws foreground and background colors in the bound window's pixels using **srcWindow**'s pixel values as a stencil.

Takes P_SYSDC_PIXELS, returns **stsOK**.

```
#define msgDcDrawPixels            MakeMsg(clsSysDrwCtx, 90)
```

Message Arguments

```
typedef struct
{
  OBJECT    srcWindow;    // in=on a clsImgDev
  P_RECT32  pBounds;      // in=may be pNull for entire window
  XY32      xy;           // in=destination location
  BOOLEAN   dstDirty;     // in=
} SYSDC_PIXELS, * P_SYSDC_PIXELS;
```

Comments

Like **msgDcCopyPixels** except the source **clsImgDev** window must be only 1 plane and the **dstDirty** processing is not performed.

'1' pixels from the source are drawn with the foreground color, and '0' pixels with the background color.

Return Value

stsTruncatedData source rectangle not entirely on the window device; some dest pixels not affected.

msgDcScreenShot

Captures a screen image to a "tiff" file.

Takes P_SYSDC_SCREEN_SHOT, returns **stsOK**.

```
#define msgDcScreenShot            MakeMsg(clsSysDrwCtx, 67)
```

Arguments

```
typedef struct
{
  P_RECT32  pBounds;
  P_CHAR    pFileName;
} SYSDC_SCREEN_SHOT, * P_SYSDC_SCREEN_SHOT;
```

Comments

pBounds can be a rectangle that is off the window and those pixels will be captured too (actually, wraparound will occur); no clipping is implied by the window, only the relative positioning of **pBounds**.

If **pBounds** is **pNull** the whole window will be captured. If LUC are rotated non-modulo 90 degrees an upright rectangle bounding **pBounds** will be captured.

If you are just capturing screen shots for documentation, try using the SShot utility application first.

Messages from other classes

msgDrwCtxSetWindow

Binds a window to the receiver and returns the previously bound window.

Takes WIN, returns WIN.

Comments

All output through the DC will now appear on this window. A DC must be bound to a window before most messages will work.

msgDrwCtxGetWindow

Gets the window to which the drawing context is bound.

Takes **pNull**, returns WIN.

msgWinDirtyRect

Marks all or part of a window dirty.

Takes P_RECT32 or **pNull**, returns STATUS.

Comments

If P_ARGS is not null, the DC will transform the rectangle into LWC and pass the message on to the DC's bound window. The DC computes the LWC rectangle in the same manner as **msgDcAccumulateBounds**, i.e. so that it:

1) mathematically includes the entire LUC rectangle, and

2) has non-negative width and height.

If the P_ARGS is null, the DC will just pass the message on to the DC's bound window.

msgWinBeginPaint

Sets up window for painting on its visible region.

Takes P_RECT32 or **pNull**, returns STATUS.

Comments

The P_ARGS is handled the same as in **msgWinDirtyRect**.

msgWinBeginRepaint

Sets up window for painting on "dirty" region.

Takes P_RECT32 or **pNull**, returns STATUS.

Comments

The DC will pass the message on to the DC's bound window and then, if P_ARGS is not null, transform the out parameter rectangle from LWC to LUC. The DC computes the rectangle so that it:

1) mathematically includes the entire LUC rectangle, and

2) has width and height >= 1.

msgWinBeginPaint

Sets up window for painting on its visible region.

Takes P_RECT32 or **pNull**, returns STATUS.

Comments — The P_ARGS is handled the same as in **msgWinBeginRepaint**.

msgWinDelta

Moves and/or resizes a window. **pArgs**->bounds should be the newly desired bounds (size AND position).

Takes P_WIN_METRICS, returns STATUS.

Comments — The DC will transform **pArgs**->bounds into LWC and pass the message on to the DC's bound window. The DC transforms:

the in parameter bounds in the same manner as **msgDcLUCtoLWC_RECT32**, and

the out parameter bounds in the same manner as **msgDcLWCtoLUC_RECT32.**

msgWinTransformBounds

Transforms bounds from receiver's to another window's LWC.

Takes P_WIN_METRICS, returns STATUS.

Comments — The P_ARGS is handled the same as in **msgWinDelta.**

msgWinHitDetect

Locates the window "under" a point.

Takes P_WIN_METRICS, returns STATUS.

Comments — The DC will pass the message on to the DC's bound window. The bounds passed along to the window will be a copy of **pArgs**->bounds that the DC has transformed into LWC as in **msgDcLUCtoLWC_RECT32.**

msgWinGetMetrics

Gets full window metrics.

Takes P_WIN_METRICS, returns STATUS.

Comments — The DC will pass the message on to the DC's bound window, and then return a **pArgs**->bounds that is transformed as in **msgDcLWCtoLUC_RECT32.**

msgWinCopyRect

Copies pixels within a window.

Takes P_WIN_COPY_RECT, returns STATUS.

Comments — The DC will first transform the **pArgs**->srcRect from LUC to LWC as in **msgWinDelta.** The DC will then transform **pArgs**->xy:

if **wsCopyRelative** is set, as in **msgDcLUCtoLWC_SIZE32**

if **wsCopyRelative** is cleared, as in **msgDcLUCtoLWC_XY32.**

The DC will then pass the message on to the DC's bound window.

Drawing contexts respond to every other **clsWin** message by just forwarding the message on to its bound window. The P_ARGS are not touched by the DC.

msgWinDevBindPixelmap

Binds window device to a pixelmap.

Takes P_WIN_DEV_PIXELMAP, returns STATUS.

Comments

The DC will pass the message on to **pArgs**->device. The **pArgs**->size passed along to the device will be a copy of **pArgs**->size that the DC has transformed into LWC by:

1) setting up a local rectangle of x=0, y=0, w=pArgs->size.w,

h=pArgs->size.h

2) transforming this rectangle into LWC as in **msgWinDirtyRect**

(using the transformation matrix of the DC), and

3) setting the copied size to the resulting rectangle's size.

The DC will also change the **pArgs**->device passed along to be the device on which the DC's bound window was created.

msgWinDevSizePixelmap

Computes the amount of memory needed for a single plane.

Takes P_WIN_DEV_PIXELMAP, returns STATUS.

```
#endif // SYSGRAF_INCLUDED
```

Comments

The P_ARGS is handled the same as in **msgWinDevBindPixelmap**.

Drawing contexts respond to every other **clsWinDev** message by just forwarding the message on to its bound window. Note that **clsWin**'s response to **clsWinDev** messages is to just call ancestor (except for messages sent to the root window on the device, which get passed on to the device).

The P_ARGS are not touched by the DC.

TIFF.H

This file contains the API definition for **clsTiff** (Tagged Image File Format).

clsTiff inherits from **clsObject.**

clsTiff provides decoding and display of TIFF file to a window.

clsTiff remembers a pathname to a TIFF file; the file must be in the same location on redisplay. TIFF objects are not windows; they take a drawing context to repaint.

clsTiff provides display of the black and white grey scale formats. It decodes compression types for packed data (type 1); Group3 (FAX) horizontial encoding (types 2 and 3); Pack Bits run-length (type 32773). Samples per pixel are limited to 1, 2, 4, or 8. TIFF images must be grey scale; it does not support colormap or direct color (RGB) images. It supports tags for photometric interpretion, fill order, orientation, dot size, Intel & Motorola byte order.

Common uses of **clsTiff**:

clsTiff can be the data object for a **clsView** object. It is used by the Fax Viewer in this way to display fax images.

```
#ifndef TIFF_INCLUDED
#define TIFF_INCLUDED
#ifndef PICSEG_INCLUDED
#include "picseg.h"
#endif
```

Messages

msgNewDefaults

Initializes a TIFF_NEW structure to default values.

Takes P_TIFF_NEW, returns STATUS. Category: class message.

Comments

defaults: tiff.**pName** = **pNull**; tiff.**imageFlags** = **sysDcImageFillWindow**; tiff.rectangle = zeros;

msgNew

Creates a new TIFF object, and optionaly opens its associated file.

Takes P_TIFF_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct TIFF_STYLE {
    U16 save    : 1,        // false if reading and display; true for saving
        spare1  : 15;
    U16 spare2  : 16;
}TIFF_STYLE, * P_TIFF_STYLE;
typedef struct {
    P_U8                pName;       // a pointer pathname of the file
    SYSDC_IMAGE_FLAGS   imageFlags;  // sysDcImageXXFilter and sysDcImageFillWindow
    RECT32              rectangle;   // display size of the tiff image in LUC
    TIFF_STYLE          style;
    S32                 spare[3];
} TIFF_NEW_ONLY, * P_TIFF_NEW_ONLY;
```

```
#define tiffNewFields       \
    objectNewFields         \
    TIFF_NEW_ONLY   tiff;
typedef struct TIFF_NEW {
    tiffNewFields
} TIFF_NEW, *P_TIFF_NEW;
```

Comments

If **imageFlags** has the **sysDcImageFillWindow** flag set, **msgNew** will pass back the size of the image in mils in the rectangle member of the TIFF_NEW struct.

Status Codes for msgNew

stsTiffNumStrips returned if the number of strips is bad.

stsTiffStripByteCount returned if the number of strip byte counts does not match the image length.

stsTiffStripOffsets returned if there are no strip offsets.

stsTiffImageTooLarge returned if the image is too large to display (32000 pixels by 32000 pixels).

stsTiffByteCountZero returned the a byte count is zero.

stsTiffBadName returned if **pName** is bad or **pNull**.

stsFSNodeNotFound returned the TIFF file is not found.

and status errors form OSHeapBlockAlloc()

```
#define  stsTiffNumStrips           MakeStatus(clsTiff,0)
#define  stsTiffStripByteCount      MakeStatus(clsTiff,1)
#define  stsTiffStripOffsets        MakeStatus(clsTiff,2)
#define  stsTiffImageTooLarge       MakeStatus(clsTiff,3)
#define  stsTiffByteCountZero       MakeStatus(clsTiff,4)
#define  stsTiffBadFormatId         MakeStatus(clsTiff,5)
#define  stsTiffBadName             MakeStatus(clsTiff,6)
```

clsPicSeg messages used by clsTiff

msgPicSegPaintObject

Paints the Tiff to the drawing context object provided.

Takes P_PIC_SEG_PAINT_OBJECT, returns STATUS.

Comments

Object Call either **msgWinBeginPaint** or **msgWinBeginRepaint** before using this message. A **clsPicSeg** object will send this message to any Tiff object in its display list. If the rectangle in P_PIC_SEG_PAINT_OBJECT is all zeros then the whole window is filled with the image.

clsTiff Messages

msgTiffGetMetrics

Passes back the metrics of the Tiff.

Takes P_TIFF_METRICS, returns STATUS.

```
#define msgTiffGetMetrics                   MakeMsg(clsTiff, 1)
```

msgTiffSetMetrics

Sets the metrics of the Tiff.

Takes P_TIFF_METRICS, returns STATUS.

```
#define msgTiffSetMetrics                    MakeMsg(clsTiff, 2)
```

Orientation defines

Valid values for metrics.orientation

```
#define tiffOrientTopLeft       1   // 1st row top; 1st column left
#define tiffOrientTopRight      2   // 1st row top; 1st column right
#define tiffOrientBottomRight   3   // 1st row bottom; 1st column right
#define tiffOrientBottomLeft    4   // 1st row bottom; 1st column left
#define tiffOrientLeftTop       5   // 1st row left; 1st column top
#define tiffOrientRightTop      6   // 1st row right; 1st column top
#define tiffOrientRightBottom   7   // 1st row right; 1st column bottom
#define tiffOrientLeftBottom    8   // 1st row left; 1st column bottom
```

Compression types

Valid values for metrics.compression

```
#define tiffCompPackedData  1       //
#define tiffCompGroup3      2       // only horiz. encoding
#define tiffCompFax         3       // only horiz. encoding w/EOL
#define tiffCompPackBits    32773   // Mac pack bits run-length
```

Rational

The ratio of two longs (num / dem).

```
typedef struct {
    U32     num;
    U32     dem;
} RATIONAL, * P_RATIONAL;
```

Metrics

The data read from the file tags.

```
typedef struct {
    P_U8     pFileName;          // the path for the file
    RECT32   rectangle;          // the display rect
                                 //(zero width and height fills the window)
    SYSDC_IMAGE_FLAGS   imageFlags;
    U32      newSubfileType;     // the tiff data read from the file
    U16      SubfileType;        // 1 the only supported value
    U32      width;              // number of pixels in the x dimension
    U32      length;             // number of pixels in the y dimension
    U16      bitsPerSample;      // number of bits per sample 1, 2, 4 or 8
    U16      compression;        // the image compression type
    U16      photometricInterpretation;// 0 - 0 black; highest value white
                                       // 1 - highest value black; 0 white
    U16      fillOrder;          // bit order of image bytes
                                 // 1 - MSB first; 2 - LSB first
    P_S8     pDocumentName;      // pointer to a string in a heap or pNull
    P_S8     pImageDescription;  // pointer to a string in a heap or pNull
    P_S8     pMake;              // pointer to a string in a heap or pNull
    P_S8     pModel;             // pointer to a string in a heap or pNull
    P_S32    pStripOffsets;      // pointer to an array of file locations
```

```
    U16      orientation;       // see orient #defines for values
    U16      samplesPerPixel;   // number of samples per pixel
    S32      rowsPerStrip;      // number of scanlines per strip
    P_S32    pStripByteCounts;  // array of byte counts in each strip
    RATIONAL xResolution;       // x number of samples per resolution unit
    RATIONAL yResolution;       // y number of samples per resolution unit
    U16      planarConfiguration;// 1 the only supported value
    P_S8     pPageName;         // pointer to a string in a heap or pNull
    RATIONAL xPosition;         // current x position (UNUSED)
    RATIONAL yPosition;         // current y position (UNUSED)
    U32      group3Options;     // only works if 0
    U16      resolutionUnit;    // 1 for inches; 2 for milimeters
    U16      pageNumber;        // page number for the image
    P_S8     pSoftware;         // pointer to a string in a heap or pNull
    P_S8     pDataTime;         // pointer to a string in a heap or pNull
    P_S8     pArtist;           // pointer to a string in a heap or pNull
    P_S8     pHostComputer;     // pointer to a string in a heap or pNull
    P_U16    pColorMap;         // pointer to an array in a heap or pNull
} TIFF_METRICS, * P_TIFF_METRICS;
```

msgTiffGetSizeMils

Provides the actual size of the TIFF image in MILS (1 /1000 inch).

Takes P_SIZE32, returns STATUS.

```
#define msgTiffGetSizeMils                      MakeMsg(clsTiff, 3)
```

msgTiffGetSizeMM

Provides the actual size of the TIFF image in milimeters.

Takes P_SIZE32, returns STATUS.

```
#define msgTiffGetSizeMM                        MakeMsg(clsTiff, 4)
```

msgTiffSave

Saves a TIFF file.

Takes P_TIFF_SAVE, returns STATUS.

```
#define msgTiffSave                             MakeMsg(clsTiff, 5)
// Format of Input image (style.inputDataFormat)
// The stored data type is provided in the tiff metrics.
// Curently the only conversion of image compression is
// from tiffSaveRunLength to tiffCompGroup3. The data provided for other
// compression types is writen directly to the file with no conversion.
#define tiffSavePackedData  1       // NOT WORKING
#define tiffSavePackedBits  2       // NOT WORKING
#define tiffSaveRunLength   3       // can only be use for a Group 3 Fax file
#define tiffSaveGroup3      4       // NOT WORKING
// How the image data is provided (style.provideData)
#define tiffCallBack    1       // use tiffSave.callback.function() to get row
#define tiffCallObject  2       // not working
#define tiffProvided    3       // all the data is in pBuffer (NOT WORKING)
```

Arguments

```
typedef struct TIFF_SAVE_STYLE {
    U16 inputDataFormat : 4,    // the compression of the input image data
        provideData     : 3,
        convert         : 1,    // on if the input data is to be converted
                                // to metrics.commpresson (NOT WORKING)
        spare1          : 8;
    U16 spare2          : 16;
}TIFF_SAVE_STYLE, * P_TIFF_SAVE_STYLE;
```

```
typedef struct TIFF_SAVE * P_TIFF_SAVE;
typedef STATUS FunctionPtr(P_TIFF_GETROW)(P_TIFF_SAVE pTiffSave);
typedef struct TIFF_SAVE {
    TIFF_SAVE_STYLE     style;
    union {
        P_TIFF_GETROW   function;
        OBJECT          object;             // ObjectCall with msgTiffGetRow
    }                   callBack;
    U32                 bufferCount;        // number of bytes in pBuffer
                                            // if 0 its assumed there is no
                                            // more data and metrics.length
                                            // will be changed
    P_U8                pBuffer;            // provided by the client
    P_UNKNOWN           pClientData;        // clients own data
} TIFF_SAVE;
```

Comments

The TIFF object must be created with the save style (tiff.style.save = true;). The metrics of the TIFF must first be set. The default metrics are:

```
metrics.newSubfileType = 1;
metrics.SubfileType = 1;
metrics.width = 0;
metrics.length = 0;
metrics.bitsPerSample = 1;
metrics.compression = 1;
metrics.photometricInterpretation = 0;
metrics.fillOrder = 1;
metrics.pDocumentName = pNull;
metrics.pImageDescription = pNull;
metrics.pMake = pNull;
metrics.pModel = pNull;

metrics.samplesPerPixel = 1;
metrics.orientation = tiffOrientTopLeft;
metrics.pStripOffsets = pNull;
metrics.pStripByteCounts = pNull;
metrics.rowsPerStrip = 0L;

metrics.xResolution.num = 0L;           // the resolution must be set
metrics.xResolution.dem = 0L;
metrics.yResolution.num = 0L;
metrics.yResolution.dem = 0L;
metrics.planarConfiguration = 1;
metrics.pPageName = pNull;
metrics.group3Options = 0L;
metrics.resolutionUnit = 2;
metrics.pageNumber = 0;
metrics.pSoftware = pNull;
metrics.pDataTime = pNull;
metrics.pArtist = pNull;
metrics.pHostComputer = pNull;
metrics.pColorMap = pNull;
```

All pointers should be alloced on a heap with OSHeapBlockAlloc(). It will save any strings and arrays that are not **pNull**. Strip offsets and strip byte counts are calculated while the image is being saved.

msgTiffSetGroup3Defaults

Sets the TIFF metrics to the Group3 compression type 2 defaults.

Takes P_TIFF_SAVE, returns STATUS.

```
#define msgTiffSetGroup3Defaults                MakeMsg(clsTiff, 6)
```

Message Arguments

```
typedef struct TIFF_SAVE {
    TIFF_SAVE_STYLE     style;
    union {
        P_TIFF_GETROW   function;
        OBJECT          object;             // ObjectCall with msgTiffGetRow
    }                   callBack;
    U32                 bufferCount;        // number of bytes in pBuffer
                                            // if 0 its assumed there is no
                                            // more data and metrics.length
                                            // will be changed
    P_U8                pBuffer;            // provided by the client
    P_UNKNOWN           pClientData;        // clients own data
} TIFF_SAVE;
```

Comments

Takes 0 for low resoution and 1 for high resolution.

msgTiffGetRow

Sent client of the TIFF_SAVE to get the next row of the image.

Takes U32, returns STATUS.

```
#define msgTiffGetRow                                   MakeMsg(clsTiff, 7)
```

ReverseBits

Reverses the bit ordering in each byte in an array of bytes.

Returns void.

Function Prototype

```
void EXPORTED ReverseBits(
    P_U8 pBuf,          // the bytes to reverse
    S32 nBytes          // the nuber of bytes to reverse
);
```

TILE.H

Interface to the pop-up tiling routine.

The functions described in this file are contained in MISC.LIB.

```
#ifndef TILE_INCLUDED
#define TILE_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
typedef enum {
    tileAbove,  // above the target
    tileBelow,  // below the target
    tileLeft,   // to the left of the target
    tileRight   // to the right of the target
} TILE_LOCATOR;
```

TilePopUp

Center a rectangle under (over/to the left/right of) another rectangle but staying inside the bounds of a third rectangle.

Returns STATUS.

Function Prototype

```
STATUS PASCAL TilePopUp(
    TILE_LOCATOR preferred,     // preferred location
    P_RECT32 pPop,              // In-Out rect to be manipulated
    P_RECT32 pTarget,           // anchor rect
    P_RECT32 pWorld             // surrounding rect, base for pop & target
                                // use pNull for theRootWindow
);
```

This routine makes it easy to position pop-up windows next to existingor screen regions. **pPop**->origin is set to the best position tothat rectangle. For example, if you want to center a popup windowa selected word but stay inside **theRootWindow**, you'd set preferred**tileBelow**, **pPop**->size to the size of the new window, **pTarget** to thecontaining the selection, and **pWorld** to **pNull**. If a window ofsize can be centered below **pTarget**, TilePopUp will return theto insert it at. If it won't fit below, but it will fit above,will give THAT position. If it will fit below, but not centered,will sacrifice centering to keep it all on screen.

All rects are assumed to be relative to the same origin. You stillto actually position and insert the actual window; this justyou where to put it.

WIN.H

This file provides the API's for **clsWin**, **clsWinDev**. Two abstract classes, **clsDrwCtx** and **clsPixDev** are also defined, but they are not used directly by application-level clients.

clsDrwCtx inherits from **clsObject.**

Defines the minimal behavior for a drawing context.

clsPixDev inherits from **clsObject.**

Defines the minimal behavior for a pixelmap graphics device.

clsWinDev inherits from **clsPixDev.**

Provides devices of **clsPixDev** that can have windows on them.

clsImgDev inherits from **clsWinDev.**

Provides window devices whose pixels are accessible in memory.

clsWin inherits from **clsObject.**

Provides windows onto **clsWinDev** objects.

theScreen is a well-known instance of **clsWinDev.** It is the main display surface for PenPoint.

theRootWindow is a well-known instance of **clsWin.** It is the root of the window tree on **theScreen.**

Terminology:

DU4 -- Device Units, 4th Quadrant. A 4th quadrant coordinate system; device space, device units. This is used internally, but not seen by application software.

LWC -- Logical Window Coordinates. A 1st quadrant coordinate system. The lower-left-hand corner of the window is 0,0. The units are device pixels. These are the coordinates in which windowing operations are specified and input is delivered.

LUC -- Logical Unit Coordinates. The nature of the coordinate system is determined by a drawing context. Such coordinates are always relative to the window. Some drawing contexts will implement window messages that takes LWC coordinates and transform them so that window operations can occur in LUC space. See sysgraf.h for details.

Debugging Flags

The **clsWin** debugging flag is 'W'. Defined values are:

flag0 (0x0001) window layout

flag1 (0x0002) window layout

flag2 (0x0004) flash interesting regions during damage

flag3 (0x0008) bitmap caching

flag4 (0x0010) window filing

flag5 (0x0020) font cache char ops

flag6 (0x0040) font cache char ops

flag7 (0x0080) matrix/rectangle math

flag8 (0x0100) layout timing

flag9 (0x0200) font cache macro ops

flag10 (0x0400) msgWinDumpTree outputs input flags

flag11 (0x0800) Measure/Draw text

flag12 (0x1000) window printing/clipping

flag13 (0x2000) unused

flag14 (0x4000) unused

flag15 (0x8000) window bitblt coordinates

```
#ifndef WIN_INCLUDED
#define WIN_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
```

Typedefs, #defines, and Status Values

```
#define  stsWinConstraint        MakeStatus(clsWin,    1)
#define  stsWinHasParent         MakeStatus(clsWin,    3)
#define  stsWinParentBad         MakeStatus(clsWin,    4)
#define  stsWinBad               MakeStatus(clsWin,    5)
#define  stsWinInfiniteLayout    MakeStatus(clsWin,    6)
#define  stsWinNoEnv             MakeStatus(clsWin,    7)
#define  stsWinIsChild           MakeWarning(clsWin,    8)
#define  stsWinIsDescendant      MakeWarning(clsWin,    9)
#define  stsPixDevBad            MakeStatus(clsPixDev, 1)
#define  stsPixDevOutOfRegions   MakeStatus(clsPixDev, 2)
#define  stsWinDevBad            MakeStatus(clsWinDev, 1)
#define  stsWinDevFull           MakeStatus(clsWinDev, 2)
#define  stsWinDevCachedHit      MakeStatus(clsWinDev, 3)
typedef WIN      * P_WIN;
typedef DRW_CTX  * P_DRW_CTX;
typedef PIX_DEV  * P_PIX_DEV;
typedef WIN_DEV  * P_WIN_DEV;
typedef IMG_DEV  * P_IMG_DEV;
```

Window style flags

```
#define  wsClipChildren      ((U32)flag0)  // Don't draw on my children
#define  wsClipSiblings      ((U32)flag1)  // Don't draw on my siblings
#define  wsParentClip        ((U32)flag2)  // Borrow my parent's vis rgn
#define  wsSaveUnder         ((U32)flag3)  // Try to save pixels on insert
#define  wsGrowTop           ((U32)flag4)  // Pixels move to bottom on resize
#define  wsGrowBottom        ((U32)flag5)  // Pixels move to top    on resize
#define  wsGrowLeft          ((U32)flag6)  // Pixels move to right  on resize
#define  wsGrowRight         ((U32)flag7)  // Pixels move to left   on resize
#define  wsCaptureGeometry   ((U32)flag8)  // I capture m,s,i,e of children
#define  wsSendGeometry      ((U32)flag9)  // Send me delta,ins,ext advice
#define  wsSendOrphaned      ((U32)flag10) // Send msgOrphaned not msgFree
```

```
#define  wsSynchRepaint      ((U32)flag12) // ObjectCall to repaint
#define  wsTransparent       ((U32)flag13) // I am transparent
#define  wsVisible           ((U32)flag14) // I am visible
#define  wsPaintable         ((U32)flag15) // I can be painted
#define  wsSendFile          ((U32)flag16) // I should be filed

#define  wsShrinkWrapWidth   ((U32)flag17) // I shrink to fit children
#define  wsShrinkWrapHeight  ((U32)flag18) // I shrink to fit children
#define  wsLayoutDirty       ((U32)flag19) // My layout is dirty
#define  wsCaptureLayout     ((U32)flag20) // I'm dirty if children delta,
                                           // extract, insert, or
                                           // child wsVisible changes
#define  wsSendLayout        ((U32)flag21) // I'm dirty if I change size or
                                           // wsShrinkWrapWidth/Height or
                                           // wsMaskWrapWidth/Height changes
#define  wsHeightFromWidth   ((U32)flag22) // height is computed from width
#define  wsWidthFromHeight   ((U32)flag24) // width is computed from height
#define  wsFileInline        ((U32)flag23) // file without object header
#define  wsFileNoBounds      ((U32)flag26) // don't file the bounds
#define  wsFileLayoutDirty   ((U32)flag27) // always dirty layout bit on restore
#define  wsMaskWrapWidth     ((U32)flag28) // mask out wsShrinkWrapWidth
#define  wsMaskWrapHeight    ((U32)flag29) // mask out wsShrinkWrapHeight
#define  wsDefault          (wsClipChildren  |    \
                             wsClipSiblings  |    \
                             wsPaintable     |    \
                             wsCaptureLayout |    \
                             wsSendLayout    |    \
                             wsLayoutDirty   |    \
                             wsVisible            \
                            )

typedef struct
{
  U32    input,                    // see input.h
         style;                    // see ws* flags above
} WIN_FLAGS, * P_WIN_FLAGS;       // part of WIN_METRICS
#define WinShrinkWrapWidth(style)     \
    (!((style) & wsMaskWrapWidth)  && ((style) & wsShrinkWrapWidth))

#define WinShrinkWrapHeight(style)    \
    (!((style) & wsMaskWrapHeight) && ((style) & wsShrinkWrapHeight))
#define WinShrinkWrap(style)          \
    (WinShrinkWrapWidth(style) || WinShrinkWrapHeight(style))
```

You can use these WinShrinkWrap macros are test if a window has shrink-wrap-width or shirnk-wrap-height enabled. If **wsMaskWrapWidth/Height** is on, the shrink wrapping will be off in that dimension. **clsGrabBox** will turn on **wsMaskWrapWidth/Height** if the user resizes a window and changes the width/height. **clsFrame** will clear the **wsMaskWrapWidth/Height** bits and re-layout when the user tripple-taps on the title bar.

```
Enum16(WIN_OPTIONS)
{ wsPosTop         = 0,
  wsPosBottom      = flag0,         // In:  to msgWinInsert...
  wsPosInFront     = wsPosTop,
  wsPosInBack      = wsPosBottom,
  wsWinMoved       = flag9,         // Out: from msgWinDelta
  wsWinSized       = flag10,        // Out: from msgWinDelta
  wsParentMoved    = flag12,        // Out: from msgWinDelta
  wsParentSized    = flag13,        // Out: from msgWinDelta
  wsLayoutResize   = flag11,        // In:  to msgWinLayout...
  wsLayoutMinPaint = flag14,        // In:  to msgWinLayout...
  wsLayoutNoCache  = flag8,         // Out: from msgWinLayoutSelf
  wsLayoutDefault  = wsLayoutResize // In:  to msgWinLayout...
};
```

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

A P_WIN_METRICS is the argument to most of the messages defined by **clsWin**. However, for most of these messages, not all of the fields are used. In the discussion of each message below, fields which are not mentioned are not used; and they don't have to be initialized before sending the message. This is not to say that these "unused" fields are not modified during the call; they will be during the processing of some messages.

Messages Sent to a Window

msgNew

Creates a window.

Takes P_WIN_METRICS, returns STATUS. Category: class message.

```
typedef WIN_METRICS WIN_NEW_ONLY, * P_WIN_NEW_ONLY;
#define winNewFields  \
    objectNewFields  \
    WIN_NEW_ONLY    win;
```

Arguments

```
typedef struct WIN_NEW
{
  winNewFields
} WIN_NEW, *P_WIN_NEW;
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

If **pArgs**->parent is not **objNull**, **clsWin** will create the window on the spceified parent's window device. Note that the new window will not be inserted as a child of the specified parent. You must send **msgWinInsert** to the new window after creating it to insert it into its parent.

If **pArgs**->parent is **objNull**, the window will be created on **pArgs**->device. If **pArgs**->device is **objNull**, **clsWin** will create the window on OSThisWinDev().

Returns

stsWinParentBad if **pArgs**->parent is not **objNull** or a valid window

stsWinDevBad if **pArgs**->device is not **objNull** or a valid window device

stsWinDevFull if the window device window array can't be grown

See Also

msgWinInsert

msgNewDefaults

Initializes the WIN_NEW structure to default values.

Takes P_WIN_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct WIN_NEW
{
  winNewFields
} WIN_NEW, *P_WIN_NEW;
    object.cap          |= objCapCall;
    win.parent           = objNull;
    win.child            = objNull;
    win.device           = objNull;
    win.flags.style      = wsDefault;
    win.flags.input      = 0;
    win.tag              = 0;
    win.options          = wsPosTop;
    win.bounds.origin.x = 0;
    win.bounds.origin.y = 0;
    win.bounds.size.w    = 0;
    win.bounds.size.h    = 0;
```

msgWinInsert

Inserts or changes z-order of a window.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinInsert                    MakeMsg(clsWin,    1)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

You send this message to the child that you want to insert or change z-order.

In parameters are:

```
pArgs->parent   = child's new parent or objNull;
pArgs->options  = either wsPosTop or wsPosBottom;
```

If **pArgs**->parent is not **objNull** or self's current parent, **clsWin** will insert self as a child of the specified parent. If **pArgs**->options has **wsPosTop** on, self will be inserted as the top-most child; if **wsPosBottom** is on, self will be inserted as the bottom-most child.

If **pArgs**->parent is **objNull** or self's current parent, **clsWin** will change the z-order of self according to **pArgs**->options. If **pArgs**->options has **wsPosTop** on, self will be altered in z-space to be the top-most child; if **wsPosBottom** is on, self will be altered to be the bottom-most child. If the z-order of self is changed, **wsWinMoved** will be or-ed into **pArgs**->options as an out parameter.

If the receiver's parent has **wsCaptureLayout** on, **wsLayoutDirty** will be set on the receiver's parent.

Returns

stsWinParentBad if **pArgs**->parent is not **objNull** or a valid windowon the same window device as self

stsWinHasParent if self already has a parent and **pArgs**->parent is not either **objNull** or self's current parent

See Also **msgWinInsertSibling**

msgWinInsertSibling

Inserts or changes z-order of a window (relative to a sibling).

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinInsertSibling                MakeMsg(clsWin,    2)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments You send this message to the child that you want to insert or change z-order. This message is similar to **msgWinInsert**, except **pArgs**->parent should be the intended sibling of the receiver.

In parameters are:

```
pArgs->parent   = receiver's new sibling
pArgs->options  = either wsPosTop or wsPosBottom;
```

clsWin will insert self as a sibling of the specified sibling. If **pArgs**->options has **wsPosTop** on, self will be inserted as in front of **pArgs**->parent; if **wsPosBottom** is on, self will be inserted behind **pArgs**->parent.

If **pArgs**->parent is already self's sibling, **clsWin** will change the z-order of self according to **pArgs**->options. If **pArgs**->options has **wsPosTop** on, self will be altered in z-space to be in front of **pArgs**->parent; if **wsPosBottom** is on, self will be altered to be behind **pArgs**->parent. If the z-order of self is changed, **wsWinMoved** will be or-ed into **pArgs**->options as an out parameter.

If the receiver's parent has **wsCaptureLayout** on, **wsLayoutDirty** will be set on the receiver's parent.

Returns

stsWinParentBad if **pArgs**->parent is not a valid windowon the same window device as self

stsWinHasParent if self already has a parent and **pArgs**->parent isnot a sibling of self

See Also **msgWinInsert**

msgWinExtract

Extracts a window from its parent.

Takes P_WIN_METRICS or **pNull**, returns STATUS.

```
#define msgWinExtract                      MakeMsg(clsWin,    3)
```

Comments If a P_WIN_METRICS is passed instead of **pNull** the same information returned by **msgWinGetMetrics** is returned in the WIN_METRICS structure. This will include the parent field BEFORE the extract is performed. If the window is already extracted, **stsWinParentBad** is returned, and any passed WIN_METRICS field is unmodified.

If the receiver's parent has **wsCaptureLayout** on, **wsLayoutDirty** will be set on the receiver's parent.

msgWinDelta

Moves and/or resizes a window. **pArgs**->bounds should be the newly desired bounds (size AND position).

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinDelta                          MakeMsg(clsWin,    4)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

If the receiver is involved in a layout episode (**msgWinLayout** is being processed in the receiver's window tree), the new bounds will be remembered for use at the end of the layout episode. If the new bounds has a new width or height, and a cached desired size is being remembered for the receiver, the desired size will be discarded if either of the following is true:

- the new bounds has a new width and the receiver has **wsHeightFromWidth** on or does not have **wsShrinkWrapWidth** on
- the new bounds has a new height and the receiver has **wsWidthFromHeight** on or does not have **wsShrinkWrapHeight**

If the receiver is involved in a layout episode this is all that is done and **stsOK** is returned.

If the receiver's parent has **wsCaptureGeometry** on, the parent will be sent **msgWinDeltaOK**. If the parent responds with anything other than **stsOK**, that status will be returned and nothing else is done. Otherwise, the (possibly modified) bounds returned by the parent will be used. If the parent modified the proposed child origin, **wsParentMoved** will be or-ed into **pArgs**->options as an out parameter. If the parent modified the proposed child size, **wsParentSized** will be or-ed into **pArgs**->options as an out parameter.

If the receiver is visible and paintable (**wsVisible** and **wsPaintable** are on for the receiver and all of its ancestors), valid portions of the receiver's window may be copied to their new location to avoid damage and repaint of those portions.

If the receiver has any of the grow bits on (**wsGrowBottom/Top/Left/Right**), the appropriate grow semantics will be applied to determine how to move the receiver's children and what portions of the receiver's window to damage for subsequent repaint.

If **pArgs**->bounds is a new bounds and the receiver's parent has **wsCaptureLayout** on, **wsLayoutDirty** will be set on the receiver's parent.

If **pArgs**->bounds.size is a new size and the receiver has **wsSendLayout** on, **wsLayoutDirty** will be set on the receiver.

Subclasses that want to know when their position or size has changed should not expect that **msgWinDelta** is the only way for this to happen. If you need to know this information, you should turn on **wsSendGeometry** and catch **msgWinMoved** or **msgWinSized**. **clsWin** may change a window's bounds without sending **msgWinDelta** to the window.

msgWinLayout

Tells a window sub-tree to layout.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinLayout                    MakeMsg(clsWin,   41)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

You should send **msgWinLayout** to a window after you have altered the window in such a way that its bounds or its descendants bounds must be recomputed.

For example, if you create an instance of **clsTableLayout** (a subclass that lays out its children in rows and columns) and insert children into it, you must send **msgWinLayout** to the table layout window to force it to "layout" itself and its children.

After **msgWinLayout** has been sent, every window in the receiver's tree will be positioned and sized as required. You can then use **msgWinInsert** to insert the root of the tree on the display and allow the windows to paint.

In parameters:

```
bounds      = new final bounds for receiver if wsLayoutResize is not
              on in pArgs->options

options     = wsLayoutDefault, 0, or any combination of wsLayoutResize,
              wsLayoutMinPaint
```

Subclasses must not catch **msgWinLayout**. **clsWin** will respond by beginning a "layout episode" during which the windows in the receiver's tree will be layed out.

The algorithm for a layout episode is as follows:

```
for the receiver and each of its descendants
    If the window has wsLayoutDirty on
        If the bounds of the window have been fixed by a previous
        msgWinDelta during the layout episode
            send the window msgWinLayoutSelf with the following
            WIN_METRICS parameters:
                bounds.size = current bounds.size;
                options     = 0;

        Otherwise,
            send the window msgWinLayoutSelf with the following
            WIN_METRICS parameters:
                options = wsLayoutResize;

            copy back WIN_METRICS.bounds.size as the new size for the
            window.

        If the window's parent has wsLayoutDirty on, switch to the
        window's parent and continue down the tree from there.

After the entire tree has been traversed, traverse the tree again and
process wsCaptureGeometry and wsSendGeometry requests as follows:
```

```
For each window
    If the origin or size has changed
        If the window's parent has wsCaptureGeometry on
            send msgWinDeltaOK to the window's parent;

        If the window has wsSendGeometry on
            send msgWinMoved and/or msgWinSized to the window.

After the geometry notifications have been done, apply all of the new
bounds for each window in the tree as in msgWinDelta.
```

If **wsLayoutResize** is NOT set in **pArgs**->options, then you must set **pArgs**->bounds to the new rectangle that the receiver must fit into -- it will lay out accordingly; otherwise the receiver will lay out to its desired size.

If **wsLayoutMinPaint** is not on, window damage will not be computed during the layout episode -- all of the windows in the window tree will be damaged and repaint after the layout episode. This will result in faster layout, at the expense of some (possibly) unneccessary repaints. If **wsLayoutMinPaint** is on, the true damaged area will be computed. This may take longer, but will result in the minimal amount of repaint after the layout episode.

In general this message should not be handled by subclasses. However, it results in the sending of **msgWinLayoutSelf**, which does need to be handled by subclasses.

Returns

stsWinInfiniteLayout the layout episode does not appear to terminate

See Also **msgWinLayoutSelf**

msgWinLayoutSelf

Tells a window to layout its children (sent during layout).

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinLayoutSelf                MakeMsg(clsWin,   42)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

This message is sent by **clsWin** during a layout episode. It can be handled by knowledgeable window classes.

When sent, **pArgs**->bounds.size contains the present size. If **pArgs**->options is 0 then the window cannot change **pArgs**->bounds.size, it must lay out its children, as best it can, within those bounds. If **pArgs**->option is **wsLayoutResize** then it may change **pArgs**->bounds.size to its desired size.

After **pArgs**->bounds.size is determined, the window should **msgWinDelta** each child to its final position and size.

In order to determine its desired size and layout, a window may need to send **msgWinGetDesiredSize** to some, or all, of its children first.

clsWin responds to **msgWinLayoutSelf** by doing nothing and returning the current window size in pArgs->bounds.size if **wsLayoutResize** is on in **pArgs**->options.

See Also

msgWinLayout

msgWinGetDesiredSize

Gets the desired size of a window (sent during layout).

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinGetDesiredSize              MakeMsg(clsWin,   43)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

This message should not be handled by a subclass.

If the receiver is not in a layout episode, **clsWin** responds by returning the receiver's current bounds.

Otherwise, if the desired size has already been computed (cached) for the receiver, that value will be returned.

Otherwise, **msgWinLayoutSelf** will be self-sent with the following WIN_METRICS parameters:

```
options = wsLayoutResize;
```

Subclasses should catch **msgWinLayoutSelf**, layout to their desired size and return the desired size in WIN_METRICS.bounds.size. The computed desired size will be remembered in the window's cache for future use and will be passed back in **pArgs**->bounds.size.

See Also

msgWinLayout

msgWinGetBaseline

Gets the desired x,y alignment of a window.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinGetBaseline                 MakeMsg(clsWin,   46)
#define wsNoXBaseline    ((U16)flag0)
#define wsNoYBaseline    ((U16)flag1)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

Subclasses can set **pArgs**->bounds.origin to reflect the window's desired baseline position. **clsWin** will set both x and y to 0,0.

pArgs->bounds.size should contain the size of the window. This is useful for windows whose alignment is a function of window size (like centered).

If the receiver does not have either an x or y baseline, **wsNoXBaseline** and/or **wsNoYBaseline** can be or-ed into **pArgs->**options as an out parameter.

clsWin will always set **pArgs->**options to **wsNoXBaseline** | **wsNoYBaseline** (i.e. the default is the window has no x or y baseline).

msgWinSetLayoutDirty

Turns **wsLayoutDirty** bit on or off, returns previous value.

Takes BOOLEAN, returns BOOLEAN.

```
#define msgWinSetLayoutDirty                MakeMsg(clsWin,   44)
```

Comments

If the window has a cached desired size, and **wsLayoutDirty** comes on, the desired size will be discarded.

msgWinSetLayoutDirtyRecursive

Turns **wsLayoutDirty** bit on for every window in subtree.

Takes BOOLEAN, returns nothing.

```
#define msgWinSetLayoutDirtyRecursive     MakeMsg(clsWin,   45)
```

msgWinSend

Sends a message up a window ancestry chain.

Takes P_WIN_SEND, returns STATUS.

```
#define msgWinSend                        MakeMsg(clsWin,   36)
```

Arguments

```
Enum16(WIN_SEND_FLAGS)
{ wsSendDefault      = 0,
  wsSendIntraProcess = flag0,    // stop at process transition
};
typedef struct
{
  U32             lenSend;       // length of message,
                                 // SizeOf(WIN_SEND) minimum
  WIN_SEND_FLAGS  flags;         //
  MESSAGE         msg;           // the "message"
  P_UNKNOWN       data[1];       // an argument to the message
  // clients can put
  // more data here
  // if needed
} WIN_SEND, * P_WIN_SEND;
```

Comments

The receiver may reply to the message or forward the message up the window parent chain. **clsWin** will forward the message to the parent using ObjectSendUpdate. If the message reaches the root window **stsMessageIgnored** is returned. If the **wsSendIntraProcess** flag is true the message will not be propagated past a process transition (based on the owner of the window object); in this case **stsMessageIgnored** may also be returned.

lenSend must be at least SizeOf(WIN_SEND) but may be larger to move more data to a window owned by another process. A single unit of data, data[0] is defined in WIN_SEND as a convenience. The message a window receives when **msgWinSend** is forwarded is **msgWinSend**, NOT msg. The field msg is provided so the receiving client can properly interpret the purpose of the **msgWinSend**.

msgWinGetMetrics

Gets full window metrics.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinGetMetrics                    MakeMsg(clsWin,    5)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->parent passes back the receiver's parent **pArgs**->child passes back self **pArgs**->bounds passes back size and parent relative position **pArgs**->device passes back self's device **pArgs**->flags passes back self's window and input flags **pArgs**->tag passes back self's tag

msgWinGetFlags

Like **msgWinGetMetrics** but passes back flags only.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinGetFlags                      MakeMsg(clsWin,    6)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->flags passes back self's window and input flags.

msgWinSetFlags

Sets the window flags.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinSetFlags                      MakeMsg(clsWin,    7)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->flags should be set to the new window and input flags.

If **wsVisible** is changed and the receiver's parent has **wsCaptureLayout** on, **wsLayoutDirty** will be set on the receiver's parent.

If the new flags result in a new value for WinShrinkWrap() (e.g. **wsShrinkWrapWidth** changes) and the receiver has **wsSendLayout** on, **wsLayoutDirty** will be set on the receiver.

msgWinGetTag

Like **msgWinGetMetrics** but passes back tag only.

Takes P_WIN_METRICS, returns **stsOK**.

```
#define msgWinGetTag                    MakeMsg(clsWin,   37)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->tag passes back self's tag.

msgWinSetTag

Sets the window tag.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinSetTag                    MakeMsg(clsWin,   38)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->tag should be set to the new window tag.

msgWinIsVisible

Returns **stsOK** if the receiver and all its ancestors have **wsVisible** on.

Takes nothing, returns STATUS.

```
#define msgWinIsVisible                 MakeMsg(clsWin,   40)
```

Comments

clsWin will traverse the parent chain of the receiver until the parent is **objNull** or the root window of the receiver's device. If the receiver or any of its ancestors have **wsVisible** off in their window flags, **stsFailed** is returned. Otherwise, if the final ancestor is the root window on the receiver's device, **stsOK** is returned.

msgWinIsDescendant

Checks if **pArgs**->child is a descendant of the receiver.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinIsDescendant                    MakeMsg(clsWin,   59)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

In parameters child: child to look for options: 0 for direct children, **wsEnumRecursive** for recursive or-in **wsEnumSelf** to include self in the search

clsWin will check the receiver's children and return **stsWinIsChild** if **pArgs**->child is one of them.

If **pArgs**->options has **wsEnumRecursive** on, the search will continue down the window tree until **pArgs**->child is found or all of the receiver's descendants have been examined. If no match is found, **stsNoMatch** is returned.

If **pArgs**->child is self and **wsEnumSelf** is on in **pArgs**->options, **stsWinIsChild** is returned; otherwise **stsNoMatch** is returned.

Returns Value

stsWinIsChild if **pArgs**->child is self or a direct child

stsWinIsDescendant if **pArgs**->child is a descendant

stsNoMatch if **pArgs**->child is not a descendant

msgWinGetPopup

Gets the popup window.

Takes P_WIN_METRICS, returns **stsOK**.

```
#define msgWinGetPopup                    MakeMsg(clsWin,   53)
```

Message Arguments

```
typedef struct
{
  WIN           parent,
                child;
  RECT32        bounds;
  WIN_DEV       device;
  WIN_FLAGS     flags;
  TAG           tag;
  WIN_OPTIONS   options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->child passes back self's popup window.

The popup window is traversed during **msgWinFindTag** only. See **msgWinFindTag** for more details.

msgWinSetPopup

Sets a popup window.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinSetPopup                    MakeMsg(clsWin,   54)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->child should be set to the popup window.

The popup window is traversed during **msgWinFindTag** only. See **msgWinFindTag** for more details.

One example of popup window use is in **clsMenuButton**. A menu button will set its popup window to be its menu. This allows you to use **msgWinFindTag** on a menu bar and find a menu button in one of the popup menus.

msgWinFindAncestorTag

Searches for a match on argument tag. Returns match or **objNull**.

Takes U32, returns OBJECT.

```
#define msgWinFindAncestorTag             MakeMsg(clsWin,   49)
```

Comments

The search is up the ancestor chain; the first match found is returned. If no match is found, **objNull** is returned.

msgWinFindTag

Searches for a match on argument tag. Returns match or **objNull**.

Takes U32, returns OBJECT.

```
#define msgWinFindTag                     MakeMsg(clsWin,   39)
```

Comments

The search is breadth first; but, it starts with the first child of the window, not the window itself. The first match found is returned. If no match is found, **objNull** is returned. Trees rooted at popup windows (set with **msgWinSetPopup**) are traversed too. The traversal order is siblings first, then children, then popups.

msgWinSetVisible

Turns window visibility bit on or off, returns previous value.

Takes BOOLEAN, returns BOOLEAN.

```
#define msgWinSetVisible                  MakeMsg(clsWin,    8)
```

Comments

If visibility is changed and the receiver's parent has **wsCaptureLayout** on, **wsLayoutDirty** will be set on the receiver's parent.

msgWinSetPaintable

Turns window paintability bit on or off, returns previous value.

Takes BOOLEAN, returns BOOLEAN.

```
#define msgWinSetPaintable              MakeMsg(clsWin,    9)
```

msgWinBeginRepaint

Sets up window for painting on "dirty" region.

Takes P_RECT32 or **pNull**, returns STATUS.

```
#define msgWinBeginRepaint              MakeMsg(clsWin,   10)
```

Comments

A BeginRepaint/EndRepaint pair bracket an update episode for a window. They should be sent ONLY in response to the receipt of **msgWinRepaint**. If **pArgs** is not **pNull** a rectangle describing the bounds of the dirty region is passed back.

msgWinEndRepaint

Tells window system that repainting has ended for this window.

Takes nothing, returns STATUS.

```
#define msgWinEndRepaint                MakeMsg(clsWin,   11)
```

msgWinBeginPaint

Sets up window for painting on its visible region.

Takes P_RECT32 or **pNull**, returns STATUS.

```
#define msgWinBeginPaint                MakeMsg(clsWin,   12)
```

Comments

A BeginPaint/EndPaint pair can be used to paint on a window at anytime, even if it is not dirty. If **pArgs** is not **pNull** a rectangle describing the bounds of the visible region is passed back.

msgWinEndPaint

Tells window system that painting has ended for this window.

Takes nothing, returns STATUS.

```
#define msgWinEndPaint                  MakeMsg(clsWin,   13)
```

msgWinDirtyRect

Marks all or part of a window dirty.

Takes P_RECT32 or **pNull**, returns STATUS.

```
#define msgWinDirtyRect                 MakeMsg(clsWin,   14)
```

Comments

If **pNull** is passed the entire window is marked dirty. If the dirty part is visible, the window will eventually receive **msgWinRepaint** as a side effect of this message.

msgWinUpdate

Forces a window to repaint now, provided that it needs repainting.

Takes nothing, returns STATUS.

```
#define msgWinUpdate                    MakeMsg(clsWin,   35)
```

Comments

The window and all its descendants that need painting are sent **msgWinRepaint**. However, only windows owned by the current subtask are processed.

msgWinCleanRect

Marks all or part of a window clean.

Takes P_RECT32 or **pNull**, returns STATUS.

```
#define msgWinCleanRect                 MakeMsg(clsWin,   15)
```

Comments

If **pNull** is passed the entire window is marked clean. In general it is not a good idea to mark a window clean. Window activity is asynchronous and application software has no way of knowing if the window is really clean.

msgWinCopyRect

Copies pixels within a window.

Takes P_WIN_COPY_RECT, returns STATUS.

```
#define msgWinCopyRect                  MakeMsg(clsWin,   16)
```

Arguments

```
Enum16(WIN_COPY_FLAGS)
{ wsCopyNormal   = 0,          // normal copy of normal planes
  wsPlanePen     = flag0,      // do pen plane(s) too
  wsPlaneMask    = flag1,      // use planeMask
  wsSrcNotDirty  = flag2,      // don't mark source dirty
  wsDstNotDirty  = flag3,      // don't mark dirty dst pixels dirty
  wsChildrenStay = flag4,
  wsCopyRelative = flag5,      // xy is a delta on srcRect.origin
};
typedef struct
{
  RECT32          srcRect;       // rectangle    in LWC
  XY32            xy;            // new location in LWC
  WIN_COPY_FLAGS  flags;
  U16             planeMask;
} WIN_COPY_RECT, * P_WIN_COPY_RECT;
```

Comments

In general, pixels which are dirty, invisble, or just off the edge of the window, are not copied. Rather, at the destination it is recognized that they did not get copied, and they are marked dirty instead. Also, it is assumed that pixels at the source need to be repainted. (This behavior is controlled by the two flags **wsSrcNotDirty** and **wsDstNotDirty**).

The intent of this message is that it be used as an accelerator; to move potentially good pixels to a new location. It should be sent OUTSIDE of an update episode. Then, areas that require repainting will be marked dirty and handled by the next update episode.

If, by mistake, this message is sent inside an update episode it will probably not copy any pixels, because it will assume that all the pixels that are currently being updated are dirty.

The use of **wsCopyNormal** is recommended to copy the normal planes and skip the pen plane(s). More precise control over which planes are copied is available with the use of flags **wsCopyNormal**, **wsPlanePen** and **wsPlaneMask** (in conjunction with the **planeMask** field).

If **wsChildrenStay** is not in in **pArgs**->flags and the receiver has children in the area being copied, the children will be moved also. Note that even if the receiver has **wsCaptureGeometry** on, the receiver will not be sent **msgWinDeltaOK** when the children are moved. However, each child that has **wsSendGeometry** on and is moved will be sent **msgWinMoved**.

msgWinTransformBounds

Transforms bounds from receiver's to another window's LWC.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinTransformBounds            MakeMsg(clsWin,   18)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

Set the **pArgs**->parent to a window or use **objNull** for the receiver's actual parent. **pArgs**->bounds in the receiver's LWC are transformed into the equivalent bounds in the parent's LWC.

msgWinEnum

Enumerate a window's children.

Takes P_WIN_ENUM, returns STATUS.

```
#define msgWinEnum                       MakeMsg(clsWin,   33)
```

Arguments

```
Enum16(WIN_ENUM_FLAGS)
{ wsEnumChildren     = 0,      // enum children only
  wsEnumSelf         = flag0,  // enum self too
  wsEnumRecursive    = flag1,  // enum children of children...
  wsEnumFlags        = flag2,  // return flags too
  wsEnumBreadthFirst = flag3,  //
  wsEnumSendFile     = flag4,  // enum only windows with
                               // wsSendFile == TRUE
  wsEnumMetrics      = flag5   // return WIN_METRICS
};
typedef struct
{
  U16              max,         // in = size of pWin[] and pFlags[] arrays
                   count;       // in = # to return in arrays
                                // if count > max then memory may be allocated
                                // out = # of valid entries in arrays
  P_WIN            pWin;
  P_WIN_FLAGS      pFlags;      // in = ptr to arrays
                                // out = if memory was allocated
                                // client should free the memory
  U16              next;        // in  = 0 to start at beginning
                                //       OR previous out value to pick up
                                //       where we left off
  WIN_ENUM_FLAGS   flags;       // in  = see options
} WIN_ENUM, * P_WIN_ENUM;
```

Comments

Here is some sample code for enumerating the direct children of a window:

```
WIN_ENUM e;
WIN      w[10];
U16      i;
e.max    = 10;              // e.pWin is an array of 10 WINs
e.count  = maxU16;          // allocate as much storage as needed
e.pWin   = w;               // put windows in w array
e.flags  = wsEnumChildren;  // return only direct children
e.next   = 0;               // start from the first child
s = ObjectCall(msgWinEnum,parent,&e);
// stsEndOfData means we got them all
if (s == stsEndOfData)
    s = stsOK;
// e.count is the actual number of children
for (i = 0; i < e.count; i++) {
    child = e.pWin[i];
    // put code that does something with
    // child here
}
// free any allocated storage
if (e.pWin != w)
    StsWarn(OSHeapBlockFree(e.pWin));
```

If you want to retrieve all of the window metrics for each window, turn on **wsEnumMetrics** in **pArgs**->flags and set **pArgs**->pWin to an array of WIN_METRICS structs.

Returns

stsEndOfData if all of the descendants have been returned

See Also

WinEachChild

WinEachChild

Helper macro for enumerating the direct children of a window

Returns nothing.

```
#define WinEachChild(parent, child, s)        \
{                                             \
  WIN_ENUM _e;                                \
  WIN      _w[10];                            \
  U16      _i;                                \
                                              \
  _e.max    = 10;                             \
  _e.count  = maxU16;                         \
  _e.pWin   = _w;                             \
  _e.flags  = wsEnumChildren;                 \
  _e.next   = 0;                              \
                                              \
  s = ObjectCall(msgWinEnum,parent,&_e);      \
                                              \
  if (s == stsEndOfData)                      \
    s = stsOK;                                \
                                              \
  for (_i = 0; _i < _e.count; _i++)           \
  {                                           \
    child = _e.pWin[_i];
    // put code that does something with
    // child here
```

Comments

You can use WinEachChild to retrieve the direct children of a window.

See Also

WinEndEachChild

WinEndEachChild

Ending helper macro for most common window enumeration idiom.

Returns nothing.

```
#define WinEndEachChild                         \
  } /* for */                                   \
  if (_e.pWin != (P_WIN)_w)                     \
    OSHeapBlockFree(_e.pWin);                   \
} // end scope
```

WinEachChild and WinEndEachChild

Use WinEachChild(parent,child,status) to start a for loop enumeration of the children of parent. The variable child will be set for each child. Close the enumeration with WinEndEachChild. Here is an example; notice that semicolons are NOT used.

WinEachChild(p,c,s)// send a message to c // break if necessary
    // s is set here

The code placed between these macros becomes the body of a for loop. If it is necessary to exit the loop early, use a break statement, not a return or goto, so that WinEndEachChild is reached. If an error in the enum occurs, the for loop will not be executed, and the status value will be set.

msgWinRepaint

Tells a window to repaint itself.

Takes nothing, returns STATUS. Category: descendant responsibility.

```
#define msgWinRepaint                   MakeMsg(clsWin,   21)
```

Comments

Windows only receive this if the **wsPaintable** flag is true. This message is sent by the window system during an update episode. It should NOT be sent by the application.

If you want a window to be updated immediately (synchronously), use **msgWinUpdate**.

Upon receipt of this message, applications should NOT perform other windowing operations that are visually significant (**msgWinDelta**, **msgWinInsert**, **msgWinExtract**, etc.). When this message is received; it is too late. The only thing that should happen is repainting.

See Also

msgWinBeginRepaint

msgWinOrphaned

Tells a window its parent has been freed.

Takes nothing, returns STATUS. Category: advisory message.

```
#define msgWinOrphaned                  MakeMsg(clsWin,   22)
```

Comments

Windows only receive this if the **wsSendOrphaned** flag is true.

msgWinInsertOK

Informs a potential parent of a pending child insertion.

Takes P_WIN_METRICS, returns STATUS. Category: advisory message.

```
#define msgWinInsertOK                  MakeMsg(clsWin,   23)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->child is the window that is being inserted; **pArgs**->bounds is its bounds, which the parent can modify. If receiver does not return **stsOK** the insertion will be denied.

Windows only receive this if **wsCaptureGeometry** in flags is true.

---

msgWinExtractOK

Informs parent of a pending child extraction.

Takes P_WIN_METRICS, returns STATUS. Category: advisory message.

```
#define msgWinExtractOK                  MakeMsg(clsWin,   24)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->child is the window that is being extracted. If receiver does not return **stsOK** the extraction will be denied.

Windows only receive this if **wsCaptureGeometry** in flags is true.

---

msgWinDeltaOK

Informs parent of a pending change in a child window's size or position.

Takes P_WIN_METRICS, returns STATUS. Category: advisory message.

```
#define msgWinDeltaOK                    MakeMsg(clsWin,   25)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs are the arguments to **msgWinDelta**. If receiver does not return **stsOK** the delta will be denied.

Windows only receive this if **wsCaptureGeometry** in flags is true.

msgWinFreeOK

Informs parent of the pending destruction of a child window.

Takes WIN, returns STATUS. Category: advisory message.

```
#define msgWinFreeOK                    MakeMsg(clsWin,   26)
```

Comments

Windows only receive this if **wsCaptureGeometry** in flags is true.

msgWinInserted

Advises window that it has been inserted.

Takes WIN, returns STATUS. Category: advisory message.

```
#define msgWinInserted                  MakeMsg(clsWin,   27)
```

Comments

pArgs is the window that actually was inserted, it may be self or an ancestor. If it is an ancestor, the window is being inserted indirectly, as part of a sub-tree insertion.

Windows only receive this if **wsSendGeometry** in flags is true.

msgWinExtracted

Advises window that it has been extracted.

Takes WIN, returns STATUS. Category: advisory message.

```
#define msgWinExtracted                 MakeMsg(clsWin,   28)
```

Comments

pArgs is the window that actually was extracted, it may be self or an ancestor. If it is an ancestor, the window is being extracted indirectly, as part of a sub-tree extraction.

Windows only receive this if **wsSendGeometry** in flags is true.

msgWinVisibilityChanged

Advises window that its visibility may have changed.

Takes WIN, returns STATUS. Category: advisory message.

```
#define msgWinVisibilityChanged         MakeMsg(clsWin,   60)
```

Comments

pArgs is the window that actually was changed, it may be self or an ancestor. If it is an ancestor, the window is being made visible or invisible indirectly, as part of a sub-tree insertion or extraction.

Note that if **pArgs** is an ancestor, the ancestor's visibility change may not have changed self's visibility. Use **msgWinIsVisible** to determine self's current visibility.

Windows only receive this if **wsSendGeometry** in flags is true.

See Also

msgWinIsVisible

msgWinMoved

Advises window that it, or an ancestor, has moved.

Takes P_WIN_METRICS, returns STATUS. Category: advisory message.

```
#define msgWinMoved                     MakeMsg(clsWin,   29)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

Windows only receive this if **wsSendGeometry** in flags is true. **pArgs**->bounds.origin is the previous position. **pArgs**->child is the window that actually moved, it may be self or an ancestor. If it is an ancestor, the window is being moved indirectly, as part of a sub-tree move.

msgWinSized

Advises window that it, or an ancestor, has changed size.

Takes P_WIN_METRICS, returns STATUS. Category: advisory message.

```
#define msgWinSized                    MakeMsg(clsWin,   30)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

Windows only receive this if **wsSendGeometry** in flags is true. **pArgs**->bounds.size is the previous size. **pArgs**->child is the window that actually changed size, it may be self or an ancestor. If it is an ancestor, the window did not actually change size, the ancestor did.

msgWinStartPage

Advises window that it is on a printer, and printing is about to commence.

Takes **pNull**, returns STATUS. Category: advisory message.

```
#define msgWinStartPage                MakeMsg(clsWin,   48)
```

Comments

clsWin does nothing and returns **stsOK** in response to this message.

This message is sent before a page is about to be printed. The window may want to set a state variable used to change the way the window paints on a printer.

msgWinSort

Sorts a window's children into a back to front order determined by a client supplied comparison function.

Takes P_WIN_SORT, returns STATUS.

```
#define msgWinSort                     MakeMsg(clsWin,   52)
```

Function Prototype

```
                                                    );
typedef struct
{
  P_WIN_SORT_PROC   pSortProc;     // In:  comparison callback
  P_UNKNOWN         pClientData;   // In:  parameter to callback
  BOOLEAN           changed;       // Out: did sort cause change in order
} WIN_SORT, *P_WIN_SORT;
```

Comments

The client must create a function of the profile P_WIN_SORT_PROC that takes two windows (A,B) and returns -1 if A < B, 0 if A == B, and +1 if A > B. The comparison will normally be based on information retrieved from the windows (for instance, **msgLabelGetString**).

---

msgWinGetEnv

Gets the current window environment.

Takes P_WIN_ENV, returns STATUS.

```
#define msgWinGetEnv                        MakeMsg(clsWin,   47)
```

Arguments

```
typedef struct WIN_ENV
{
  U8        scale;              // system font scale
  U16       sysFontId,          // system font
            userFontId;         // user font
  SIZE32    ppm;                // device pixels per meter
} WIN_ENV, *P_WIN_ENV;
typedef struct WIN_SAVE_ENV
{
  WIN_ENV   env;                // environment being saved
  U32       spare1;
  U32       spare2;
} WIN_SAVE_ENV, *P_WIN_SAVE_ENV;
typedef struct WIN_RESTORE_ENV
{
  WIN_ENV   env;                // the saved environment
  BOOLEAN   scaleChanged,
            sysFontIdChanged,   // these are true if the current
            userFontIdChanged,  // environment has changed from
            ppmWChanged,        // the saved environment.
            ppmHChanged;
  U32       spare1;
  U32       spare2;
} WIN_RESTORE_ENV, *P_WIN_RESTORE_ENV;
```

Comments

The window environment is information filed with the root of each filed tree of windows.

This message would not normally be used by application software.

---

msgWinDumpTree

In lieu of **msgDump**. Dumps a dense subset of information for the window and all it's children recursively.

Takes **pNull**, returns STATUS.

```
#define msgWinDumpTree                      MakeMsg(clsWin,   51)
```

Comments

Debug /DW 2 causes the input flags to be printed, otherwise the window flags are printed.

This function may not work unless the debugging version of win.dll is being used.

msgWinHitDetect

Locates the window "under" a point.

Takes P_WIN_METRICS, returns STATUS.

```
#define msgWinHitDetect                    MakeMsg(clsWin,   58)
```

Message Arguments

```
typedef struct
{
  WIN          parent,
               child;
  RECT32       bounds;
  WIN_DEV      device;
  WIN_FLAGS    flags;
  TAG          tag;
  WIN_OPTIONS  options;
} WIN_METRICS, * P_WIN_METRICS;
```

Comments

pArgs->bounds.origin is a point relative to the receiver. The window tree, starting with the root window, is searched for a window underneath this point. The result is returned in **pArgs**->child.

If the search is NOT successful, **pArgs**->child will be **objNull**.

Messages from other classes

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

clsWin will save its instance data and file each direct child that has **wsSendFile** on.

If **pArgs**->root is self, **clsWin** will file the window environment along with its instance data. The window environment is retrieved by self-sending **msgWinGetEnv**. If **pArgs**->pEnv is not **pNull**, the current environment info (WIN_SAVE_ENV) will be copied to the storage provided (**pArgs**->pEnv should either be **pNull** or a P_WIN_SAVE_ENV). Subclasses of **clsWin** can make use of **pArgs**->pEnv to look at the environment under which the window is being saved. The filed window environment will be used during **msgRestore** to adjust the window bounds and/or dirty the window layout if the restore environment is not the same as the saved environment.

If **wsFileNoBounds** is on in self's window style flags, the current bounds will not be filed. This will save space in the filed window.

If self's desired size has been computed (via **msgWinGetDesiredSize** during **msgWinLayout** processing), the desired size will be filed.

For each child of self that has **wsSendFile** on, **clsWin** will do the following:

```
If wsFileInline is on in the child's window style flags, the class of the
child window will be filed, and then the child will be sent msgSave with
the following OBJ_SAVE parameters:

    all fields as in *pArgs,
    objSave = pointer to current save environment

This will file the child "inline" without the usual resource file object
header. This will save storage, but the child will not have its own
resId and can only be restored by restoring its parent.
```

```
If wsFileInline is not on in the child's window style flags, the child
window will be filed by sending msgResPutObject to pArgs->file with the
child's uid as pArgs.
```

Returns

stsWinNoEnv if **pArgs**->root != self and **pArgs**->pEnv is **pNull**

See Also **msgRestore**

---

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments **clsWin** will restore its instance data from **pArgs**->file. Each filed child window will also be restored. The window will be created on the window device returned from OSThisWinDev().

If the window environment was filed when the window was saved, the window environment will be restored and copied to **pArgs**->pEnv if it is not **pNull** (**pArgs**->pEnv must be either **pNull** or P_WIN_RESTORE_ENV). The current window environment will be retrieved using **msgWinGetEnv** and compared to the filed window environment.

If **wsFileNoBounds** is on in self's window style flags, the bounds will be set to (0, 0, 0, 0) and the window will be marked as layout-dirty (**wsLayoutDirty** will be or-ed into the window's style flags). Otherwise, the filed bounds will be restored and adjusted to compensate for differences in the save/restore-time device resolution and orientation.

clsWin will or-in **wsLayoutDirty** into the window's style flags if any of the following are true (in this context "changed" means that the current window environment values do not match the window environment filed with the window tree):

wsFileLayoutDirty is on in the window's style flagssystem font or system font scale has changeduser font has changedpixels-per-meter in x or y have changed

Each child that was filed will be restored as follows:

```
If wsFileInline was on in the child's window style flags, the child's
class will be read in from pArgs->file and msgRestoreInstance will be
sent to the classs with the following OBJ_RESTORE parameters:

    all fields as in *pArgs
    object      = msgNewDefaults to clsObject
    object.key  = pArgs->object.key;
    object.cap  = pArgs->object.cap;
    object.heap = pArgs->object.heap;

 If wsFileInline was not on in the child's window style flags, the child's
 resId will be read in from pArgs->file and the child will be restored
 by sending msgResReadObject to pArgs->file with the following
 RES_READ_OBJECT parameters:

    mode        = resReadObjectOnce;
    objectNew   = same as object in wsFileInline case above
```

After all of the children have been restored, they will be inserted into the restored parent. Note that the **wsCaptureGeometry** and **wsSendGeometry** protocol is not used for these inserts (e.g. the parent will not be sent **msgWinInsertOK**, even if the parent has **wsCaptureGeometry** on).

See Also **msgSave**

Messages Sent to a Window Device

As a rule applications should not send these messages to **theScreen**. They would be used if the application creates image devices.

msgNew

Creates a windowing device.

Takes P_WIN_DEV_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct
{
  U16   initialWindows;     // default window slots to allocate
} WIN_DEV_NEW_ONLY, * P_WIN_DEV_NEW_ONLY;
typedef struct
{
  OBJECT_NEW        object;
  WIN_DEV_NEW_ONLY  winDev;
} WIN_DEV_NEW, * P_WIN_DEV_NEW,
  IMG_DEV_NEW, * P_IMG_DEV_NEW;
```

msgNewDefaults

Initializes the WIN_DEV_NEW structure to default values.

Takes P_WIN_DEV_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct
{
  OBJECT_NEW        object;
  WIN_DEV_NEW_ONLY  winDev;
} WIN_DEV_NEW, * P_WIN_DEV_NEW,
 win.Dev.initialWindows = 100;
```

msgWinDevGetRootWindow

Passes back root window for receiver.

Takes P_OBJECT, returns STATUS.

```
#define msgWinDevGetRootWindow          MakeMsg(clsWinDev,10)
```

msgWinDevBindScreen

Binds window device to a screen.

Takes P_CHAR, returns STATUS.

```
#define msgWinDevBindScreen             MakeMsg(clsWinDev, 6)
```

msgWinDevBindPrinter

Binds window device to an object of **clsPrn**.

Takes OBJECT, returns STATUS.

```
#define msgWinDevBindPrinter            MakeMsg(clsWinDev, 7)
```

msgWinDevBindPixelmap

Binds window device to a pixelmap.

Takes P_WIN_DEV_PIXELMAP, returns STATUS.

```
#define msgWinDevBindPixelmap                MakeMsg(clsWinDev,11)
```

Comments

Note that you should not file the memory allocated by **msgWinDevBindPixelmap**, since the memory is device-dependant and you may be restored on a different screen device or system processor.

msgWinDevSizePixelmap

Computes the amount of memory needed for a single plane.

Takes P_WIN_DEV_PIXELMAP, returns STATUS.

```
#define msgWinDevSizePixelmap                MakeMsg(clsWinDev,12)
```

Arguments

```
typedef struct
{
  OBJECT      device;         // in  = device to be "compatible" with
  SIZE32      size;           // in  = w,h of device to allocate
  U16         planeCount;     // in  = # planes to allocate
  SIZEOF      planeSize;      // out = amount of memory for one plane
  PP_UNKNOWN  pPlanes;        // in  = plane memory
} WIN_DEV_PIXELMAP, * P_WIN_DEV_PIXELMAP;
```

msgWinDevSetOrientation

Changes orientation of a window device.

Takes PIX_DEV_ORIENT, returns STATUS.

```
#define msgWinDevSetOrientation              MakeMsg(clsWinDev, 8)
```

Arguments

```
Enum16(PIX_DEV_ORIENT)
{
  pdUL                      = 0,
  pdUR                      = 1,
  pdLR                      = 2,
  pdLL                      = 3,
  pdOrientLandscapeNormal   = pdLL,
  pdOrientPortraitNormal    = pdUL,
  pdOrientLandscapeReverse  = pdUR,     // not supported on printers
  pdOrientPortraitReverse   = pdLR      // not supported on printers
};
```

msgPixDevGetMetrics

Gets metrics of a pixelmap device.

Takes P_PIX_DEV_METRICS, returns nothing.

```
#define msgPixDevGetMetrics                  MakeMsg(clsPixDev, 1)
```

Arguments

```
typedef struct
{
  SIZE32          size,               // size of device in DU4
                  ppm;                // pixel per meter in DU4
  U16             planes;             // # of planes total
  U16             planeMask;          // mask representing all planes
  U16             planeNormalCount;   // # of normal (not pen) planes
  U16             planeNormalMask;    // mask for the normal planes
  U16             planePenCount;      // # of pen planes
  U16             planePenMask;       // mask for the pen planes
```

```
  PIX_DEV_ORIENT  orient;              // pdUL, pdLR, etc.
  P_UNKNOWN       devPhysical,         // handles to physical and
                  devLogical;          // logical device drivers
  U16             mode;                // private flags, see pix...
  OBJECT          prn;                 // printer (or objNull)
  PP_UNKNOWN      ppDryRunRgn;
} PIX_DEV_METRICS, * P_PIX_DEV_METRICS;
```

msgWinDevPrintPage

Repaints and outputs a page.

Takes nothing, returns STATUS.

```
#define msgWinDevPrintPage              MakeMsg(clsWinDev, 9)
```

Messages sent to a drawing context

msgDrwCtxSetWindow

Binds a drawing context to a window, returns old window.

Takes WIN, returns WIN.

```
#define msgDrwCtxSetWindow              MakeMsg(clsDrwCtx, 3)
```

msgDrwCtxGetWindow

Returns the window to which a drawing context is bound.

Takes nothing, returns WIN.

```
#define msgDrwCtxGetWindow              MakeMsg(clsDrwCtx, 4)
#endif // WIN_INCLUDED
```

Part 4 / UI Toolkit

BORDER.H

This file contains the API for **clsBorder**.

clsBorder inherits from **clsEmbeddedWin.**

clsBorder supports drawing borders, backgrounds and shadows. Support is also provided for resize, drag and top window management.

```
#ifndef BORDER_INCLUDED
#define BORDER_INCLUDED

#include <win.h>

#include <ewnew.h>

#include <input.h>
```

```
#ifndef WIN_INCLUDED

#endif
#ifndef EWNEW_INCLUDED

#endif
#ifndef INPUT_INCLUDED

#endif
```

Common #defines and typedefs

```
#define hlpBorderResizeBottom   MakeTag(clsBorder, 1)
#define hlpBorderResizeCorner   MakeTag(clsBorder, 2)
#define hlpBorderResizeRight    MakeTag(clsBorder, 3)
typedef OBJECT          BORDER;
```

Edge Styles

```
#define bsEdgeNone                  0       // no borders
#define bsEdgeLeft                  flag0   // border on the left
#define bsEdgeRight                 flag1   // border on the right
#define bsEdgeTop                   flag2   // border on the top
#define bsEdgeBottom                flag3   // border on the bottom
// Borders on all edges
#define bsEdgeAll                   (bsEdgeLeft | bsEdgeRight | \
                                    bsEdgeTop  | bsEdgeBottom)
```

Join Styles

```
#define bsJoinSquare                0   // right-angle rectangle
#define bsJoinRound                 1   // round corner rectangle
#define bsJoinEllipse               2   // ellipse instead of rectangle
//                                  3   // unused (reserved)
```

Line Styles

```
#define bsLineSingle            0   // solid ink
#define bsLineDouble            1   // ink-white-ink lines
#define bsLineMarquee           2   // flowing dashed lines
#define bsLineDashed            3   // dashed lines
#define bsLineDoubleMarquee     4   // double flowing dashed lines
#define bsLineDoubleDashed      5   // double dashed lines
//                              6   // unused (reserved)
//                              .. // unused (reserved)
//                              15  // unused (reserved)
```

Edge and Background Colors

```
#define bsInkTransparent            0   // no ink
#define bsInkBlack                  1   // black
#define bsInkGray75                 2   // 75% gray
#define bsInkGray66                 3   // 66% gray
#define bsInkGray50                 4   // 50% gray
#define bsInkGray33                 5   // 33% gray
#define bsInkGray25                 6   // 25% gray
#define bsInkWhite                  7   // white
#define bsInkAsIs                   8   // use appropriate dc value
#define bsInkRGB                    9   // use custom RGB value
#define bsInkBackground             10  // use the background ink
//                                  11  // unused (reserved)
//                                  .. // unused (reserved)
//                                  31  // unused (reserved)
```

bsInkExclusive can be or'ed into any ink to indicate that the specified ink should only be used if the window exclusively paints its pixels. If the window is transparent or shares clipping with its parent, **bsInkTransparent** will be used (i.e. nothing will be painted).

```
#define bsInkExclusive              flag4
```

BorderInk extracts the base ink from a border ink

```
#define BorderInk(ink)              ((ink) & 0xF)
```

Shadow Styles: drawn on the bottom and right

```
#define bsShadowNone                0   // no shadow
#define bsShadowThinGray            1   // one line gray
#define bsShadowThickGray           2   // two line gray
#define bsShadowThinBlack           3   // one line black
#define bsShadowThickBlack          4   // two line black
#define bsShadowThinWhite           5   // one line white
#define bsShadowThickWhite          6   // two line white
#define bsShadowCustom              7   // use shadowThickness and shadowInk
//                                  8   // unused (reserved)
//                                  .. // unused (reserved)
//                                  15  // unused (reserved)
```

Units

```
#define bsUnitsLayout               0   // values are in layout units
#define bsUnitsDevice               1   // values are in device units
#define bsUnitsTwips                2   // values are in twips
#define bsUnitsPoints               BorderUnitsCustom(bsUnits20x, bsUnitsTwips)
                                        // values are in points = 20 x twips
#define bsUnitsRules                3   // values are in rules
#define bsUnitsLines                BorderUnitsCustom(bsUnits20x, bsUnitsRules)
                                        // values are in lines = 20 x rules
#define bsUnitsMetric               4   // values are in .01 mm
#define bsUnitsMil                  5   // values are in .001 inch
#define bsUnitsFitWindow            6   // values not specified --
                                        // compute to fit window
#define bsUnitsFitWindowProper      7   // values not specified --
                                        // compute to fit window w/proper
                                        // aspect ratio
//                                  8   // unused (reserved)
//                                  .. // unused (reserved)
//                                  15  // unused (reserved)
```

Units Multiplier

These values can be used with BorderUnitsCustom() to produce new units e.g. BorderUnitsCustom(**bsUnits20x**, **bsUnitsTwips**) indicates units are 20 x twips

```
#define bsUnits1x                   0   //    1x
#define bsUnits20x                  1   //   20x
#define bsUnits100x                 2   //  100x
#define bsUnits1000x                3   // 1000x
#define BorderUnitsCustom(mult, units)  ((mult << 4) | (units))
```

macros to extract base units and multiplier values

```
#define BorderUnits(units)          ((units) & 0x0F)
#define BorderUnitsMult(units)      ((units) >> 4)
```

Common Margin Values

```
#define bsMarginNone                0   // no inner margin
#define bsMarginSmall               1   // 1 unit
#define bsMarginMedium              2   // 2 units
#define bsMarginLarge               8   // 8 units
```

Resize Handles

```
#define bsResizeNone                0       // no resize handles
#define bsResizeCorner              flag0   // lower-right corner
#define bsResizeBottom              flag1   // center-bottom
#define bsResizeRight               flag2   // center-right
#define bsResizeAll                 (bsResizeCorner | bsResizeBottom |\
                                    bsResizeRight)
```

Drag Styles

```
#define bsDragNone                  0       // no drag
#define bsDragHoldDown              1       // drag on penHoldDown
#define bsDragDown                  2       // drag on penDown
#define bsDragMoveDown              3       // drag on penMoveDown beyond range
```

Top Styles

```
#define bsTopNone                   0       // never top the window
#define bsTopUp                     1       // top on penUp
#define bsTopDrag                   2       // top after drag
//                                  3       // unused (reserved)
```

Shadow Gap Styles

```
#define bsGapNone                   0       // no shadow gap
#define bsGapWhite                  1       // cleared to white
#define bsGapTransparent            2       // unpainted
//                                  3       // unused (reserved)
```

Look Styles

```
#define bsLookActive                0       // usually black foreground color
#define bsLookInactive              1       // usually gray66 foreground color
//                                  2       // unused (reserved)
//                                  3       // unused (reserved)
```

Alter Styles for preview and selected

```
#define bsAlterNone                 0       // don't alter anything
#define bsAlterBackground           1       // alter the background ink
#define bsAlterBorders              2       // alter the border ink
//                                  3       // unused (reserved)
typedef struct BORDER_STYLE {
    U16 edge            : 4,    // edges to border
        top             : 2,    // top style (e.g. bsTopUp)
        drag            : 2,    // drag style (e.g bsDragDown)
        resize          : 5,    // resize handles (e.g. bsResizeCorner|bsResizeBottom)
        maskBorders     : 1,    // mask out edge, shadow, resize
        getDeltaWin     : 1,    // use msgBorderProvideDeltaWin
        spare1          : 1;    // unused (reserved)
    U16 leftMargin      : 8,    // margin in marginUnits
        rightMargin     : 8;    //      "
    U16 bottomMargin    : 8,    //      "
        topMargin       : 8;    //      "
    U16 borderInk       : 6,    // edge line color
        backgroundInk   : 6,    // background fill color
        previewAlter    : 2,    // what to alter when previewing
        selectedAlter   : 2;    // what to alter when selected
    U16 marginInk       : 6,    // ink for margin area (not implemented)
        marginUnits     : 6,    // units for left, right, bottom, top margins
        preview         : 1,    // true/false
        selected        : 1,    // true/false
        look            : 2;    // active/inactive
    U16 shadow          : 4,    // type of shadow
        shadowGap       : 2,    // type of shadow gap
        shadowThickness : 8,    // custom shadow thickness, in lineUnits
        spare4          : 2;    // unused (reserved)
    U16 shadowInk       : 6,    // custom shadow ink
        lineStyle       : 4,    // edge line style (e.g. bsLineSingle)
        spare5          : 6;    // unused (reserved)
    U16 lineUnits       : 6,    // units for lineThickness and shadowThickness
        lineThickness   : 8,    // line thickness, in lineUnits
        join            : 2;    // how edges join together
    U16 propagateVisuals: 1,    // propagate changes in visuals to children
        notifyVisuals   : 1,    // send msgBorderSetVisuals to observers
        spare3          : 14;   // unused (reserved)
} BORDER_STYLE, *P_BORDER_STYLE;
```

Default BORDER_STYLE:

```
    edge            = bsEdgeNone
    join            = bsJoinSquare
    lineStyle       = bsLineSingle
    marginUnits     = bsUnitsLayout
    resize          = bsResizeNone
    move            = bsDragNone
    top             = bsTopNone
    leftMargin      = bsMarginNone
    rightMargin     = bsMarginNone
    bottomMargin    = bsMarginNone
    topMargin       = bsMarginNone
    look            = bsLookActive
    preview         = false
    selected        = false
    propagateVisuals= false
    notifyVisuals   = false
    getDeltaWin     = false
    maskBorders     = false
    borderInk       = bsInkBlack
   backgroundInk    = bsInkWhite
    marginInk       = bsInkBackground
```

```
    shadow          = bsShadowNone
    shadowGap       = bsGapWhite
    shadowInk       = bsInkBlack
    shadowThickness = 1
    lineUnits       = bsUnitsLines
    lineThickness   = 1
    previewAlter    = bsAlterNone
    selectedAlter   = bsAlterNone
```

Input event flags returned in INPUT_EVENT.flags indicates event was used to move/resize

```
#define evBorderTaken       evFlag0
```

Tags used by resize or drag tracks. These will be the tags in TRACK_METRICS of **msgTrackProvideMetrics** and **msgTrackDone**.

```
#define tagBorderResize     MakeTag(clsBorder, 4)
#define tagBorderDrag       MakeTag(clsBorder, 5)
```


msgNew

Creates a border window.

Takes P_BORDER_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct BORDER_NEW_ONLY {
    BORDER_STYLE            style;  // overall style
    U32                     spare1; // unused (reserved)
    U32                     spare2; // unused (reserved)
} BORDER_NEW_ONLY, BORDER_METRICS,
  *P_BORDER_NEW_ONLY, *P_BORDER_METRICS;
#define borderNewFields     \
    embeddedWinNewFields    \
    BORDER_NEW_ONLY         border;
typedef struct {
    borderNewFields
} BORDER_NEW, *P_BORDER_NEW;
```

Comments

If **pArgs**->border.style.**maskBorders** is true, style.resize is treated as though it is **bsResizeNone**, style.edge is treated as though it is **bsEdgeNone**, and style.shadow is treated as though it is **bsShadowNone**.

If **pArgs**->style.resize is not **bsResizeNone**, **pArgs**->win.flags.input is altered to enable events needed for resizing.

If **pArgs**->style.drag is not **bsDragNone**, **pArgs**->win.flags.input is altered to enable events needed for draging.

If **pArgs**->style.top is not **bsTopNone**, **pArgs**->win.flags.input is altered to enable events needed for topping.

msgNewDefaults

Initializes the BORDER_NEW structure to default values.

Takes P_BORDER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct {
    borderNewFields
} BORDER_NEW, *P_BORDER_NEW;
```

Comments

Zeroes out **pNew**->border and sets...

```
    pArgs->win.flags.style              |= wsSendFile;
```

```
pArgs->border.style.shadowInk       = bsInkBlack;
pArgs->border.style.borderInk       = bsInkBlack;
pArgs->border.style.marginInk       = bsInkBackground;
pArgs->border.style.backgroundInk   = bsInkWhite;
pArgs->border.style.lineUnits       = bsUnitsLines;
pArgs->border.style.lineThickness   = 1;
pArgs->border.style.shadowThickness = 1;
pArgs->border.style.shadowGap       = bsGapWhite;
pArgs->border.style.previewAlter    = bsAlterNone;
pArgs->border.style.selectedAlter   = bsAlterNone;
```

msgBorderGetStyle

Passes back the current style values.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgBorderGetStyle       MakeMsg(clsBorder, 1)
```

Message Arguments

```
typedef struct BORDER_STYLE {
    U16 edge            : 4,    // edges to border
        top             : 2,    // top style (e.g. bsTopUp)
        drag            : 2,    // drag style (e.g bsDragDown)
        resize          : 5,    // resize handles (e.g. bsResizeCorner|bsResizeBottom)
        maskBorders     : 1,    // mask out edge, shadow, resize
        getDeltaWin     : 1,    // use msgBorderProvideDeltaWin
        spare1          : 1;    // unused (reserved)
    U16 leftMargin      : 8,    // margin in marginUnits
        rightMargin     : 8;    //      "
    U16 bottomMargin    : 8,    //      "
        topMargin       : 8;    //      "
    U16 borderInk       : 6,    // edge line color
        backgroundInk   : 6,    // background fill color
        previewAlter    : 2,    // what to alter when previewing
        selectedAlter   : 2;    // what to alter when selected
    U16 marginInk       : 6,    // ink for margin area (not implemented)
        marginUnits     : 6,    // units for left, right, bottom, top margins
        preview         : 1,    // true/false
        selected        : 1,    // true/false
        look            : 2;    // active/inactive
    U16 shadow          : 4,    // type of shadow
        shadowGap       : 2,    // type of shadow gap
        shadowThickness : 8,    // custom shadow thickness, in lineUnits
        spare4          : 2;    // unused (reserved)
    U16 shadowInk       : 6,    // custom shadow ink
        lineStyle       : 4,    // edge line style (e.g. bsLineSingle)
        spare5          : 6;    // unused (reserved)
    U16 lineUnits       : 6,    // units for lineThickness and shadowThickness
        lineThickness   : 8,    // line thickness, in lineUnits
        join            : 2;    // how edges join together
    U16 propagateVisuals: 1,    // propagate changes in visuals to children
        notifyVisuals   : 1,    // send msgBorderSetVisuals to observers
        spare3          : 14;   // unused (reserved)
} BORDER_STYLE, *P_BORDER_STYLE;
```

msgBorderSetStyle

Sets all of the style values.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgBorderSetStyle       MakeMsg(clsBorder, 2)
```

Message Arguments

```
typedef struct BORDER_STYLE {
    U16 edge            : 4,    // edges to border
        top             : 2,    // top style (e.g. bsTopUp)
        drag            : 2,    // drag style (e.g bsDragDown)
        resize          : 5,    // resize handles (e.g. bsResizeCorner|bsResizeBottom)
        maskBorders     : 1,    // mask out edge, shadow, resize
        getDeltaWin     : 1,    // use msgBorderProvideDeltaWin
        spare1          : 1;    // unused (reserved)
    U16 leftMargin      : 8,    // margin in marginUnits
        rightMargin     : 8;    //      "
    U16 bottomMargin    : 8,    //      "
        topMargin       : 8;    //      "
    U16 borderInk       : 6,    // edge line color
        backgroundInk   : 6,    // background fill color
        previewAlter    : 2,    // what to alter when previewing
        selectedAlter   : 2;    // what to alter when selected
    U16 marginInk       : 6,    // ink for margin area (not implemented)
        marginUnits     : 6,    // units for left, right, bottom, top margins
        preview         : 1,    // true/false
        selected        : 1,    // true/false
        look            : 2;    // active/inactive
    U16 shadow          : 4,    // type of shadow
        shadowGap       : 2,    // type of shadow gap
        shadowThickness : 8,    // custom shadow thickness, in lineUnits
        spare4          : 2;    // unused (reserved)
    U16 shadowInk       : 6,    // custom shadow ink
        lineStyle       : 4,    // edge line style (e.g. bsLineSingle)
        spare5          : 6;    // unused (reserved)
    U16 lineUnits       : 6,    // units for lineThickness and shadowThickness
        lineThickness   : 8,    // line thickness, in lineUnits
        join            : 2;    // how edges join together
    U16 propagateVisuals: 1,    // propagate changes in visuals to children
        notifyVisuals   : 1,    // send msgBorderSetVisuals to observers
        spare3          : 14;   // unused (reserved)
} BORDER_STYLE, *P_BORDER_STYLE;
```

Comments

Self-sends **msgWinDirtyRect(pNull)** if painting styles change. If only the edge painting style changes, self-sends **msgWinDirtyRect** with **pArgs** specifying the rectangle around each border.

Self-sends **msgWinSetLayoutDirty**(true), if new style results in new layout.

If style.**propagateVisuals** is true, and **propagateVisuals** or any of the visual styles (look, **backgroundInk**, **previewAlter**, **selectedAlter**, preview, or selected) change, **msgBorderSetVisuals(pArgs)** is sent to each child of self.

If style.**notifyVisuals** is true and **notifyVisuals** or any of the visual styles change, **msgNotifyObservers** is self-sent with the following OBJ_NOTIFY_OBSERVERS parameters:

msg = **msgBorderSetVisuals**;

pArgs = pointer to new style struct;

lenSend = SizeOf(BORDER_STYLE);

msgBorderSetStyleNoDirty

Sets all of the style values.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgBorderSetStyleNoDirty    MakeMsg(clsBorder, 26)
```

Message Arguments

```
typedef struct BORDER_STYLE {
    U16 edge            : 4,    // edges to border
        top             : 2,    // top style (e.g. bsTopUp)
        drag            : 2,    // drag style (e.g bsDragDown)
        resize          : 5,    // resize handles (e.g. bsResizeCorner|bsResizeBottom)
        maskBorders     : 1,    // mask out edge, shadow, resize
        getDeltaWin     : 1,    // use msgBorderProvideDeltaWin
        spare1          : 1;    // unused (reserved)
    U16 leftMargin      : 8,    // margin in marginUnits
        rightMargin     : 8;    //      "
    U16 bottomMargin    : 8,    //      "
        topMargin       : 8;    //      "
    U16 borderInk       : 6,    // edge line color
        backgroundInk   : 6,    // background fill color
        previewAlter    : 2,    // what to alter when previewing
        selectedAlter   : 2;    // what to alter when selected
    U16 marginInk       : 6,    // ink for margin area (not implemented)
        marginUnits     : 6,    // units for left, right, bottom, top margins
        preview         : 1,    // true/false
        selected        : 1,    // true/false
        look            : 2;    // active/inactive
    U16 shadow          : 4,    // type of shadow
        shadowGap       : 2,    // type of shadow gap
        shadowThickness : 8,    // custom shadow thickness, in lineUnits
        spare4          : 2;    // unused (reserved)
    U16 shadowInk       : 6,    // custom shadow ink
        lineStyle       : 4,    // edge line style (e.g. bsLineSingle)
        spare5          : 6;    // unused (reserved)
    U16 lineUnits       : 6,    // units for lineThickness and shadowThickness
        lineThickness   : 8,    // line thickness, in lineUnits
        join            : 2;    // how edges join together
    U16 propagateVisuals: 1,    // propagate changes in visuals to children
        notifyVisuals   : 1,    // send msgBorderSetVisuals to observers
        spare3          : 14;   // unused (reserved)
} BORDER_STYLE, *P_BORDER_STYLE;
```

Comments

This message is the same as **msgBorderSetStyle**, except **msgWinDirtyRect** or **msgWinSetLayoutDirty** will not be self-sent, even if they new style parameters require repaint or relayout.

msgBorderGetLook

Passes back value of style.look.

Takes P_U16, returns STATUS.

```
#define msgBorderGetLook        MakeMsg(clsBorder, 13)
```

msgBorderSetLook

Sets style.look as in **msgBorderSetStyle**.

Takes U16 (**bsLook...**), returns STATUS.

```
#define msgBorderSetLook        MakeMsg(clsBorder, 12)
```

msgBorderSetPreview

Sets style.preview as in **msgBorderSetStyle**.

Takes BOOLEAN, returns STATUS.

```
#define msgBorderSetPreview     MakeMsg(clsBorder, 8)
```

msgBorderGetPreview

Passes back value of style.preview.

Takes P_BOOLEAN, returns STATUS.

```
#define msgBorderGetPreview     MakeMsg(clsBorder, 9)
```

msgBorderSetSelected

Sets style.selected as in **msgBorderSetStyle**.

Takes BOOLEAN, returns STATUS.

```
#define msgBorderSetSelected    MakeMsg(clsBorder, 16)
```

msgBorderGetSelected

Passes back value of style.selected.

Takes P_BOOLEAN, returns STATUS.

```
#define msgBorderGetSelected    MakeMsg(clsBorder, 17)
```

msgBorderPropagateVisuals

Propagates visuals to children.

Takes nothing, returns STATUS.

```
#define msgBorderPropagateVisuals   MakeMsg(clsBorder, 15)
```

Comments

Sends **msgBorderSetVisuals**(&style), where style is self's current style, to each child.

msgBorderSetDirty

Sends **msgBorderSetDirty**(**pArgs**) to each child.

Takes BOOLEAN, returns STATUS.

```
#define msgBorderSetDirty       MsgNoError(MakeMsg(clsBorder, 37))
```

Comments

clsBorder will pass this message along to each of its children. Child windows can alter their visuals to display a clean/dirty look. For example, **clsControl** will self-send **msgControlSetDirty**(**pArgs**) when receiving this message.

msgBorderGetDirty

Passes back true if any child responds to **msgBorderGetDirty** with true; otherwise passes back false.

Takes P_BOOLEAN, returns STATUS.

```
#define msgBorderGetDirty       MsgNoError(MakeMsg(clsBorder, 38))
```

Comments

clsBorder will pass this message along to each of its children. The first child that responds with true will result in an answer of true. If no children are dirty, or there are no children, false will be returned.

This message can be used to check the overall dirty/clean visual state of a tree of border windows. **clsControl** will respond by passing back the value of visual dirty bit, style.dirty.

msgBorderGetForegroundRGB

Passes back foreground RGB to use given current visuals.

Takes P_SYSDC_RGB, returns STATUS.

```
#define msgBorderGetForegroundRGB        MakeMsg(clsBorder, 27)
```

Comments

Subclasses should use this message to determine the correct foreground color to use. For example, **clsLabel** will self-send **msgBorderGetForegroundRGB** in its response to **msgWinRepaint** to make sure and get the correct foreground color.

msgBorderGetBackgroundRGB

Passes back background RGB to use given current visuals.

Takes P_SYSDC_RGB, returns STATUS.

```
#define msgBorderGetBackgroundRGB        MakeMsg(clsBorder, 28)
```

msgBorderInkToRGB

Maps ink value (**bsInkGray66**, etc.) to RGB.

Takes P_SYSDC_RGB, returns STATUS.

```
#define msgBorderInkToRGB                MakeMsg(clsBorder, 29)
```

Comments

For example, **bsInkGray66** maps to **sysDcRGBGray66**.

msgBorderRGBToInk

Maps RGB value to ink (**bsInkGray66**, etc).

Takes P_SYSDC_RGB, returns STATUS.

```
#define msgBorderRGBToInk                MakeMsg(clsBorder, 30)
```

Comments

For example, **sysDCRGBGray66** maps to **bsInkGray66**.

If **pArgs** has no matching ink value, **bsInkTransparent** is passed back.

msgBorderConvertUnits

catagory: class or instance message Converts values from one unit to another.

Takes P_BORDER_UNITS, returns STATUS.

```
#define msgBorderConvertUnits        MakeMsg(clsBorder, 39)
```

Arguments

```
typedef struct BORDER_UNITS {
    WIN     win;        // in: window on target device
    U16     fromUnits;  // in: units for initial size.w/h
    U16     toUnits;    // in: units for final size.w/h
    SIZE32  size;       // in/out: initial/converted value
    U32     spare;      // unused (reserved)
} BORDER_UNITS, *P_BORDER_UNITS;
```

Comments

This message can be sent to **clsBorder** or an instance of **clsBorder**. **clsBorder** will convert **pArgs**->size from **pArgs**->fromUnits to **pArgs**->toUnits. If **bsUnitsDevice** is specified, **pArgs**->win should be set to a window on the corresponding device.

msgBorderSetVisuals

Sets only the visual fields from **pArgs**.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgBorderSetVisuals         MakeMsg(clsBorder, 22)
```

Message Arguments

```
typedef struct BORDER_STYLE {
    U16 edge             : 4,    // edges to border
        top              : 2,    // top style (e.g. bsTopUp)
        drag             : 2,    // drag style (e.g bsDragDown)
        resize           : 5,    // resize handles (e.g. bsResizeCorner|bsResizeBottom)
        maskBorders      : 1,    // mask out edge, shadow, resize
        getDeltaWin      : 1,    // use msgBorderProvideDeltaWin
        spare1           : 1;    // unused (reserved)
    U16 leftMargin       : 8,    // margin in marginUnits
        rightMargin      : 8;    //      "
    U16 bottomMargin     : 8,    //      "
        topMargin        : 8;    //      "
    U16 borderInk        : 6,    // edge line color
        backgroundInk    : 6,    // background fill color
        previewAlter     : 2,    // what to alter when previewing
        selectedAlter    : 2;    // what to alter when selected
    U16 marginInk        : 6,    // ink for margin area (not implemented)
        marginUnits      : 6,    // units for left, right, bottom, top margins
        preview          : 1,    // true/false
        selected         : 1,    // true/false
        look             : 2;    // active/inactive
    U16 shadow           : 4,    // type of shadow
        shadowGap        : 2,    // type of shadow gap
        shadowThickness  : 8,    // custom shadow thickness, in lineUnits
        spare4           : 2;    // unused (reserved)
    U16 shadowInk        : 6,    // custom shadow ink
        lineStyle        : 4,    // edge line style (e.g. bsLineSingle)
        spare5           : 6;    // unused (reserved)
    U16 lineUnits        : 6,    // units for lineThickness and shadowThickness
        lineThickness    : 8,    // line thickness, in lineUnits
        join             : 2;    // how edges join together
    U16 propagateVisuals: 1,     // propagate changes in visuals to children
        notifyVisuals    : 1,    // send msgBorderSetVisuals to observers
        spare3           : 14;   // unused (reserved)
} BORDER_STYLE, *P_BORDER_STYLE;
```

Comments

Sets style.look, style.preview, and style.selected from **pArgs** as in **msgBorderSetStyle.**

If style.**backgroundInk** is not currently **bsInkTransparent**, sets style.**backgroundInk** from **pArgs** as in **msgBorderSetStyle.**

msgBorderGetBorderRect

Passes back the rect on the border.

Takes P_RECT32, returns STATUS.

```
#define msgBorderGetBorderRect      MakeMsg(clsBorder, 3)
```

Comments

The first pixel of this rect is on the border. This is the rectangle on which the border edges will be drawn, which is outside the inner margin. **pArgs** is in device units.

msgBorderInsetToBorderRect

Assumes given rect is window bounds, insets to border rect as in **msgBorderGetBorderRect**.

Takes P_RECT32, returns STATUS.

```
#define msgBorderInsetToBorderRect  MakeMsg(clsBorder, 7)
```

Comments

You can send this message to determine where the border rect would be with the given bounds.

clsBorder will self-send this message during **msgWinRepaint** to determine the rect on which the border edges should be drawn.

pArgs should be in device units.

msgBorderGetInnerRect

Passes back the rect after the inner margin.

Takes P_RECT32, returns STATUS.

```
#define msgBorderGetInnerRect       MakeMsg(clsBorder, 4)
```

Comments

The first pixel of this rect is inside the shadow, border edges and margin area. This is the outer-most usable area. **pArgs** is in device units. Subclasses should use this message to determine the area available to draw in after **clsBorder** has drawn all the shadows and borders.

msgBorderInsetToInnerRect

Assumes given rect is window bounds, insets to inner rect as in **msgBorderGetInnerRect**.

Takes P_RECT32, returns STATUS.

```
#define msgBorderInsetToInnerRect   MakeMsg(clsBorder, 18)
```

msgBorderGetMarginRect

Passes back the rect after the border.

Takes P_RECT32, returns STATUS.

```
#define msgBorderGetMarginRect      MakeMsg(clsBorder, 31)
```

Comments

The first pixel of this rect is the start of the margin area. **pArgs** is in device units.

msgBorderInsetToMarginRect

Assumes given rect is window bounds, insets to margin rect as in **msgBorderGetMarginRect**.

Takes P_RECT32, returns STATUS.

```
#define msgBorderInsetToMarginRect  MakeMsg(clsBorder, 35)
```

msgBorderGetOuterSize

Passes back the sum of the border, margin and shadow sizes for width and height.

Takes P_SIZE32, returns STATUS.

```
#define msgBorderGetOuterSize       MakeMsg(clsBorder, 5)
```

Comments

Values are in device units. Subclasses can use this message to determine the space needed for the border area. For example, **clsLabel** will use this number to compute its total shrink-wrap size.

msgBorderGetOuterSizes

Passes back the breakdown of the outer size requirements.

Takes P_RECT32, returns STATUS.

```
#define msgBorderGetOuterSizes      MakeMsg(clsBorder, 36)
```

Comments OuterSizes are insets from outer edge to inner rect. Note that this is not a true rectangle, each field (x, y, w, h) is a distance from the outer edge. The sum x+w is equivalent to the OuterSize w, the sum y+h is equivalent to the OuterSize h. Values are in device units.

msgBorderGetOuterOffsets

Passes back the distance from the outer edge to the border rect in each dimension.

Takes P_RECT32, returns STATUS.

```
#define msgBorderGetOuterOffsets    MakeMsg(clsBorder, 25)
```

Comments OuterOffsets are insets from outer edge to inner rect. Note that this is not a true rectangle, each field (x, y, w, h) is a distance from the outer edge.

Values are in device units.

This message may be subclassed to return the visual outer offsets. For example, **clsFrame** will return the outer offsets to the frame border window.

msgBorderXOR

Sets the raster-op to XOR and paints the background.

Takes U16, returns STATUS.

```
#define msgBorderXOR                MakeMsg(clsBorder, 33)
```

Comments The U16 passed in is used as **backgroundInk**. Using **pArgs** of **bsInkWhite** yields a true XOR, **bsInkGray66** gives a graying effect.

msgBorderPaint

Paints the border, background, shadow, etc. using **msgWinBeginPaint**.

Takes VOID, returns STATUS.

```
#define msgBorderPaint              MakeMsg(clsBorder, 34)
```

See Also msgBorderXOR

msgBorderProvideDeltaWin

catagory: ancestor window responsibility Receiver must provide window to be dragged, resized or topped.

Takes P_WIN, returns STATUS.

```
#define msgBorderProvideDeltaWin    MakeMsg(clsBorder, 23)
```

Comments **clsBorder** will respond by self-sending **msgWinSend** with the following WIN_SEND parameters:

```
ws.flags = wsSendDefault;
ws.lenSend = SizeOf(WIN_SEND);
ws.msg = msgBorderProvideDeltaWin;
ws.data[0] = objNull;
```

*pArgs will be set to ws.data[0].

This message is used by **clsBorder** if style.**getDeltaWin** is true to determine which window to drag/resize/top.

See Also **msgWinSend**

msgBorderProvideBackground

catagory: subclass responsibility Receiver must provide rect and ink for drawing background.

Takes P_BORDER_BACKGROUND, returns STATUS.

Arguments

```
typedef struct BORDER_BACKGROUND {
    RECT32      rect;       // in/out: background rect to fill
    U16         ink;        // in/out: ink to fill with (e.g. bsInkWhite)
    U16         borderInk;  // in/out: ink to draw border with (e.g. bsInkBlack)
    U32         spare;      // unused (reserved)
} BORDER_BACKGROUND, *P_BORDER_BACKGROUND;

#define msgBorderProvideBackground  MakeMsg(clsBorder, 24)
```

Comments Self-sent during **msgWinRepaint** if style.preview or style.selected is true. **pArgs** defaults to current border rect, background and border inks.

A subclass can catch this message and change any of the parameters. For example, **clsMenuButton** will alter the background rect if the menu button has a top or bottom border on, to back away previewing feedback from the border edge.

msgBorderPaintForeground

catagory: subclass window responsibility Receiver must paint the foreground, if any.

Takes VOID, returns STATUS.

```
#define msgBorderPaintForeground    MakeMsg(clsBorder, 32)
```

Comments **clsBorder** never sends this message. A subclass may send this message to force an ancestor class (e.g. **clsLabel**) to paint the foreground.

clsBorder responds by doing nothing and returning **stsOK**.

See Also **msgBorderPaint**

msgBorderFlash

Flashes self's window by drawing a thick border and erasing it.

Takes VOID, returns STATUS.

```
#define msgBorderFlash  MakeMsg(clsBorder, 40)
```

Comments **clsBorder** will flash a border around self's window. This is used by **msgBorderTop** to hilight a window that is already on top.

See Also **msgBorderTop**

msgBorderTop

Tops the border window with optional UI feedback and/or bottoming.

Takes U32, returns STATUS.

```
#define bsTopFlash      ((U32)flag0)    // msgBorderFlash if already on top
#define bsTopBottom     ((U32)flag1)    // send to bottom if already on top
#define msgBorderTop    MakeMsg(clsBorder, 41)
```

Comments

If self is not already on top of its siblings, **clsBorder** will bring self to top.

If **pArgs** has **bsTopFlash** on and self is already on top, **clsBorder** will self-send **msgBorderFlash** to flash a border around self.

If **pArgs** has **bsTopBottom** on and self is already on top, **clsBorder** will re-insert self at the "bottom". The bottom is defined as the first child of the **mainWin** of **theDesktop**. If **theDesktop** does not exist, or it has no **mainWin**, self is placed at the bottom of its sibling stack. If self is not a sibling of the **mainWin** of **theDesktop**, nothing is done.

See Also

msgBorderFlash

Messages from other classes

msgWinSend

Sends a message up a window ancestry chain.

Takes WIN_SEND, returns STATUS.

Comments

If **pArgs**->msg is **msgBorderProvideDeltaWin** and style.**getDeltaWin** is true, **clsBorder** will set **pArgs**->data[0] to self and return **stsOK**. This will result in self being the window that is dragged/resized/topped.

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments

clsBorder will respond to input events that trigger dragging, resizing, or topping.

If **pArgs**->devCode is **msgPenHoldTimeout** and style.drag is **bsDragHoldDown**, or **pArgs**->devCode is **msgPenDown** and style.drag is **bsDragDown**, or **pArgs**->devCode is **msgPenMoveDown** and style.drag is **bsDragMoveDown** and the pen has moved beyond a small threshold since the last **msgPenDown**, the following is done:

msgGWinAbort(pNull) is self-sent to terminate any gesture in progress.

If style.**getDeltaWin** is true, **msgBorderProvideDeltaWin** is self-sent**msgWinSend** to determine the window to be dragged. Otherwise,is used as the window to be dragged.

msgTrackProvideMetrics is sent to the window to be dragged with_METRICS parameters as follows:

msgNewDefaults is sent to **clsTrack** to initialize a TRACK_METRICS struct and then:

```
style.startThickness    = tsThicknessDouble;
win                     = parent of window to be dragged;
client                  = self;
clientData              = window to be dragged;
initRect                = bounds of window to be dragged;
constrainRect.size      = size of window to be dragged;
keepRect                = rect around grabbed point;
tag                     = tagBorderDrag;
```

An instance of **clsTrack** is created and started via **msgTrackStart.**

If **pArgs**->devCode is **msgPenUp** and style.top is **bsTopUp** and **gWin.style.gestureEnable** is false, a window to be topped is determined as in the window to be dragged above, and

msgBorderTop(bsTopBottom) is sent to the window to bring it to top (or take it to bottom if already on top).

If **pArgs**->devCode is one of **msgPenInProxUp**, **msgPenEnterUp**, or **msgPenMoveUp**, and style.resize is not **bsResizeNone**, and **pArgs**->xy is in one of the resize handle areas, the following is done:

msgGWinAbort(pNull) is self-sent to terminate any gesture in progress.

A window to be resized is determined as in the window to be dragged above,an instance of **clsGrabBox** is created with this window as its client.**grabBox** is sent **msgGrabBoxShow**(true) to start the resize feedback.

If a drag or resize is done, **pArgs**->flags will have **evBorderTaken** turned on to indicate that **clsBorder** "took" the event.

---

msgTrackDone

Sent by a tracker when it's done.

Takes P_TRACK_METRICS, returns STATUS. Category: client notification.

Comments

If **pArgs**->tag is not **tagBorderDrag**, nothing is done and the message is passed to ancestor.

Otherwise, **clsBorder** assumes **pArgs**->clientData is a window to be dragged and sends **msgWinDelta** to this window to change its origin to one based on **pArgs**->rect.origin.

If style.top is **bsTopDrag**, the window to be dragged is also topped (brought to front) by sending it **msgBorderTop**(0).

---

msgTimerNotify

Notifies the client that the timer request has elapsed.

Takes P_TIMER_NOTIFY, returns nothing. Category: advisory message.

Comments

If self's **lineStyle** is **bsLineMarquee** or **bsLineDoubleMarquee**, **clsBorder** will animate the marquee and set the timer again.

---

msgSelSelect

Sets self to be the selection.

Takes nothing, returns STATUS.

Comments

clsBorder responds by self-sending **msgBorderSetSelected**(true).

---

msgSelYield

The Selection Manager requires the release of the selection.

Takes BOOLEAN, returns STATUS.

Comments

clsBorder responds by self-sending **msgBorderSetSelected**(false).

---

msgGWinGesture:

Called to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

If **pArgs->**msg is xgs1Tap and style.top is **bsTopUp**, a window to be topped is determined and topped as in response to the input event **msgPenUp**.

If **pArgs->**msg is **xgsQuestion** and style.resize is not **bsResizeNone** and **pArgs->**hotPoint falls over one of the resize handle areas, quick help for the resize handle is shown.

See Also

msgInputEvent

msgWinRepaint

Tells a window to repaint itself.

Takes nothing, returns STATUS. Category: descendant responsibility.

Comments

clsBorder responds by painting the background, shadow, resize handles, and border edges.

msgBorderInsetToBorderRect will be self-sent with a default of the current window bounds to allow the subclass to alter the rect on which the border will be drawn.

If style.preview or style.selected are true, **msgBorderProvideBackground** is self-sent with the following BORDER_BACKGROUND parameters:

rect = rectangle on which the border will be drawn, in device units;

ink = **backgroundInk** to be used;

The resulting rect and ink are used during painting.

If any of the specified inks have **bsInkExclusive** or-ed in, and the border window does not exclusively paint the pixels in its window, **bsInkTransparent** will be used. The test for a window exclusively painting the pixels in its window is as follows:

```
define selfStyle to be self's window style flags
define parentStyle to be parent's window style flags

if (selfStyle & wsTransparent)
    return false;

if (selfStyle & (wsClipSiblings | wsClipChildren))
    return true;

if (!(selfStyle & wsParentClip))
    return true;

if (parentStyle & wsTransparent)
    return true;

if (parentStyle & wsClipChildren)
    return true;

return false;
```

If any of the specified inks are **bsInkTransparent**, nothing will be painted for that feature (e.g. **backgroundInk** of **bsInkTransparent** results in no paint on the background).

msgScrollWinProvideDelta

Self-sent when **scrollWin.style.getDelta** is set to true so that descendant or client can normalize the scroll if desired.

Takes P_SCROLL_WIN_DELTA, returns STATUS. Category: descendant/client responsibility.

Comments

clsBorder responds by computing a new origin based on **pArgs**->action and normalizing to prevent scrolling into part of a row or column.

clsBorder will enumerate the leaf-level children and try to compute the row/column structure from the placement of the children.

Normalization will occur in the direction of the scroll. For example, if the scroll action is moving upward (e.g **sbLineUp**), normalization will occur at the top of the view.

BUSY.H

This file contains the API for **clsBusy** and **theBusyManager**.

clsBusy inherits from **clsObject.**

theBusyManager is typically the only instance of **clsBusy**. **theBusyManager** puts up and takes down a visual indication that the system is busy.

Debugging Flags

The **clsBusy** debugging flag is 'K'. Defined values are:

flag0 (0x0001) general busy on/off/inhibit

flag10 (0x0400) never put up the busy UI

```
#ifndef BUSY_INCLUDED
#define BUSY_INCLUDED

#include <clsmgr.h>
```

```
#ifndef CLSMGR_INCLUDED

#endif
```

---

msgBusyDisplay

Requests a change in the state of the busy UI.

Takes U32, returns STATUS.

```
#define msgBusyDisplay          MakeMsg(clsBusy, 9)
#define busyOff             0       // turn the busy UI off
#define busyOn              1       // turn the busy UI on
// these can be or-ed into busyOn or busyOff
#define busyNoRefCount      flag1   // don't increment/decrement the ref count
#define busyNoDelay         flag2   // don't wait for timer to display
```

Comments

You send this message to **theBusyManager**.

theBusyManager maintains a reference count. Requests of **busyOn** increment the count, and requests of **busyOff** decrement the count. **theBusyManager** will put up the UI when the count goes from 0 to 1, and take the UI down when the count goes from 1 to 0.

If **pArgs** is **busyOn** | **busyNoRefCount**, and the reference count is already 1 or greater (i.e. the busy UI is already being displayed), nothing is done.

If **pArgs** is **busyOn** | **busyNoDelay**, the busy UI will be displayed immediately, skipping the usual delay time.

If **pArgs** is **busyOff** | **busyNoRefCount**, the reference count is set to 0 and the busy UI is taken down.

The busy UI will be displayed (i.e. hot spot at) the last xy specified via **msgBusySetXY**. If this is (**minS32**, **minS32**), the xy specified via **msgBusySetDefaultXY** will be used.

When the busy UI is taken down, the xy for the next display of the busy UI is set to (**minS32**, **minS32**).

See Also

msgBusyInhibit

msgBusyInhibit

Inhibits/allows display of the busy UI.

Takes BOOLEAN, returns STATUS.

```
#define msgBusyInhibit          MakeMsg(clsBusy, 10)
```

Comments

You send this message to **theBusyManager**.

theBusyManager maintains an inhibit reference count. Requests of TRUE increment the count, and requests of FALSE decrement the count. **theBusyManager** will take down the UI when the count goes from 0 to 1, and allow subsequent displays of the busy UI (via **msgBusyDisplay(busyOn)**) when the count is zero.

You can use **msgBusyInhibit** to prevent the busy UI from being displayed, even if requested by other parts of the system.

See Also

msgBusyDisplay

msgBusySetXY

Specifies the position for the busy UI the next time it is shown.

Takes P_XY32, returns STATUS.

```
#define msgBusySetXY        MakeMsg(clsBusy, 11)
```

Comments

You send this message to **theBusyManager**. The UI will be centered at **pArgs** the next time **msgBusyDisplay(busyOn)** is sent.

pArgs should be in root window space.

If the busy UI is currently being shown, this message is ignored.

msgBusySetDefaultXY

Specifies the default position for the busy UI the next time it is shown.

Takes P_XY32, returns STATUS.

```
#define msgBusySetDefaultXY     MakeMsg(clsBusy, 12)
```

Comments

The input system sends this message to **theBusyManager** when an input event has not been processed within the default time limit. The UI will be centered at **pArgs** the next time **msgBusyDisplay(busyOn)** is sent, if **msgBusySetXY** has not been used to specify a position.

pArgs should be in root window space.

msgBusyGetSize

Passes back the size of the busy UI.

Takes P_SIZE32, returns STATUS.

```
#define msgBusyGetSize          MakeMsg(clsBusy, 3)
```

Comments

theBusyManager will set *pArgs to the size of the default UI.

BUTTON.H

This file contains the API definition for **clsButton**.

clsButton inherits from **clsLabel**.

Buttons are labels, but with input behavior. Buttons also have a state value: on or off. Buttons notify their client when certain input events occur. **clsButton** make extensive use of its ancestors display capabilities, particularly **clsBorder** and **clsLabel**.

```
#ifndef BUTTON_INCLUDED
#define BUTTON_INCLUDED

#include <label.h>
```

```
#ifndef LABEL_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT          BUTTON;
```

Contact Styles

Use one of these values in button's style.contact.

```
#define bsContactMomentary      0   // push-on, release-off
#define bsContactToggle         1   // push-on, push-off
#define bsContactLockOn         2   // push-on, stays on
//                              3   // unused (reserved)
```

Feedback Styles

Use one of these values in button's style.feedback.

```
#define bsFeedbackInvert        0   // invert on/off
#define bsFeedbackDecorate      1   // use onDecoration/offDecoration
#define bsFeedbackNone          2   // no feedback
#define bsFeedback3D            3   // 3D shadow effect
#define bsFeedbackBox           4   // boxed outline
//                              5   // unused (reserved)
//                              .. // unused (reserved)
//                              7   // unused (reserved)
```

pArgs Styles

Use one of these values in button's style.**pArgs**.

```
#define bsPargsData             0   // pArgs is data
#define bsPargsValue            1   // pArgs is current value
#define bsPargsUID              2   // pArgs is button's UID
//                              3   // unused (reserved)
```

Manager Styles

Use one of these values in button's style.manager.

```
#define bsManagerNone           0   // no manager
#define bsManagerParent         1   // parent is the manager
#define bsManagerClient         2   // client is the manager
//                              3   // unused (reserved)
typedef struct BUTTON_STYLE {
    U16 contact         : 2,    // push behavior
        feedback        : 4,    // invert, decorate, etc.
        notifyDetail    : 1,    // notify manager of BeginPreview etc.
        notifyWithMsg   : 1,    // send specified msg & data
        on              : 1,    // button state: true == on
        manager         : 2,    // button manager style
        pArgs           : 2,    // which pArgs to send with msg
        halfHeight      : 1,    // half-height borders
        spare1          : 2;    // unused (reserved)
    U16 onDecoration    : 5,    // label decoration when on (see label.h)
        offDecoration   : 5,    // label decoration when off (see label.h)
        spare           : 6;    // unused (reserved)
} BUTTON_STYLE, *P_BUTTON_STYLE;
```

Default BUTTON_STYLE:

```
    contact         = bsContactMomentary
    feedback        = bsFeedbackInvert
    onDecoration    = lsDecorationNone
    offDecoration   = lsDecorationNone
    notifyDetail    = false
    notifyWithMsg   = true
    pArgs           = bsPargsData
    on              = false
    halfHeight      = false
typedef struct BUTTON_NOTIFY {
    OBJECT  button; // uid of sender
    MESSAGE msg;    // defined message or some other data
    U32     data;   // pArgs for message or some other data
    MESSAGE detail; // msgButtonBeginPreview, etc.
    U32     spare;  // unused (reserved)
} BUTTON_NOTIFY, *P_BUTTON_NOTIFY;
```

Messages

msgNew

Creates a button window.

Takes P_BUTTON_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct BUTTON_NEW_ONLY {
    BUTTON_STYLE    style;          // overall style
    MESSAGE         msg;            // message to send or other data
    U32             data;           // pArgs for msg or other data
    U16             onCustomGlyph;  // glyph to use for
                                    // lsDecorationCustomLeft/Right
    U16             offCustomGlyph; // glyph to use for
                                    // lsDecorationCustomLeft/Right
    U32             spare;          // unused (reserved)
} BUTTON_NEW_ONLY, BUTTON_METRICS,
  *P_BUTTON_NEW_ONLY, *P_BUTTON_METRICS;
#define buttonNewFields     \
    labelNewFields          \
```

```
    BUTTON_NEW_ONLY     button;
typedef struct BUTTON_NEW {
    buttonNewFields
} BUTTON_NEW, *P_BUTTON_NEW;
```

Comments

The rest of this description uses the following abbreviations:

```
on      = pArgs->button.style.on;
pButton = &pArgs->button.style;
pBorder = &pArgs->border.style,
pLabel  = &pArgs->label.style,
```

If **pButton**->feedback is **bsFeedbackInvert**, sets

```
pBorder->preview = on;
```

If **pButton**->feedback is **bsFeedback3D**, sets

```
pBorder->join           = bsJoinSquare;
pBorder->previewAlter   = bsAlterNone;
pBorder->edge           = bsEdgeTop | bsEdgeLeft;
pBorder->shadowGap      = bsGapNone;
pBorder->preview        = on;
if (on) {
    pBorder->borderInk      = bsInkBlack;
    pBorder->backgroundInk  = bsInkGray66;
    pBorder->shadow         = bsShadowThinWhite;
} else {
    pBorder->borderInk      = bsInkWhite;
    pBorder->backgroundInk  = bsInkGray33;
    pBorder->shadow         = bsShadowThinGray;
}
```

If **pButton**->feedback is **bsFeedbackDecorate**, sets

```
    pLabel->decoration = on ?
      pArgs->button.style.onDecoration :
      pArgs->button.style.offDecoration;
```

msgNewDefaults

Initializes the BUTTON_NEW structure to default values.

Takes P_BUTTON_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct BUTTON_NEW {
    buttonNewFields
} BUTTON_NEW, *P_BUTTON_NEW;
```

Comments

Zeroes out **pArgs**->button and sets:

```
pArgs->win.flags.input |= inputTip | inputEnter | inputExit;
pArgs->win.flags.style |= wsFileInline;

pArgs->border.style.edge = bsEdgeAll;
pArgs->border.style.join = bsJoinSquare;
pArgs->border.style.shadow = bsShadowThinBlack;
pArgs->border.style.borderInk = bsInkGray66;

pArgs->control.style.previewEnable = true;

pArgs->label.style.xAlignment = lsAlignCenter;
pArgs->label.style.yAlignment = lsAlignCenter;

pArgs->button.style.notifyWithMsg = true;
```

msgButtonGetMetrics

Passes back the current metrics.

Takes P_BUTTON_METRICS, returns STATUS.

```
#define msgButtonGetMetrics     MakeMsg(clsButton, 1)
```

msgButtonSetMetrics

Sets the metrics.

Takes P_BUTTON_METRICS, returns STATUS.

```
#define msgButtonSetMetrics     MakeMsg(clsButton, 2)
```

Comments

If style.on changes, the button does the following:

- If style.contact != **bsContactMomentary**, self-sends **msgControlSetDirty**, true.
- Self-sends **msgButtonNotifyManager** with msg = **msgButtonDone**.
- Self-sends **msgButtonNotify** with detail of **msgButtonAcceptPreview**. This results in either **msgButtonNotify** or a client-specified message to the client. Alters border and label styles to reflect the new "on" value (see **msgNew** description).

Changes to style.feedback and style.on/offDecoration result in appropriate changes to the Border and Label styles.

msgButtonGetStyle

Passes back the current style values.

Takes P_BUTTON_STYLE, returns STATUS.

```
#define msgButtonGetStyle       MakeMsg(clsButton, 3)
```

Message Arguments

```
typedef struct BUTTON_STYLE {
    U16 contact         : 2,    // push behavior
        feedback        : 4,    // invert, decorate, etc.
        notifyDetail    : 1,    // notify manager of BeginPreview etc.
        notifyWithMsg   : 1,    // send specified msg & data
        on              : 1,    // button state: true == on
        manager         : 2,    // button manager style
        pArgs           : 2,    // which pArgs to send with msg
        halfHeight      : 1,    // half-height borders
        spare1          : 2;    // unused (reserved)
    U16 onDecoration    : 5,    // label decoration when on (see label.h)
        offDecoration   : 5,    // label decoration when off (see label.h)
        spare           : 6;    // unused (reserved)
} BUTTON_STYLE, *P_BUTTON_STYLE;
```

msgButtonSetStyle

Sets the style values.

Takes P_BUTTON_STYLE, returns STATUS.

```
#define msgButtonSetStyle       MakeMsg(clsButton, 4)
```

Message Arguments

```
typedef struct BUTTON_STYLE {
    U16 contact         : 2,    // push behavior
        feedback        : 4,    // invert, decorate, etc.
        notifyDetail    : 1,    // notify manager of BeginPreview etc.
        notifyWithMsg   : 1,    // send specified msg & data
```

```
        on              : 1,    // button state: true == on
        manager         : 2,    // button manager style
        pArgs           : 2,    // which pArgs to send with msg
        halfHeight      : 1,    // half-height borders
        spare1          : 2;    // unused (reserved)
    U16 onDecoration    : 5,    // label decoration when on (see label.h)
        offDecoration   : 5,    // label decoration when off (see label.h)
        spare           : 6;    // unused (reserved)
} BUTTON_STYLE, *P_BUTTON_STYLE;
```

Comments Reacts to changes in style.on and other style values as in **msgButtonSetMetrics**.

msgButtonGetMsg

Passes back metrics.msg.

Takes P_MESSAGE, returns STATUS.

```
#define msgButtonGetMsg         MakeMsg(clsButton, 5)
```

msgButtonSetMsg

Sets metrics.msg.

Takes MESSAGE, returns STATUS.

```
#define msgButtonSetMsg         MakeMsg(clsButton, 6)
```

msgButtonGetData

Passes back metrics.data.

Takes P_U32, returns STATUS.

```
#define msgButtonGetData        MakeMsg(clsButton, 7)
```

msgButtonSetData

Sets metrics.data.

Takes U32, returns STATUS.

```
#define msgButtonSetData        MakeMsg(clsButton, 8)
```

msgButtonSetNoNotify

Sets the value of the button (i.e. style.on) without notifying.

Takes BOOLEAN, returns STATUS.

```
#define msgButtonSetNoNotify    MakeMsg(clsButton, 17)
```

Comments **pArgs** must be true or false. The button's manager and client are not notified. Alters border and label styles to reflect new on value (see **msgNew** description).

msgButtonButtonShowFeedback

Shows the feedback for an on/off button if **pArgs** is true/false.

Takes BOOLEAN, returns STATUS. Category: self-sent.

```
#define msgButtonShowFeedback   MakeMsg(clsButton, 19)
```

Comments This message is self-sent by **clsButton** to change the on/off feedback shown to the user. For example, when a button with a contact style of **bsContactToggle** is pressed and **msgControlBeginPreview** is

received, **clsButton** self-sends **msgButtonShowFeedback**(!style.on) to show the user what will happen when the pen is lifted.

Subclasses can handle the message and show the appropriate feedback for the new state.

Messages Sent to Button's Manager

msgButtonDone

Sent via **msgWinSend** to the manager when button receives **msgControlAcceptPreview**.

Takes UID, returns STATUS. Category: manager notification.

```
#define msgButtonDone                MakeMsg(clsButton, 16)
```

msgButtonBeginPreview

Sent via **msgWinSend** to the manager when button receives **msgControlBeginPreview**.

Takes UID, returns STATUS. Category: manager notification.

```
#define msgButtonBeginPreview        MakeMsg(clsButton, 9)
```

Comments Only sent if style.**notifyDetail** is true.

msgButtonUpdatePreview

Sent via **msgWinSend** to the manager when button receives **msgControlUpdatePreview**.

Takes UID, returns STATUS. Category: manager notification.

```
#define msgButtonUpdatePreview       MakeMsg(clsButton, 10)
```

Comments Only sent if style.**notifyDetail** is true.

msgButtonRepeatPreview

Sent via **msgWinSend** to the manager when button receives **msgControlRepeatPreview**.

Takes UID, returns STATUS. Category: manager notification.

```
#define msgButtonRepeatPreview       MakeMsg(clsButton, 11)
```

Comments Only sent if style.**notifyDetail** is true.

msgButtonCancelPreview

Sent via **msgWinSend** to the manager when button receives **msgControlCancelPreview**.

Takes UID, returns STATUS. Category: manager notification.

```
#define msgButtonCancelPreview       MakeMsg(clsButton, 12)
```

Comments Only sent if style.**notifyDetail** is true.

msgButtonAcceptPreview

Sent via **msgWinSend** to the manager when button receives **msgControlAcceptPreview**.

Takes UID, returns STATUS. Category: manager notification.

```
#define msgButtonAcceptPreview       MakeMsg(clsButton, 13)
```

Comments Only sent if style.**notifyDetail** is true.

msgButtonNotifyManager

Sent to self when button wants to notify its manager.

Takes P_BUTTON_NOTIFY, returns STATUS. Category: self-sent.

```
#define msgButtonNotifyManager      MakeMsg(clsButton, 18)
```

Message Arguments

```
typedef struct BUTTON_NOTIFY {
    OBJECT  button; // uid of sender
    MESSAGE msg;    // defined message or some other data
    U32     data;   // pArgs for message or some other data
    MESSAGE detail; // msgButtonBeginPreview, etc.
    U32     spare;  // unused (reserved)
} BUTTON_NOTIFY, *P_BUTTON_NOTIFY;
```

Comments

A button responds to this by sending **msgWinSend** with the following WIN_SEND parameters to its manager:

```
flags   = wsSendDefault;
lenSend = SizeOf(WIN_SEND);
msg     = pArgs->msg;
data[0] = pArgs->data;
```

msgButtonNotify

Sent to self when button wants to notify its client.

Takes P_BUTTON_NOTIFY, returns STATUS. Category: client notification.

```
#define msgButtonNotify             MakeMsg(clsButton, 14)
```

Message Arguments

```
typedef struct BUTTON_NOTIFY {
    OBJECT  button; // uid of sender
    MESSAGE msg;    // defined message or some other data
    U32     data;   // pArgs for message or some other data
    MESSAGE detail; // msgButtonBeginPreview, etc.
    U32     spare;  // unused (reserved)
} BUTTON_NOTIFY, *P_BUTTON_NOTIFY;
```

Comments

If style.**notifyWithMessage** is true, **pArgs**->msg is sent to the button's client with the **pArgs** of **pArgs**->data or as specified by style.**pArgs**.

Otherwise, **msgButtonNotify** is sent to the button's client with the following BUTTON_NOTIFY parameters:

```
button  = self;
msg     = pArgs->msg;
data    = pArgs->data;
detail  = pArgs->detail;
```

Messages Defined by Other Classes

msgBorderGetForegroundRGB

Passes back foreground RGB to use given current visuals.

Takes P_SYSDC_RGB, returns STATUS.

Comments

If style.feedback is **bsFeedback3D** and border.style.look is **bsLookInactive**, passes back **sysDcRGBGray66**. Otherwise, calls ancestor.

msgControlBeginPreview

Self-sent when **msgPenDown** is received.

Takes P_EVENT, returns STATUS. Category: self-sent.

Comments

Button computes new on value according to style.feedback (e.g. **bsContactToggle** results in on = !style.on).

Alters border and label styles to reflect new on value and self-sends **msgWinUpdate** to repaint immediately. style.on is not changed.

If style.contact is not **bsContactMomentary**, self sends **msgControlSetDirty**, true.

If style.**notifyDetail** is true, self-sends **msgButtonNotifyManager**, which results in **msgWinSend** to the manager. Also, if control.style.**previewRepeat** is true, self-sends **msgButtonNotify** which results in client notification.

msgControlUpdatePreview

Self-sent when **msgPenMoveDown** is received.

Takes P_EVENT, returns STATUS. Category: self-sent.

Comments

If style.**notifyDetail** is true, notifies manager and client as in **msgControlBeginPreview**.

msgControlRepeatPreview

Self-sent if style.**repeatPreview** is true. Initial delay is 600ms, then immediate repeat until **msgPenUp**.

Takes P_EVENT, returns STATUS. Category: self-sent.

Comments

If style.**notifyDetail** is true, notifies manager and client as in **msgControlBeginPreview**.

msgControlCancelPreview

Self-sent when control.style.**previewGrab** is false and **msgPenExitDown** is received.

Takes P_EVENT, returns STATUS. Category: self-sent.

Comments

Clients or subclasses can send this to a control to cancel existing preview.

Alters border and label styles to reflect current style.on value and self-sends **msgWinUpdate** to repaint immediately. This undoes the visual effects of **msgControlBeginPreview**.

If style.**notifyDetail** is true, notifies manager and client as in **msgControlBeginPreview**.

msgControlAcceptPreview

Self-sent when **msgPenUp** is received.

Takes P_EVENT, returns STATUS. Category: self-sent.

Comments

If gestures are enabled this message is not sent until **msgGWinGesture** is received with xgs1Tap.

Self-sends **msgControlSetValue** with on value computed as in **msgControlBeginPreview**.

msgControlSetValue

Sets style.on.

Takes S32, returns STATUS.

Comments

Updates visuals to reflect new on value as in **msgButtonSetMetrics.**

Self-sends **msgButtonNotifyManager** with the following BUTTON_NOTIFY parameters (this results in **msgWinSend** to the manager):

```
button  = self;
msg     = msgButtonDone;
data    = self;
```

Self-sends **msgButtonNotify** with the following BUTTON_NOTIFY parameters (this results in client notification):

```
button  = self;
msg     = metrics.msg;
data    = metrics.data;
detail  = msgButtonAcceptPreview;
```


msgControlGetValue

Passes back the style.on.

Takes P_S32, returns STATUS.

CHMGR.H

This file contains the API for **clsChoiceMgr**.

clsChoiceMgr inherits from **clsManager.**

Choice managers serve as **tkTable** managers in tables of buttons.

A choice manager, when plugged in as the manager of a **tkTable** of buttons, responds to the **msgWinSend**'s generated by the buttons and makes the entire group perform as a choice.

Debugging Flags

The **clsChoiceMgr** debugging flag is 'K'. Defined values are:

flag0 (0x0001) general info

```
#ifndef CHMGR_INCLUDED
#define CHMGR_INCLUDED

#include <manager.h>
```

```
#ifndef MANAGER_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT              CHOICE_MGR;
```

---

msgNew

Creates a choice manager.

Takes P_CHOICE_MGR_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct CHOICE_MGR_NEW_ONLY {
    U32     spare;  // unused (reserved)
} CHOICE_MGR_NEW_ONLY, *P_CHOICE_MGR_NEW_ONLY;
#define choiceMgrNewFields  \
    managerNewFields        \
    CHOICE_MGR_NEW_ONLY     choiceMgr;
typedef struct CHOICE_MGR_NEW {
    choiceMgrNewFields
} CHOICE_MGR_NEW, *P_CHOICE_MGR_NEW;
```

---

msgNewDefaults

Initializes the CHOICE_MGR_NEW structure to default values.

Takes P_CHOICE_MGR_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct CHOICE_MGR_NEW {
    choiceMgrNewFields
} CHOICE_MGR_NEW, *P_CHOICE_MGR_NEW;
```

Comments

clsChoiceManager has no instance data of its own.

msgChoiceMgrGetOnButton

Gets the current on button. Passes back **objNull** if no button is on.

Takes P_UID, returns STATUS.

```
#define msgChoiceMgrGetOnButton     MakeMsg(clsChoiceMgr, 1)
```

msgChoiceMgrSetOnButton

Sets the current on button.

Takes UID, returns STATUS.

```
#define msgChoiceMgrSetOnButton     MakeMsg(clsChoiceMgr, 2)
```

Comments

Since the **choiceMgr** will use **msgControlSetValue** to turn the button on, that button's normal notification protocol will be invoked.

All buttons are turned off if message argument is **objNull**.

msgChoiceMgrSetNoNotify

Like **msgChoiceMgrSetOnButton**, but no notifications are generated.

Takes UID, returns STATUS.

```
#define msgChoiceMgrSetNoNotify     MakeMsg(clsChoiceMgr, 3)
```

Messages from Other Classes

msgWinSend

Sends a message up a window ancestry chain.

Takes P_WIN_SEND, returns STATUS.

Comments

clsChoiceMgr responds when **pArgs**->msg is **msgButtonBeginPreview**, **msgButtonCancelPreview**, or **msgButtonDone**. If **pArgs**->msg is anything else, **clsChoiceMgr** just returns **stsManagerContinue**.

For these three messages, **clsChoiceMgr** will make the set of entry windows act as a group.

Return Value

stsManagerContinue clsChoiceMgr always returns this so that the caller will continue to propagate the **msgWinSend**.

CHOICE.H

This file contains the API for **clsChoice**.

clsChoice inherits from **clsTkTable**.

Choices are **tkTables** of buttons that act as exclusive choices.

Note that **msgNewDefaults** to **clsChoice** results in a prototypical new struct whose values describe a button of contact style **bsContactLockOn**. This is correct for choices that always have one button on, but this won't work if you want a choice that can have 0 or 1 buttons on. In this case, making each button child have a contact style of **bsContactToggle** will achieve the desired effect. Here is the appropriate code.

```
ObjCallWarn(MsgNewDefaults, clsChoice, &choiceNew);
choiceNew.tkTable.pButtonNew->button.style.contact = bsContactToggle;
ObjCallRet(msgNew, clsChoice, &choiceNew, s);
```

See the documentation for **msgTkTableChildDefaults** below.

```
#ifndef CHOICE_INCLUDED
#define CHOICE_INCLUDED

#include <tktable.h>
```

```
#ifndef TKTABLE_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT CHOICE;
typedef struct CHOICE_STYLE {
    U16 spare;  // unused (reserved)
} CHOICE_STYLE, *P_CHOICE_STYLE;
```

Informational return status returned by **msgControlGetValue** if choice has no value

```
#define stsChoiceNoValue    MakeWarning(clsChoice, 1)
```

---

msgNew

Creates a choice (and its nested button windows).

Takes P_CHOICE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct CHOICE_NEW_ONLY {
    CHOICE_STYLE    style;  // overall style
    U32             value;  // tag of on button
    U32             spare;  // unused (reserved)
} CHOICE_NEW_ONLY, *P_CHOICE_NEW_ONLY;
#define choiceNewFields \
    tkTableNewFields    \
    CHOICE_NEW_ONLY     choice;
typedef struct CHOICE_NEW {
    choiceNewFields
} CHOICE_NEW, *P_CHOICE_NEW;
```

Comments

Will create a default instance of **clsChoiceMgr** if the incoming **pArgs**->tkTable.manager is null. The uid of the created manager will be an out parameter.

After the manager has been set up, **clsChoice** will use **msgControlGetValue** to find the button that is 'on', and then send **msgChoiceMgrSetNoNotify** to the manager to tell the manager which button is 'on'.

---

msgNewDefaults

Initializes the CHOICE_NEW structure to default values.

Takes P_CHOICE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct CHOICE_NEW {
    choiceNewFields
} CHOICE_NEW, *P_CHOICE_NEW;
```

Comments

Sets up **tkTable.pButtonNew** to create buttons by default. Zeroes out **pNew.choice** and sets:

```
pArgs->gWin.style.gestureEnable = false;

pArgs->tableLayout.style.growChildHeight = false;
pArgs->tableLayout.style.growChildWidth = true;

pArgs->tableLayout.numCols.constraint = tlAbsolute;
pArgs->tableLayout.numCols.value = 1;

pArgs->tableLayout.numRows.constraint = tlInfinite;

pArgs->tableLayout.colWidth.constraint = tlChildrenMax;
pArgs->tableLayout.colWidth.gap = 0;

pArgs->tableLayout.rowHeight.constraint = tlGroupMax;
pArgs->tableLayout.rowHeight.gap = 0;

pArgs->tkTable.manager = objNull;
```

Instance Messages

---

msgChoiceGetStyle

Gets the style of the receiver.

Takes P_CHOICE_STYLE, returns STATUS.

```
#define msgChoiceGetStyle       MakeMsg(clsChoice, 1)
```

Message Arguments

```
typedef struct CHOICE_STYLE {
    U16 spare;  // unused (reserved)
} CHOICE_STYLE, *P_CHOICE_STYLE;
```

---

msgChoiceSetStyle

Sets the style of the receiver.

Takes P_CHOICE_STYLE, returns STATUS.

```
#define msgChoiceSetStyle       MakeMsg(clsChoice, 2)
```

Message Arguments

```
typedef struct CHOICE_STYLE {
    U16 spare;  // unused (reserved)
} CHOICE_STYLE, *P_CHOICE_STYLE;
```

msgChoiceSetNoNotify

Like **msgControlSetValue** (see below), but without button notifications.

Takes TAG, returns STATUS.

```
#define msgChoiceSetNoNotify    MakeMsg(clsChoice, 3)
```

Comments — Using this message avoids button notifications being sent out to their clients.

Messages from Other Classes

msgFree

Sent as the last of three msgs to destroy an object.

Takes OBJ_KEY, returns STATUS.

Comments — If the choice had created its own TK_TABLE_NEW_ONLY.manager at **msgNew** time, the manager will be sent **msgDestroy**.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments — **clsChoice** responds by restoring its instance data. If the choice had created its own TK_TABLE_NEW_ONLY.manager at **msgNew** time, a new one is created from **clsChoiceMgr**.

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments — **clsChoice** responds by filing away its instance data. It will remember whether **clsChoice** created its own TK_TABLE_NEW_ONLY.manager at **msgNew** time.

msgWinSend

Sends a message up a window ancestry chain.

Takes P_WIN_SEND, returns STATUS.

Comments — **clsChoice** responds when **pArgs**->msg is **msgButtonBeginPreview** or **msgButtonDone** by using **msgControlSetDirty**(true) to mark its children as dirty. This is done as follows:

clsChoice calls its ancestor and remembers the returned status. It then tests whether **pArgs**->msg is **msgButtonDone**. If so, then if one of the child buttons is currently previewing, **clsChoice** just returns the saved status (because it was when the previewing started that the choice marked its children as dirty). If, however, the msg is **msgButtonDone** and no button is previewing, the choice will go ahead and mark its children dirty (this case can happen if a child button is changing value programmatically and so isn't previewing), then return **stsManagerContinue**.

If the **pArgs**->msg is **msgButtonBeginPreview**, the choice will mark its children dirty and then return **stsManagerContinue**.

If the **pArgs**->msg is anything else, **clsChoice** will return the status saved from the call to its ancestor.

Return Value — **stsManagerContinue** tell the caller to continue to propagate the **msgWinSend**

msgControlGetDirty

Sets *pArgs true if any child control is dirty, false otherwise.

Takes P_BOOLEAN, returns STATUS.

msgControlGetEnable

Sets *pArgs true if any child control is enabled, false otherwise.

Takes P_BOOLEAN, returns STATUS.

msgControlGetValue

Gets the tag of the child button that is currently on.

Takes P_TAG, returns STATUS.

Comments Returns **stsChoiceNoValue** if no child button is on.

msgControlSetDirty

Forwards this message and **pArgs** on to each child control in the choice.

Takes BOOLEAN, returns STATUS.

msgControlSetEnable

Forwards this message and **pArgs** on to each child control in the choice.

Takes BOOLEAN, returns STATUS.

msgControlSetValue

Turns on the child button having the passed tag.

Takes TAG, returns STATUS.

Comments If another child button was on, it is turned off.

msgTkTableAddAsFirst

Adds specified window as the first child in the table.

Takes WIN, returns STATUS.

Comments **clsChoice** first calls its ancestor, then gets its manager via **msgTkTableGetManager**. If it has no manager, **clsChoice** returns **stsOK**. Otherwise, **clsChoice** gets the BUTTON_STYLE.on value of the new button and, if that is true, uses **msgChoiceMgrSetOnButton** to change the choice's 'on' button to the one just added.

msgTkTableAddAsLast

Adds specified window as the last child in the table.

Takes WIN, returns STATUS.

Comments **clsChoice** first calls its ancestor, then gets its manager via **msgTkTableGetManager**. If it has no manager, **clsChoice** returns **stsOK**. Otherwise, **clsChoice** gets the BUTTON_STYLE.on value of the new button and, if that is true, uses **msgChoiceMgrSetOnButton** to change the choice's 'on' button to the one just added.

msgTkTableAddAsSibling

Inserts specified window in front of or behind an existing child.

Takes P_TK_TABLE_ADD_SIBLING, returns STATUS.

Comments

clsChoice first calls its ancestor, then gets its manager via **msgTkTableGetManager**. If it has no manager, **clsChoice** returns **stsOK**. Otherwise, **clsChoice** gets the BUTTON_STYLE.on value of the new button and, if that is true, uses **msgChoiceMgrSetOnButton** to change the choice's 'on' button to the one just added.

msgTkTableAddAt

Inserts specified window table at specified index.

Takes P_TK_TABLE_ADD_AT, returns STATUS.

Comments

clsChoice first calls its ancestor, then gets its manager via **msgTkTableGetManager**. If it has no manager, **clsChoice** returns **stsOK**. Otherwise, **clsChoice** gets the BUTTON_STYLE.on value of the new button and, if that is true, uses **msgChoiceMgrSetOnButton** to change the choice's 'on' button to the one just added.

msgTkTableRemove

Extracts **pArgs** from the table.

Takes WIN, returns STATUS.

Comments

clsChoice first calls its ancestor, then gets its manager via **msgTkTableGetManager**. If it has no manager, **clsChoice** returns **stsOK**. Otherwise, **clsChoice** checks to see if the button being removed is the one that is currently 'on' (by sending **msgChoiceMgrGetOnButton** to its manager). If so, the choice will either set the manager's 'on' button to the first remaining child (if the button's BUTTON_STYLE.contact is **bsContactLockOn**), or to null (if no children remain or the button's BUTTON_STYLE.contact is anything else). Put simply, the choice repairs its state according to whether the choice is always exactly one value, or can have no value.

msgTkTableChildDefaults

Sets the defaults in P_ARGS for a common child.

Takes P_UNKNOWN, returns STATUS.

Comments

This can be sent to either an instance of **clsChoice** or to **clsChoice** itself. Here is the response for either case:

```
if <pArgs->object.class inherits from clsGWin>
    pArgs->gWin.style.gestureEnable = false;

if <pArgs->object.class inherits from clsBorder> {
    pArgs->border.style.edge = bsEdgeNone;
    pArgs->border.style.topMargin = 1;
    pArgs->border.style.bottomMargin = 1;
}

if <pArgs->object.class inherits from clsLabel>
    pArgs->label.style.xAlignment = lsAlignLeft;
```

```
if <pArgs->object.class inherits from clsButton> {
    pArgs->button.style.notifyDetail = true;
    pArgs->button.style.contact = bsContactLockOn;
    pArgs->button.style.feedback = bsFeedbackDecorate;
    pArgs->button.style.offDecoration =
        lsDecorationExclusiveOff;
    pArgs->button.style.onDecoration =
        lsDecorationExclusiveOn;
}
```

CLAYOUT.H

This file contains the API definition for **clsCustomLayout**. **clsCustomLayout** inherits from **clsBorder.**

Provides container windows which position and size their child windows according to complex constraints you specify for each child.

See Also **clsTableLayout**

Debugging Flags

The **clsCustomLayout** debugging flag is 'W'. Defined values are:

flag1 (0x0002) msgWinLayoutSelf info

You can also set the '%' flag to:

flag8 (0x0100) layout timing

```
#ifndef CLAYOUT_INCLUDED
#define CLAYOUT_INCLUDED

#include <border.h>

#include <string.h>
```

```
#ifndef BORDER_INCLUDED

#endif
#ifndef _STRING_H_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT CSTM_LAYOUT;
typedef struct CSTM_LAYOUT_STYLE {
    U16 limitToRootWin  : 1;        // limit bounds to stay within theRootWindow
    U16 spare           : 15;       // unused (reserved)
} CSTM_LAYOUT_STYLE, *P_CSTM_LAYOUT_STYLE;
```

Default CSTM_LAYOUT_STYLE:

```
    limitToRootWin      = false
typedef struct CSTM_LAYOUT_METRICS {
    CSTM_LAYOUT_STYLE   style;  // overall style
    U32                 spare1; // unused (reserved)
    U32                 spare2; // unused (reserved)
} CSTM_LAYOUT_METRICS, *P_CSTM_LAYOUT_METRICS;
```

Constraints for Custom layout. For each of these, **relWin** of **pNull** and **relWinTag** of zero maps to parent.

```
Enum16(CSTM_LAYOUT_CONSTRAINT) {
    // for x, y, width, height
    clAsIs          = 0,    // x, y: leave unchanged; w, h: use desired size
    clAbsolute      = 1,    // use absolute value specified in spec
    // for x, y, width, height: all relative to relWin
    clBefore        = 2,    // clBefore clMinEdge is one pixel less than
                            // the border rect; clBefore clMaxEdge is
                            // on the border inner rect
    clSameAs        = 3,    // same as relWin
    clAfter         = 4,    // clAfter clMaxEdge is one pixel after max edge
                            // clAfter clMinEdge is on the border inner rect
    clPctOf         = 5     // value * relWin / 100
};
```

possible edge specifications

```
#define clMinEdge       0   // x: left edge, y: bottom edge
#define clCenterEdge    1   // x, y: mid point
#define clMaxEdge       2   // x: right edge, y: top edge
#define clBaselineEdge  3   // x: horiz. baseline, y: vertical baseline
```

macro for defining an x or y constraint to align two edges

```
#define ClAlign(childEdge, constraint, relWinEdge)  \
    ( ((childEdge) << 6) | ((relWinEdge) << 4) | (constraint) )
```

macro for defining a w or h constraint to extend to an edge

```
#define ClExtend(constraint, relWinEdge)    \
    ClAlign(clMaxEdge, constraint, relWinEdge)
```

can be or'ed into any constraint (except **clAsIs** or **clAbsolute**) to refer to opposite dimension.

```
#define clOpposite      flag8
```

can be or'ed into any constraint to compute new value as Max(as-is value, constraint-computed value) useful for children which need to be at least their desired size, but can be bigger (e.g. extend to parent's edge)

```
#define clAtLeastAsIs   flag9
```

can be or'ed into any constraint to compute new value as specified constraint or **clAsIs** if the custom layout window has **wsShrinkWrapWidth/Height** on. This allows a child to be shrink wrapped around if the custom layout window is computing its own size; or, for example, have the child's width extend to the edge of the parent if the parent is forced to a bigger size.

```
#define clAsIsIfShrinkWrap  flag10
```

can be or'ed into width or height constraint to exclude a child's width or height from the shrink-wrap computation. This is useful for children which align to parent's max edge and overlap other children.

```
#define clShrinkWrapExclude flag11
```

macros to extract the parts of a constraint

```
#define ClChildEdge(c)      (((c) >> 6) & 0x3)
#define ClRelWinEdge(c)     (((c) >> 4) & 0x3)
#define ClConstraint(c)     ((c) & 0x7)
typedef struct CSTM_LAYOUT_DIMENSION {
    CSTM_LAYOUT_CONSTRAINT  constraint;
    S32                     value;              // offset or absolute value
    WIN                     relWin;             // relative window
    U32                     relWinTag;          // tag of relative window
    U16                     valueUnits  : 6,    // units for value (e.g. bsUnitsLayout)
                            spare1      : 10;   // unused (reserved)
    U32                     spare;              // unused (reserved)
} CSTM_LAYOUT_DIMENSION, *P_CSTM_LAYOUT_DIMENSION;
typedef struct CSTM_LAYOUT_SPEC {
    CSTM_LAYOUT_DIMENSION   x, y, w, h;
} CSTM_LAYOUT_SPEC, *P_CSTM_LAYOUT_SPEC;
typedef struct CSTM_LAYOUT_CHILD_SPEC {
    WIN                 child;
    CSTM_LAYOUT_SPEC    metrics;
    BOOLEAN             parentShrinkWrapWidth;
    BOOLEAN             parentShrinkWrapHeight;
    U32                 spare;      // unused (reserved)
} CSTM_LAYOUT_CHILD_SPEC, *P_CSTM_LAYOUT_CHILD_SPEC;
```

msgNew

Creates a custom layout window.

Takes P_CSTM_LAYOUT_NEW, returns STATUS. Category: class message.

```
typedef CSTM_LAYOUT_METRICS CSTM_LAYOUT_NEW_ONLY, *P_CSTM_LAYOUT_NEW_ONLY;
#define customLayoutNewFields       \
    borderNewFields                 \
    CSTM_LAYOUT_NEW_ONLY    customLayout;
```

Arguments

```
typedef struct CSTM_LAYOUT_NEW {
    customLayoutNewFields
} CSTM_LAYOUT_NEW, *P_CSTM_LAYOUT_NEW;
```

msgNewDefaults

Initializes the CSTM_LAYOUT_NEW structure to default values.

Takes P_CSTM_LAYOUT_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct CSTM_LAYOUT_NEW {
    customLayoutNewFields
} CSTM_LAYOUT_NEW, *P_CSTM_LAYOUT_NEW;
```

Comments

Zeroes out pNew->customLayout.

msgCstmLayoutGetMetrics

Passes back the current metrics.

Takes P_CSTM_LAYOUT_METRICS, returns STATUS.

```
#define msgCstmLayoutGetMetrics     MakeMsg(clsCustomLayout, 1)
```

Message Arguments

```
typedef struct CSTM_LAYOUT_METRICS {
    CSTM_LAYOUT_STYLE   style;  // overall style
    U32                 spare1; // unused (reserved)
    U32                 spare2; // unused (reserved)
} CSTM_LAYOUT_METRICS, *P_CSTM_LAYOUT_METRICS;
```

msgCstmLayoutSetMetrics

Sets the current metrics.

Takes P_CSTM_LAYOUT_METRICS, returns STATUS.

```
#define msgCstmLayoutSetMetrics     MakeMsg(clsCustomLayout, 2)
```

Message Arguments

```
typedef struct CSTM_LAYOUT_METRICS {
    CSTM_LAYOUT_STYLE   style;  // overall style
    U32                 spare1; // unused (reserved)
    U32                 spare2; // unused (reserved)
} CSTM_LAYOUT_METRICS, *P_CSTM_LAYOUT_METRICS;
```

Comments

If style.**limitToRootWin** is changed, **msgWinSetLayoutDirty**(true) will be self-sent.

msgCstmLayoutGetStyle

Passes back current style values.

Takes P_CSTM_LAYOUT_STYLE, returns STATUS.

```
#define msgCstmLayoutGetStyle   MakeMsg(clsCustomLayout, 5)
```

Message Arguments

```
typedef struct CSTM_LAYOUT_STYLE {
    U16 limitToRootWin  : 1;        // limit bounds to stay within theRootWindow
    U16 spare           : 15;       // unused (reserved)
} CSTM_LAYOUT_STYLE, *P_CSTM_LAYOUT_STYLE;
```

msgCstmLayoutSetStyle

Sets style values.

Takes P_CSTM_LAYOUT_STYLE, returns STATUS.

```
#define msgCstmLayoutSetStyle   MakeMsg(clsCustomLayout, 6)
```

Comments

If style.**limitToRootWin** is changed, **msgWinSetLayoutDirty**(true) will be self-sent.

CstmLayoutSpecInit

Zeros the P_CSTM_LAYOUT_SPEC.

Returns VOID.

```
#define CstmLayoutSpecInit(lm)  memset((lm), 0, sizeof(CSTM_LAYOUT_SPEC))
```

Message Arguments

```
typedef struct CSTM_LAYOUT_STYLE {
    U16 limitToRootWin  : 1;        // limit bounds to stay within theRootWindow
    U16 spare           : 15;       // unused (reserved)
} CSTM_LAYOUT_STYLE, *P_CSTM_LAYOUT_STYLE;
```

Comments

This is equivalent to the following:

x, y, w, h constraint = **clAsIs**

You should use CustmLayoutSpecInit to initialize the layout spec that you pass in to **msgCstmLayoutSetChildSpec**. For example:

```
CSTM_LAYOUT_CHILD_SPEC  cs;

CstmLayoutSpecInit(&cs.metrics);
cs.child = child;
cs.metrics.x.constraint = ClAlign(clMinEdge, clSameAs, clMinEdge);
cs.metrics.y.constraint = ClAlign(clMinEdge, clSameAs, clMinEdge);
ObjCallRet(msgCstmLayoutSetChildSpec, clayout, &cs, s);
```

msgCstmLayoutSetChildSpec

Sets layout spec for given child.

Takes P_CSTM_LAYOUT_CHILD_SPEC, returns STATUS.

```
#define msgCstmLayoutSetChildSpec   MakeMsg(clsCustomLayout, 3)
```

Message Arguments

```
typedef struct CSTM_LAYOUT_CHILD_SPEC {
    WIN                 child;
    CSTM_LAYOUT_SPEC    metrics;
    BOOLEAN             parentShrinkWrapWidth;
    BOOLEAN             parentShrinkWrapHeight;
    U32                 spare;      // unused (reserved)
} CSTM_LAYOUT_CHILD_SPEC, *P_CSTM_LAYOUT_CHILD_SPEC;
```

Comments

Storage will be allocated for the spec. The child spcecification will be used in response to **msgCstmLayoutGetChildSpec**, which is self-sent during **msgWinLayoutSelf**.

clsCustomLayout will self-send **msgWinSetLayoutDirty**(true).

See Also

CstmLayoutSpecInit

msgCstmLayoutRemoveChildSpec

Removes the spec for the specified child (**pArgs**).

Takes WIN, returns STATUS.

```
#define msgCstmLayoutRemoveChildSpec    MakeMsg(clsCustomLayout, 7)
```

Comments

If a child is extracted or destroyed, and **msgCstmLayoutSetChildSpec** was used to set the child layout constraints, you must use this message to remove the child layout constraints.

See Also

msgCstmLayoutSetChildSpec

msgCstmLayoutGetChildSpec

Passes back the current spec for the specified child.

Takes P_CSTM_LAYOUT_CHILD_SPEC, returns STATUS. Category: self-sent, subclass responsibility.

```
#define msgCstmLayoutGetChildSpec   MakeMsg(clsCustomLayout, 4)
#define stsCstmLayoutBadRelWin      MakeStatus(clsCustomLayout, 1)
#define stsCstmLayoutBadRelWinTag   MakeStatus(clsCustomLayout, 4)
#define stsCstmLayoutLoop           MakeStatus(clsCustomLayout, 2)
#define stsCstmLayoutBadConstraint  MakeStatus(clsCustomLayout, 3)
```

Message Arguments

```
typedef struct CSTM_LAYOUT_CHILD_SPEC {
    WIN                 child;
    CSTM_LAYOUT_SPEC    metrics;
    BOOLEAN             parentShrinkWrapWidth;
    BOOLEAN             parentShrinkWrapHeight;
    U32                 spare;      // unused (reserved)
} CSTM_LAYOUT_CHILD_SPEC, *P_CSTM_LAYOUT_CHILD_SPEC;
```

Comments

Self-sent during **msgWinLayout** to retrieve the current spec from subclasses. **clsCustomLayout** responds by returning the stored spec, or an initialized spec (CstmLayoutSpecInit()) if none is found.

Subclasses can catch this message, look at **pArgs**->child and return the layout constraints for known children.

If **pArgs**->relWin is not **objNull**, this uid will be used as the relative window. Otherwise, if **pArgs**->relWinTag will be used to find the relative window (i.e. **relWinTag** should be the window tag of the relative window). The relative window must be **objNull** (in which case the parent is used) or a sibling of **pArgs**->child.

status values

Messages from other classes

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

clsCustomLayout will save the constraints for each child that has **wsSendFile** on in its WIN_METRICS.flags.style. If a child's constraint specifies a **relWin** that does not file, the **relWin** will be filed as **objNull**.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsCustomLayout will restore the constraints for each child that was filed.

clsCustomLayout will self-send **msgWinSetLayoutDirty**(true) if the system font or system font scale changed since the table was filed. **pArgs**->pEnv is cast to a P_WIN_RESTORE_ENV and must be a valid window environment pointer.

msgWinLayoutSelf

Tell a window to layout its children (sent during layout).

Takes P_WIN_METRICS, returns STATUS.

Comments

clsCustomLayout responds by laying out its children. For each child, the following is done:

- msgCstmLayoutGetChildSpec is self-sent with the following CSTM_LAYOUT_CHILD_SPEC parameters:

```
child                 = child to be layed out;
metrics               = result of CstmLayoutSpecInit();
parentShrinkWrapWidth = true if self can shrink wrap width;
parentShrinkWrapWidth = true if self can shrink wrap height;
```

  Self can shrink wrap width/height if **pArgs**->options has **wsLayoutResizeon** and self's WinShrinkWrapWidth/Height(WIN_METRICS.flags.style) is true.

  The passed-back **pArgs** will be used as the child's layout spec.

- msgBorderGetOuterOffsets is sent to the child with a default **pArgs** (RECT32) of (1, 1, 1, 1). The outer offsets are used to define "after min edge" or "before max edge" constraints.
- The x, y, w, h of the child is computed based on its constraints. If the either w or h constraints are **clAsIs**, **msgWinGetDesiredSize** is sent to the child to determine its desired size.

If **pArgs**->options has **wsLayoutResize** on and self has shrink wrap width/height on, the bounding box around the layed out children will be computed and passed back in **pArgs**->bounds.size. If style.**limitToRootWin** is true, and self has no parent or self's parent is **theRootWindow**, the computed size will be limited to insure that self will fit on **theRootWindow** and self's origin may be altered (via **msgWinDelta**) to insure the window is fully on screen.

Return Value

stsCstmLayoutBadRelWin The **relWin** specified for a child spec was not the uid of a sibling window.

stsCstmLayoutBadRelWinTag The **relWinTag** specified for a child spec was not the tag of a sibling window.

stsCstmLayoutLoop The specified set of child constraints results in a circular layout loop. For example, child A's width **clSameAs** child B's width and child B's width **clSameAs** child A's width.

stsCstmLayoutBadConstraint A constraint specified for a child is not a valid value.

CLOSEBOX.H

This file contains the API definition for **clsCloseBox.**

clsCloseBox inherits from **clsMenuButton.**

Close boxes are frame decorations that let you close the frame. Close boxes paint as a triangle in the upper-left hand corner.

```
#ifndef CLOSEBOX_INCLUDED
#define CLOSEBOX_INCLUDED

#include <mbutton.h>
```

```
#ifndef MBUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
#define hlpCloseBoxGeneral      MakeTag(clsCloseBox, 1)
typedef OBJECT CLOSE_BOX;
typedef struct CLOSE_BOX_STYLE {
    U16 spare       : 16;   // unused (reserved)
} CLOSE_BOX_STYLE, *P_CLOSE_BOX_STYLE;
```

Messages

msgNew

Creates a closebox window.

Takes P_CLOSE_BOX_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct CLOSE_BOX_NEW_ONLY {
    CLOSE_BOX_STYLE style;
    U32             spare;  // unused (reserved)
} CLOSE_BOX_NEW_ONLY, *P_CLOSE_BOX_NEW_ONLY;
#define closeBoxNewFields   \
    menuButtonNewFields         \
    CLOSE_BOX_NEW_ONLY      closeBox;
typedef struct CLOSE_BOX_NEW {
    closeBoxNewFields
} CLOSE_BOX_NEW, *P_CLOSE_BOX_NEW;
```

msgNewDefaults

Initializes the CLOSE_BOX_NEW structure to default values.

Takes P_CLOSE_BOX_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct CLOSE_BOX_NEW {
    closeBoxNewFields
} CLOSE_BOX_NEW, *P_CLOSE_BOX_NEW;
```

Comments

Zeroes out pArgs->closeBox and sets

```
pArgs->win.flags.style &= ~(U32)(wsShrinkWrapWidth | wsShrinkWrapHeight);
```

```
 pArgs->gWin.style.gestureEnable = false;
pArgs->gWin.helpId = hlpCloseBoxGeneral;

pArgs->border.style.edge = bsEdgeBottom;
pArgs->border.style.shadow = bsShadowNone;
pArgs->border.style.join = bsJoinSquare;
pArgs->border.style.leftMargin = bsMarginNone;
pArgs->border.style.rightMargin = bsMarginNone;
pArgs->border.style.bottomMargin = bsMarginNone;
pArgs->border.style.topMargin = bsMarginNone;

pArgs->button.style.feedback = bsFeedbackNone;
```

msgCloseBoxGetStyle

Passes back the current style values.

Takes P_CLOSE_BOX_STYLE, returns STATUS.

```
#define msgCloseBoxGetStyle     MakeMsg(clsCloseBox, 1)
```

Message Arguments

```
typedef struct CLOSE_BOX_STYLE {
    U16 spare       : 16;   // unused (reserved)
} CLOSE_BOX_STYLE, *P_CLOSE_BOX_STYLE;
```

msgCloseBoxSetStyle

Sets the style values.

Takes P_CLOSE_BOX_STYLE, returns STATUS.

```
#define msgCloseBoxSetStyle     MakeMsg(clsCloseBox, 2)
```

Message Arguments

```
typedef struct CLOSE_BOX_STYLE {
    U16 spare       : 16;   // unused (reserved)
} CLOSE_BOX_STYLE, *P_CLOSE_BOX_STYLE;
```

CMDBAR.H

This file contains the API definition for **clsCommandBar**.

clsCommandBar inherits from **clsTkTable.**

Command bars are **tkTables** of buttons used in option sheets and frames.

```
#ifndef CMDBAR_INCLUDED
#define CMDBAR_INCLUDED

#include <tktable.h>
```

```
#ifndef TKTABLE_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT  COMMAND_BAR;
typedef struct COMMAND_BAR_STYLE {
    U16 spare           : 16;   // unused (reserved)
} COMMAND_BAR_STYLE, *P_COMMAND_BAR_STYLE;
```

Messages

msgNew

Creates a command bar window.

Takes P_COMMAND_BAR_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct COMMAND_BAR_NEW_ONLY {
    COMMAND_BAR_STYLE   style;      // overall style
    U32                 spare;      // unused (reserved)
} COMMAND_BAR_NEW_ONLY, *P_COMMAND_BAR_NEW_ONLY;
#define commandBarNewFields \
    tkTableNewFields        \
    COMMAND_BAR_NEW_ONLY        commandBar;
typedef struct COMMAND_BAR_NEW {
    commandBarNewFields
} COMMAND_BAR_NEW, *P_COMMAND_BAR_NEW;
```

msgNewDefaults

Initializes the COMMAND_BAR_NEW structure to default values.

Takes P_COMMAND_BAR_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct COMMAND_BAR_NEW {
    commandBarNewFields
} COMMAND_BAR_NEW, *P_COMMAND_BAR_NEW;
```

Comments

Sets

```
pArgs->gWin.style.gestureEnable = false;

pArgs->border.style.backgroundInk = bsInkGray33;
```

```
pArgs->border.style.topMargin = bsMarginMedium;
pArgs->border.style.bottomMargin = bsMarginMedium;
pArgs->border.style.leftMargin = bsMarginSmall;
pArgs->border.style.rightMargin = bsMarginSmall;

pArgs->tableLayout.style.tblXAlignment = tlAlignCenter;
pArgs->tableLayout.style.tblYAlignment = tlAlignCenter;
pArgs->tableLayout.style.childXAlignment = tlAlignCenter;
pArgs->tableLayout.style.childYAlignment = tlAlignCenter;
pArgs->tableLayout.style.growChildWidth = false;
pArgs->tableLayout.style.growChildHeight = true;

pArgs->tableLayout.numCols.constraint = tlInfinite;
pArgs->tableLayout.numRows.constraint = tlAbsolute;
pArgs->tableLayout.numRows.value = 1;
pArgs->tableLayout.colWidth.constraint = tlGroupMax;
pArgs->tableLayout.colWidth.gap = defaultColGap;
pArgs->tableLayout.rowHeight.constraint = tlChildrenMax;
pArgs->tableLayout.rowHeight.gap = 0;
```

Alters **pArgs**->tkTable.**pButtonNew** as in **msgTkTableChildDefaults.**

---

msgCommandBarGetStyle

Passes back the current style values.

Takes P_COMMAND_BAR_STYLE, returns STATUS.

```
#define msgCommandBarGetStyle       MakeMsg(clsCommandBar, 1)
```

Message Arguments

```
typedef struct COMMAND_BAR_STYLE {
    U16 spare           : 16;   // unused (reserved)
} COMMAND_BAR_STYLE, *P_COMMAND_BAR_STYLE;
```

---

msgCommandBarSetStyle

Sets the style values.

Takes P_COMMAND_BAR_STYLE, returns STATUS.

```
#define msgCommandBarSetStyle       MakeMsg(clsCommandBar, 2)
```

Message Arguments

```
typedef struct COMMAND_BAR_STYLE {
    U16 spare           : 16;   // unused (reserved)
} COMMAND_BAR_STYLE, *P_COMMAND_BAR_STYLE;
```

Messages from Other Classes

---

msgTkTableChildDefaults

Sets the defaults in **pArgs** for a common child.

Takes P_UNKNOWN, returns STATUS.

Comments

clsCommandBar sets up defaults for each child as follows:

If the child is a descendant of **clsGWin**, then

```
pArgs->gWin.style.gestureEnable = false;
```

If the child is a descendant of **clsButton**, then

```
pArgs->button.style.feedback = bsFeedback3D;
```

CONTROL.H

This file contains the API definition for **clsControl.**

clsControl inherits from **clsBorder.**

clsControl implements the previewing and client notification behavior of several UI components. **clsControl** is an abstract class -- it is never instantiated directly.

Debugging Flags

The **clsControl** debugging flag is '%'. Defined values are:

flag8 (0x0100) msgControlEnable info

```
#ifndef CONTROL_INCLUDED
#define CONTROL_INCLUDED

#include <border.h>
```

```
#ifndef BORDER_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT          CONTROL;
```

Dynamic Enable Styles

Use one of these values in control's style.**dynamicEnable.**

```
#define csDynamicNone       0   // no dynamic determination of "enabled"
#define csDynamicClient     1   // send msgControlProvideEnable to client
#define csDynamicObject     2   // send msgControlProvideEnable to "object"
#define csDynamicPargs      3   // set "enabled" from pArgs
typedef struct CONTROL_STYLE {
    U16 enable          : 1,    // if enabled, a control responds to input
        previewGrab     : 1,    // grab input when previews start
        previewRepeat   : 1,    // previews repeat on time-out
        previewing      : 1,    // msgControlBeginPreview has been sent out
        dirty           : 1,    // dirty status
        previewEnable   : 1,    // self-send msgControlBeginPreview, etc.
        showDirty       : 1,    // visuals reflect dirty state
        dynamicEnable   : 2,    // how "enable" value is determined
        private1        : 1,    // reserved
        spare           : 6;    // unused (reserved)
} CONTROL_STYLE, *P_CONTROL_STYLE;
```

Default CONTROL_STYLE:

```
enable          = true
previewGrab     = true
previewRepeat   = false
previewing      = false
dirty           = false
previewEnable   = false
showDirty       = true
```

```
typedef struct CONTROL_STRING {
    P_CHAR      pString;
    U16         len;
    U32         spare;      // unused (reserved)
} CONTROL_STRING, *P_CONTROL_STRING;
```

Advisory return values for subclasses

```
#define stsControlCancelPreview         MakeWarning(clsControl, 13)
#define stsControlCancelRepeat          MakeWarning(clsControl, 1)
```

msgNew

Creates a control window.

Takes P_CONTROL_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct CONTROL_NEW_ONLY {
    CONTROL_STYLE       style;  // overall style
    OBJECT              client; // client to notify
    U32                 spare;  // unused (reserved)
} CONTROL_NEW_ONLY, CONTROL_METRICS,
  *P_CONTROL_NEW_ONLY, *P_CONTROL_METRICS;
#define controlNewFields        \
    borderNewFields             \
    CONTROL_NEW_ONLY        control;
typedef struct CONTROL_NEW {
    controlNewFields
} CONTROL_NEW, *P_CONTROL_NEW;
```

Comments

Note that setting **pArgs**->control.style.enable to false does not result in **pArgs**->border.style.look set to **bsLookInactive**. If you change style.enable after **msgNew** (via **msgControlSetStyle** or **msgControlSetEnable**), the border.style.look will be changed to match.

msgNewDefaults

Initializes the CONTROL_NEW structure to default values.

Takes P_CONTROL_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct CONTROL_NEW {
    controlNewFields
} CONTROL_NEW, *P_CONTROL_NEW;
```

Comments

Zeroes **pArgs**->control and sets

```
pArgs->win.flags.style |= wsFileInline;

pArgs->border.style.previewAlter = bsAlterBackground;
pArgs->border.style.selectedAlter = bsAlterBackground;

pArgs->control.style.enable = true;
pArgs->control.style.showDirty = true;
```

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

If the client of the control is OSThisApp(), this is remembered and reinstated in **msgRestore**. In any case, the client is not saved.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsControl restores the instance from the file. If the client of the control was OSThisApp() when filed, the client is set to OSThisApp(), otherwise **objNull**.

Messages Clients Send to Controls

msgControlGetMetrics

Passes back the current metrics.

Takes P_CONTROL_METRICS, returns STATUS.

```
#define msgControlGetMetrics    MakeMsg(clsControl, 1)
```

msgControlSetMetrics

Sets the metrics.

Takes P_CONTROL_METRICS, returns STATUS.

```
#define msgControlSetMetrics    MakeMsg(clsControl, 2)
```

msgControlGetStyle

Passes back the current style values.

Takes P_CONTROL_STYLE, returns STATUS.

```
#define msgControlGetStyle      MakeMsg(clsControl, 3)
```

Message Arguments

```
typedef struct CONTROL_STYLE {
    U16 enable          : 1,    // if enabled, a control responds to input
        previewGrab     : 1,    // grab input when previews start
        previewRepeat   : 1,    // previews repeat on time-out
        previewing      : 1,    // msgControlBeginPreview has been sent out
        dirty           : 1,    // dirty status
        previewEnable   : 1,    // self-send msgControlBeginPreview, etc.
        showDirty       : 1,    // visuals reflect dirty state
        dynamicEnable   : 2,    // how "enable" value is determined
        private1        : 1,    // reserved
        spare           : 6;    // unused (reserved)
} CONTROL_STYLE, *P_CONTROL_STYLE;
```

msgControlSetStyle

Sets the style values.

Takes P_CONTROL_STYLE, returns STATUS.

```
#define msgControlSetStyle      MakeMsg(clsControl, 4)
```

Message Arguments

```
typedef struct CONTROL_STYLE {
    U16 enable          : 1,    // if enabled, a control responds to input
        previewGrab     : 1,    // grab input when previews start
        previewRepeat   : 1,    // previews repeat on time-out
        previewing      : 1,    // msgControlBeginPreview has been sent out
        dirty           : 1,    // dirty status
        previewEnable   : 1,    // self-send msgControlBeginPreview, etc.
        showDirty       : 1,    // visuals reflect dirty state
        dynamicEnable   : 2,    // how "enable" value is determined
        private1        : 1,    // reserved
        spare           : 6;    // unused (reserved)
} CONTROL_STYLE, *P_CONTROL_STYLE;
```

Comments

If style.enable changes, the control does the following:

- self-sends **msgBorderSetLook**, with **pArgs** of **bsLookActive** if style.enable is true, **bsLookInactive** otherwise.
- self-sends **msgControlCancelPreview**, **pNull** if style.enable is false.

msgControlGetClient

Passes back metrics.client.

Takes P_UID, returns STATUS.

```
#define msgControlGetClient     MakeMsg(clsControl, 5)
```

msgControlSetClient

Sets metrics.client.

Takes UID, returns STATUS.

```
#define msgControlSetClient     MakeMsg(clsControl, 6)
```

msgControlGetDirty

Passes back true if the control has been altered since dirty was set false.

Takes P_BOOLEAN, returns STATUS.

```
#define msgControlGetDirty      MakeMsg(clsControl, 15)
```

msgControlSetDirty

Sets style.dirty.

Takes BOOLEAN, returns STATUS.

```
#define msgControlSetDirty      MakeMsg(clsControl, 16)
```

msgControlGetEnable

Passes back style.enable.

Takes P_BOOLEAN, returns STATUS.

```
#define msgControlGetEnable     MakeMsg(clsControl, 17)
```

msgControlSetEnable

Sets style.enable.

Takes BOOLEAN, returns STATUS.

```
#define msgControlSetEnable     MakeMsg(clsControl, 18)
```

Comments

Responds to changes in style.enable as in **msgControlSetStyle**.

msgControlEnable

The control re-evaluates whether it is enabled.

Takes P_CONTROL_ENABLE, returns STATUS.

```
#define msgControlEnable        MakeMsg(clsControl, 19)
```

Arguments

```
typedef struct CONTROL_ENABLE {
    WIN         root;       // In: originator
    OBJECT      object;     // In: object for msgControlProvideEnable
    BOOLEAN     enable;     // In: value to use iff csDynamicPargs
    U32         spare;      // reserved (unused)
} CONTROL_ENABLE, *P_CONTROL_ENABLE;
```

Comments

This is commonly used with menu buttons that need to be enabled/disabled according to some constraints known to the sender. For example, **clsMenuButton** sends **msgControlEnable** to its menu before showing the menu, which results in each control in the menu receiving **msgControlEnable** with appropriate parameters. See **msgMenuButtonShowMenu** (mbutton.h) for sample usage.

clsControl responds to **msgControlEnable** as follows:

- If style.**dynamicEnable** is **csDynamicNone**, simply returns **stsOK**.
- If style.**dynamicEnable** is **csDynamicPargs**, style.enable is set to **pArgs**->enable.
- If style.**dynamicEnable** is **csDynamicClient** and metrics.client is **objNull**, does not change enable and returns **stsOK**.
- If style.**dynamicEnable** is **csDynamicObject** and **pArgs**->object is **objNull**, sets style.enable to false (as in **msgControlSetEnable**) and returns **stsOK**.

The cases that remain are style.**dynamicEnable** of **csDynamicClient** or **csDynamicObject**, and a non-null object.

- If the object is not owned by OSThisProcess(), sets style.enable to false (as in **msgControlSetEnable**) and returns **stsOK**. Otherwise, sends **msgControlProvideEnable** with the following CONTROL_PROVIDE_ENABLE parameters:

```
root    = pArgs->root;
control = self;
tag     = self's WIN_METRICS.tag;
enable  = current value of style.enable;
```

- If the object responds to **msgControlProvideEnable** with **stsNotUnderstood**, sets style.enable to true (as in **msgControlSetEnable**) and returns **stsOK**. Otherwise, sets style.enable to CONTROL_PROVIDE_ENABLE.enable (as in **msgControlSetEnable**) and returns **stsOK**.

See Also

msgControlProvideEnable

Subclass Responsibility Messages

msgControlGetValue

Passes back the current "value" of the control.

Takes P_S32 , returns STATUS.

```
#define msgControlGetValue          MakeMsg(clsControl, 7)
```

Comments

In response to this message **clsControl** returns **stsNotUnderstood**.

msgControlSetValue

Sets the current "value" of the control.

Takes S32 , returns STATUS.

```
#define msgControlSetValue          MakeMsg(clsControl, 8)
```

Comments

In response to this message **clsControl** returns **stsNotUnderstood**.

Messages Controls Send to Self

msgControlBeginPreview

Self-sent when **msgPenDown** is received.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

```
#define msgControlBeginPreview      MakeMsg(clsControl, 10)
```

Comments

clsControl responds with **stsOK**. **pArgs** is **pNull** if the preview is not caused by an input event.

msgControlUpdatePreview

Self-sent when **msgPenMoveDown** is received.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

```
#define msgControlUpdatePreview      MakeMsg(clsControl, 11)
```

Comments

clsControl responds with **stsOK**. **pArgs** is **pNull** if the preview is not caused by an input event.

msgControlRepeatPreview

Self-sent if style.**repeatPreview** is true. Initial delay is 600ms, then immediate repeat until **msgPenUp**.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

```
#define msgControlRepeatPreview      MakeMsg(clsControl, 12)
```

Comments

clsControl responds with **stsOK**.

Subclasses can return **stsControlCancelRepeat** to prevent the next **msgControlRepeatPreview**.

pArgs is **pNull** if the preview is not caused by an input event.

msgControlCancelPreview

Self-sent when style.**previewGrab** is false and **msgPenExitDown** is received. Clients or subclasses can send this to a control to cancel existing preview.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

```
#define msgControlCancelPreview      MakeMsg(clsControl, 13)
```

Comments

Sets style.previewing to false.

pArgs is **pNull** if the preview is not caused by an input event.

msgControlAcceptPreview

Self-sent when **msgPenUp** is received.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

```
#define msgControlAcceptPreview      MakeMsg(clsControl, 14)
```

Comments

If gestures are enabled this message is not sent until **msgGWinGesture** is received with xgs1Tap.

clsControl responds with **stsOK**.

pArgs is **pNull** if the preview is not caused by an input event.

Messages Controls Send to Client

msgControlProvideEnable

Sent out to client or "object" during processing of **msgControlEnable**.

Takes P_CONTROL_PROVIDE_ENABLE, returns STATUS.

```
#define msgControlProvideEnable     MakeMsg(clsControl, 20)
```

Arguments

```
typedef struct CONTROL_PROVIDE_ENABLE {
    WIN         root;       // In: originator
    CONTROL     control;    // In: sending control
    TAG         tag;        // In: tag of sending control
    BOOLEAN     enable;     // In/Out: enabled value for control
    U32         spare;      // unused (reserved)
} CONTROL_PROVIDE_ENABLE, *P_CONTROL_PROVIDE_ENABLE;
```


Messages Defined by Other Classes

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments

clsControl first calls ancestor, then responds as follows. (In each of these cases, see below for status return value.)

- If **pArgs**->flags has **evBorderTaken** set (see border.h), assumes **clsBorder** used the event and returns status.
- If style.enable is false, or style.**previewEnable** is false, or the event is not a pen event, returns status returned by ancestor.
- If **pArgs**->devCode is **msgPenDown**, self-sends **msgControlBeginPreview** passing along **pArgs**. If return status is **stsControlCancelPreview**, returns status. If style.**previewRepeat** is true, and return status is not **stsControlCancelRepeat**, the control repeats preview after 600ms delay. Sets style.previewing to true.
- If **pArgs**->devCode is **msgPenMoveDown**, self-sends **msgControlUpdatePreview** passing along **pArgs**. If return status is **stsControlCancelPreview**, sets style.previewing to false and returns status.
- If **pArgs**->devCode is **msgPenUp**, checks GWIN_STYLE.**gestureEnable**. If true, does nothing and returns status. Otherwise, self-sends **msgControlAcceptPreview** passing along **pArgs** and returns **stsInputTerminate**.
- If **pArgs**->devCode is **msgPenExitDown** and style.**previewGrab** is true or style.previewing is false or GWIN_STYLE.**gestureEnable** is true, does nothing and returns status. Otherwise, self-sends **msgControlCancelPreview** passing along **pArgs** and returns **stsInputTerminate**.

clsControl returns **stsInputGrabTerminate** if no error was encountered and style.previewing and style.**previewGrab** are true after processing the input event. Otherwise, the status returned by ObjectCallAncestor() is returned.

msgGWinGesture

Called to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

If ObjectCallAncestor() returns **stsOK**, **clsControl** self-sends **msgControlCancelPreview** and returns **stsOK**.

If **pArgs**->msg is xgs1Tap and style.**previewEnable** is true, self-sends **msgControlAcceptPreview** and returns **stsOK**.

All other gestures result in **msgGWinForwardedGesture** to the control client, followed by **msgControlCancelPreview** to self.

msgGWinAbort

Clears the translation state of the GWin.

Takes void, returns STATUS.

Comments

clsControl responds to this by self-sending **msgControlCancelPreview** if the receiver is currently previewing.

msgGWinGestureDone

Sent to signal the end of a gesture.

Takes P_GWIN_GESTURE, returns STATUS. Category: self-sent.

Comments

clsControl responds to this by self-sending **msgControlCancelPreview** if the receiver is currently previewing.

msgBorderGetDirty

Passes back true if any child responds to **msgBorderGetDirty** with true; otherwise passes back false.

Takes P_BOOLEAN, returns STATUS.

Comments

clsControl responds by self-sending **msgControlGetDirty**. If the control is dirty, true is passed back. Otherwise, this message is passed on to **clsControl**'s ancestor. **clsBorder** will respond by passing back true if any child of this control is dirty.

msgBorderSetDirty

Sends **msgBorderSetDirty(pArgs)** to each child.

Takes BOOLEAN, returns STATUS.

Comments

clsControl will call ancestor (to allow **clsBorder** to dirty any children), then self-send **msgControlSetDirty(pArgs)**.

COUNTER.H

This file contains the API definition for **clsCounter**.

clsCounter inherits from **clsTableLayout.**

Counters are general components which display a current count and provide up/down arrows for the user to alter the count.

Counters are used as notebook frame decorations to provide up/down arrows to move between pages.

```
#ifndef COUNTER_INCLUDED
#define COUNTER_INCLUDED

#include <tlayout.h>
```

```
#ifndef TLAYOUT_INCLUDED

#endif
```

Common #defines and typedefs

```
#define tagCounterDecArrow      MakeTag(clsCounter, 1)
#define tagCounterLabel         MakeTag(clsCounter, 2)
#define tagCounterIncArrow      MakeTag(clsCounter, 3)

#define hlpCounterDecArrow      tagCounterDecArrow
#define hlpCounterLabel         tagCounterLabel
#define hlpCounterIncArrow      tagCounterIncArrow

typedef OBJECT COUNTER;
```

Show Style

```
#define csShowCount             0   // show "count" only     (e.g. "24")
#define csShowCountSlashTotal   1   // show "count/total"    (e.g. "1/24")
#define csShowCountOfTotal      2   // show "count of total" (e.g. "1 of 24")

typedef struct COUNTER_STYLE {
    U16 numCols     : 4,    // number of columns for shrink-wrap
        show        : 3,    // what to show
        spare       : 9;    // unused (reserved)
} COUNTER_STYLE, *P_COUNTER_STYLE;
```

Messages

---

msgNew

Creates a counter window.

Takes P_COUNTER_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct COUNTER_NEW_ONLY {
    COUNTER_STYLE   style;
    OBJECT          client;     // client to notify
    S32             value;      // initial count
    S32             total;      // total to display
    U32             spare1;     // unused (reserved)
    U32             spare2;     // unused (reserved)
} COUNTER_NEW_ONLY, *P_COUNTER_NEW_ONLY;
```

```
#define counterNewFields    \
    tableLayoutNewFields    \
    COUNTER_NEW_ONLY        counter;
typedef struct COUNTER_NEW {
    counterNewFields
} COUNTER_NEW, *P_COUNTER_NEW;
```

msgNewDefaults

Initializes the COUNTER_NEW structure to default values.

Takes P_COUNTER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct COUNTER_NEW {
    counterNewFields
} COUNTER_NEW, *P_COUNTER_NEW;
```

Comments

Zeroes out **pArgs**->counter and sets

```
pArgs->border.style.leftMargin      = bsMarginNone;
pArgs->border.style.rightMargin     = bsMarginNone;
pArgs->border.style.bottomMargin    = bsMarginSmall;
pArgs->border.style.topMargin       = bsMarginMedium;

pArgs->tableLayout.style.growChildWidth     = false;
pArgs->tableLayout.style.growChildHeight    = false;

pArgs->counter.style.numCols = 1;
```

Default COUNTER_STYLE:

```
numCols     = 1
show        = csShowCount
```

msgCounterGetStyle

Passes back the current style values.

Takes P_COUNTER_STYLE, returns STATUS.

```
#define msgCounterGetStyle      MakeMsg(clsCounter, 1)
```

Message Arguments

```
typedef struct COUNTER_STYLE {
    U16 numCols     : 4,    // number of columns for shrink-wrap
        show        : 3,    // what to show
        spare       : 9;    // unused (reserved)
} COUNTER_STYLE, *P_COUNTER_STYLE;
```

msgCounterSetStyle

Sets the style values.

Takes P_COUNTER_STYLE, returns STATUS.

```
#define msgCounterSetStyle      MakeMsg(clsCounter, 2)
```

Message Arguments

```
typedef struct COUNTER_STYLE {
    U16 numCols     : 4,    // number of columns for shrink-wrap
        show        : 3,    // what to show
        spare       : 9;    // unused (reserved)
} COUNTER_STYLE, *P_COUNTER_STYLE;
```

Comments

If style.**numCols** requires the counter to be wider, **clsCounter** will self-send **msgWinLayout** to relayout.

msgCounterGetClient

Passes back the current counter client.

Takes P_OBJECT, returns STATUS.

```
#define msgCounterGetClient     MakeMsg(clsCounter, 7)
```

msgCounterSetClient

Sets the client.

Takes OBJECT, returns STATUS.

```
#define msgCounterSetClient     MakeMsg(clsCounter, 8)
```

msgCounterGetValue

Passes back the current count value.

Takes P_S32, returns STATUS.

```
#define msgCounterGetValue          MakeMsg(clsCounter, 3)
```

msgCounterSetValue

Sets the current counter value.

Takes S32, returns STATUS.

```
#define msgCounterSetValue          MakeMsg(clsCounter, 4)
```

Comments — If the new value requires the counter to be wider, **clsCounter** will self-send **msgWinLayout** to relayout.

msgCounterGetTotal

Passes back the current total value.

Takes P_S32, returns STATUS.

```
#define msgCounterGetTotal          MakeMsg(clsCounter, 11)
```

msgCounterSetTotal

Sets the current total value.

Takes S32, returns STATUS.

```
#define msgCounterSetTotal          MakeMsg(clsCounter, 12)
```

Comments — If the new total value requires the counter to be wider, **clsCounter** will self-send **msgWinLayout** to relayout.

msgCounterIncr

Increments the current counter value by adding in **pArgs**.

Takes S32, returns STATUS.

```
#define msgCounterIncr          MakeMsg(clsCounter, 5)
```

Comments — If the new value requires the counter to be wider, **clsCounter** will self-send **msgWinLayout** to relayout.

msgCounterGoto

Sends **msgCounterNotify** to the counter's client to alter the counter's value.

Takes S32, returns STATUS.

```
#define msgCounterGoto          MakeMsg(clsCounter, 9)
```

Comments

clsCounter will send **msgCounterNotify** to the counter's client with the following COUNTER_NOTIFY parameters:

```
counter     = self;
initValue   = current counter value;
action      = csActionAccept;
value       = pArgs;
```

The client can alter the value parameter to goto a different value, if desired.

A common use for this message is to create a menu with individual menu buttons representing particular counter values, and set the (msg, data) pair for each menu button to be (**msgCounterGoto**, desired value) and set the menu button's client to be the counter.

msgCounterGetLabel

Passes back the counter label window uid.

Takes P_WIN, returns STATUS.

```
#define msgCounterGetLabel        MakeMsg(clsCounter, 10)
```

Comments

The label is an instance of **clsMenuButton**, and can be given a menu by setting the CONTROL_STYLE.**previewEnable** to true and using **msgMenuButtonSetMenu**.

Messages Counters Send to Clients

msgCounterNotify

Sent to the client when an arrow repeats, finishes or cancels.

Takes P_COUNTER_NOTIFY, returns STATUS. Category: client notification.

```
#define msgCounterNotify            MakeMsg(clsCounter, 6)
```

Arguments

```
Enum16(COUNTER_ACTION) {
    csActionIncrement   = 0,    // increment the counter
    csActionDecrement   = 1,    // decrement the counter
    csActionCancel      = 2,    // cancel the increment/decrement
    csActionAccept      = 3,    // accept the increment/decrement
};
typedef struct COUNTER_NOTIFY {
    OBJECT          counter;    // in: counter calling out
    S32             initValue;  // in: initial value before repeat
    COUNTER_ACTION  action;     // in: what happened
    S32             value;      // in/out: current value
    S32             total;      // in: current total value
    U32             spare1;     // unused (reserved)
    U32             spare2;     // unused (reserved)
} COUNTER_NOTIFY, *P_COUNTER_NOTIFY;
```

Comments

If the user presses or continues to hold down on the decrement arrow, **pArgs**->action will be set to **csActionDecrement**.

If the user presses or continues to hold down on the increment arrow, **pArgs**->action will be set to **csActionIncrement**.

If the user pen's-up over either arrow, **pArgs**->action will be set to **csActionAccept**.

If the user drags out of either arrow, **pArgs**->action will be set to **csActionCancel**.

For any action, **pArgs**->value will be the current value of the counter and **pArgs**->initValue will be the initial value of the counter when the first **csActionIncrement/Decrement** was sent out.

Clients should change **pArgs**->value to the new desired value. Note that **clsCounter** does not change the value of the counter, other than copying back **pArgs**->value.

If **pArgs**->value is not changed by the client, the value of the counter will not be changed. This allows clients to use **msgCounterIncr** or **msgCounterSetValue** to alter the value during **msgCounterNotify**.

FIELD.H

This file contains the API definition for **clsField**

clsField inherits from **clsLabel.**

Implements the UI component to edit, validate and display string data.

Fields implement the basic UI component to edit simple strings of text. The user-interface for fields has been optimized for simple short one row strings of text, although they will function for multiple lines. All display information for translated fields is handled in **clsLabel**. Typically the label layout is fixed, and shrink wrap will be turned off in the label. Otherwise the field size will change as the value of the string changes, and lead to strange results and behavior. There are three basic User-Interfaces supported through the API to edit fields. These are defined in field.style.**editType**.

Fields with **editType** of **fstInline** support direct writing, appending, and a number of gestural editing operations, including bringing up an IP. Fields with **editType** of **fstPopUp** will only allow editing through an IP. Fields with **editType** of **fstOverWrite** make the field combed and allow over-writing on individual characters. These fields have very precise stroke targetting due to the character box constraints. This, in combination with only allowing three editing gestures (insert space, delete range, and delete character) allows for highly accurate handwriting and gesture recognition and for quick correction of mistakes. The down side of this style of field is that a specific UI look is implied.

To further increase recognition accuracy, fields require a translator for both inline editing and in the IP. Translators have a rich API to provide various types of contextual information. This greatly increases translation accuracy. See **msgNew**, **msgFieldGetXlate**, **msgFieldSetXlate**, **msgFieldCreateTranslator**.

Fields can also be run in delayed mode. Delayed fields allow the user to write into an empty field, and not translate the strokes on pen out of proximity. Delayed fields are translated when **msgFieldTranslateDelayed** is sent to the field. See **msgFieldTranslateDelayed**, **msgFieldSetDelayScribble**, and **msgFieldGetDelayScribble** for more information.

Fields will replace **newLines** with spaces, and will strip trailing spaces when their value is retrieved. The value should be set via **msgLabelSetString** and retrieved via **msgLabelGetString**.

Messages from **clsInput**, messages from **clsGWin** (other then **msgGWinGesture**), messages from **clsWin**, messages from **clsLabel**, messages from **clsSelection**, messages from **clsXfer**, messages from xlate, and messages from **clsTracker** should NOT be overridden by subclasses of **clsField**.

Finally, fields provide simple hooks to allow clients or subclasses to perform various validation according to a common protocol. See **msgFieldValidate** for details.

```
#ifndef FIELD_INCLUDED
#define FIELD_INCLUDED

#include <go.h>

#include <label.h>

#include <xtemplt.h>

// Next Up: 31  Recycled: 28

#ifndef GO_INCLUDED

#endif
#ifndef LABEL_INCLUDED

#endif
#ifndef XTEMPLT_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT FIELD;
```

Field Editing Types

These define the types of edit User-Interface the field provides, defining the behavior of the field. These are used for style.**editType**.

```
#define fstInline         1     // Direct editing on field, or through IP
#define fstPopUp          2     // Editing only through an IP
#define fstOverWrite      3     // Editing in combed overwrite field
```

Insertion Pad Types

These define the type of Insertion Pad that will be created in **msgFieldCreatePopUp** when the type parameter is **fipReplaceAll**. Note: A call to **msgFieldCreatePopUp** when the type parameter is **fipInsert** will look at the system preferences to determine the type of IP. These are used for style.**popUpType**.

```
//#define fstEditBox          1 // Obsolete
#define fstCharBox        2     // The pop-up is an ipsCharBox IP
#define fstCharBoxButtons 2     // Obsolete
```

Character Box Memory

For **fstOverWrite** fields, this defines the number of characters that should be used sent to the translator via **msgXlateCharMemorySet**. This causes the translator to cycle through choices and not return the same character from a translation. These are use for style.**boxMemory**.

```
#define fstBoxMemoryZero    0   // Box memory is zero characters
#define fstBoxMemoryOne     1   // Box memory is one character
#define fstBoxMemoryFour    2   // Box Memory is four characters
```

Selection/Input Target

These define the interaction the field should have with both the selection manager and the input target when:

- **msgFieldKeyboardActivate** is called

- the pen is interacting with the field

- **msgFieldTranslateDelayed** is called

- the field is the recipient of a move/copy operation

These are used for style.**focusStyle**.

```
#define fstInputSelection 1     // Field takes selection and input target
#define fstInput          2     // Field takes input target only
#define fstNone           3     // Field takes neither selection nor target
```

Upper Case Writer Rules

These define the capitalization heuristic rules used by the field translator. These rules do not apply when the translator is provided by the client of the field, or the writer is not an all-caps writer. These are used for style.**capOutput**.

```
#define fstCapAsIs          1
#define fstCapFirstWord     2
#define fstCapAllWords      3
#define fstCapAll           4
```

Translator Type

These define the type of translator given to and maintained by the field, and affects the parameters to **msgFieldGetTranslator** and **msgFieldSetTranslator**, the interaction with **msgFieldCreateTranslator**, and **msgNew**. See these messages for more information. These are used for style.**xlateType**.

```
#define fstXlateObject      0
#define fstXlateTemplate    1
```

Field Style Structure

The field style structure defines the overall behavior of the field. Information on the various flags can be found elsewhere. For information on **focusStyle**, **capOutPut**, **popUpType**, **editType**, **xlateType**, delayed and **boxMemory**, see above.

For information on **noSpace** and veto, see **msgFieldCreateTranslator**.

```
typedef struct FIELD_STYLE {
    U16 focusStyle:     2,          // How field does selection and target
        capOutput:      3,          // Upper case writer cap rules for xlate
        popUpType:      3,          // Insertion pad style for fipReplaceAll
        editType:       2,          // Type of editing in field
        xlateType:      1,          // 0=xlate object, 1=xtemplate
        clientValidate: 1,          // client performs validation
        clientPreValidate:    1,    // Notify client before validation
        clientPostValidate:   1,    // Notify client after successful valid
        clientNotifyInvalid:  1,    // Notify client when invalid
        clientNotifyReadOnly: 1;    // Notify client when attempt to modify
                                    // readonly field
    U16 clientNotifyModified: 1,    // Notify client when field modified
        validatePending:      1,    // Field not valid since last modification
        delayed:              1,    // Delayed translation field. Capture
                                    // strokes till msgFieldTranslateDelayed
        upperCase:            1,    // Field and IP forced to upper case
        noSpace:              1,    // Turn on no space in fld created xlate
        privateData1:         1,    // Internal use only
        veto:                 1,    // Turn on veto in fld created xlate
        privateData2:         1,    // Internal use only
        boxMemory:            2,    // Enable box memory in field and IP
        dataMoveable:         1,
        dataCopyable:         1,
        reserved:             5;    // Reserved for future use
} FIELD_STYLE, *P_FIELD_STYLE;
```

Popup Editing Types

These defines are parameters in **msgFieldCreatePopUp** and **msgFieldActivatePopUp**. They specify what type of edit operation should be performed by this pop-up. Internally, an edit gesture (circle) in an **fstInline** field or pen input into **fstPopUp** field will call these messages with **fipReplaceAll**. An insert caret in an **fstInline** field will call with **fipInsert**.

```
#define fipReplaceAll   0       // The IP displays/edits the field value
#define fipInsert       1       // The IP inserts new text at the insertion pt
#define fipReplaceRange 2       // Unimplemented
```

Validation data structure

This data structure is used as a parameter to **msgFieldValidateEdit**, and **msgFieldNotifyInvalid** to capture all validation information.

```
typedef struct {
    MESSAGE         failureMessage; // Reason validation failed
    OBJECT          field;          // Field to validate
} FIELD_NOTIFY, *P_FIELD_NOTIFY;
```

Messages

msgNew

Creates and initializes a new instance of **clsField**.

Takes P_FIELD_NEW, returns STATUS. Category: class message.

Arguments

```
typedef union FIELD_XLATE {
    OBJECT      translator;
    P_XTM_ARGS  pTemplate;
} FIELD_XLATE, *P_FIELD_XLATE;
typedef struct FIELD_NEW_ONLY {
    FIELD_STYLE style;      // field style, see  above
    FIELD_XLATE xlate;      // xlate object or template
    U16         maxLen;     // maximum field string length. 0 means no limit
    U32         reserved;   // reserved for future use, must be  0
} FIELD_NEW_ONLY, *P_FIELD_NEW_ONLY;
#define fieldNewFields          \
    labelNewFields              \
    FIELD_NEW_ONLY    field;
typedef struct FIELD_NEW {
   fieldNewFields
} FIELD_NEW, *P_FIELD_NEW;
```

Comments

Will force the label.style to **lsBoxTicks** for fields of **editType fstOverWrite**. Overwrite fields must have label style of **lsBoxTicks**. Will force **gWin.style.gestureEnable** to TRUE. Extreme care should be taken if changing either of these. The xlate parameter in conjunction with style.**xlateType** specifies the type of translator the field uses. If **xlateType** is 0, and **pNew**->field.xlate.translator does not equal **objNull**, the translator will be used for all translations in the field and in the IP, and destroyed when the field is destroyed. If **xlateType** is 1, **pNew**->field.xlate.**pTemplate** is used to create, allocate, and compile a template. It will also be freed when the field is destroyed. A translator will be created and destroyed as needed via **msgFieldCreateTranslator** from this compiled template. **msgFieldCreateTrans** will also be used when **xlateType** is 0 and **pNew**->field.xlate.translator is **objNull**.

See Also

msgFieldSetXlate

msgNewDefaults

Initializes the FIELD_NEW structure to default values.

Takes P_FIELD_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct FIELD_NEW {
   fieldNewFields
} FIELD_NEW, *P_FIELD_NEW;
```

Comments

Initializes the default values. Care should be taken when changing the default values of parent classes. Examples are win.flags.input, or gwin.style.

Zeros out **pNew**->field and sets

```
fld.field.style.dataMoveable = true;
fld.field.style.dataCopyable = true;
fld.field.style.focusStyle = fstInputSelection;
fld.field.style.capOutput = fstCapAsIs;
fld.field.style.editType = fstInline;
fld.field.style.popUpType = fstCharBoxButtons;
fld.field.style.xlateType = fstXlateObject;
fld.field.style.boxMemory = fstBoxMemoryFour;
fld.field.maxLen = 64;
```

```
fld.border.style.edge = bsEdgeBottom;
fld.gwin.style.firstEnter = TRUE;
fld.gwin.style.askOtherWin = TRUE;
fld.gwin.style.otherWinSaysYes = TRUE;
fld.win.flags.input = inputTip | inputStroke |
        inputOutProx | inputInk | inputEnter |
        inputHoldTimeout | inputLRContinue |
        inputAutoTerm | inputTimeout | inputHWTimeout;
```

msgFieldGetStyle

Passes back the style value held by the field.

Takes P_FIELD_STYLE, returns STATUS.

```
#define msgFieldGetStyle            MakeMsg(clsField, 1)
```

Message Arguments

```
typedef struct FIELD_STYLE {
    U16 focusStyle:     2,          // How field does selection and target
        capOutput:      3,          // Upper case writer cap rules for xlate
        popUpType:      3,          // Insertion pad style for fipReplaceAll
        editType:       2,          // Type of editing in field
        xlateType:      1,          // 0=xlate object, 1=xtemplate
        clientValidate: 1,          // client performs validation
        clientPreValidate:    1,    // Notify client before validation
        clientPostValidate:   1,    // Notify client after successful valid
        clientNotifyInvalid:  1,    // Notify client when invalid
        clientNotifyReadOnly: 1;    // Notify client when attempt to modify
                                    // readonly field
    U16 clientNotifyModified: 1,    // Notify client when field modified
        validatePending:      1,    // Field not valid since last modification
        delayed:              1,    // Delayed translation field. Capture
                                    // strokes till msgFieldTranslateDelayed
        upperCase:            1,    // Field and IP forced to upper case
        noSpace:              1,    // Turn on no space in fld created xlate
        privateData1:         1,    // Internal use only
        veto:                 1,    // Turn on veto in fld created xlate
        privateData2:         1,    // Internal use only
        boxMemory:            2,    // Enable box memory in field and IP
        dataMoveable:         1,
        dataCopyable:         1,
        reserved:             5;    // Reserved for future use
} FIELD_STYLE, *P_FIELD_STYLE;
```

msgFieldSetStyle

Sets the style of the field.

Takes P_FIELD_STYLE, returns STATUS.

```
#define msgFieldSetStyle            MakeMsg(clsField, 2)
```

Message Arguments

```
typedef struct FIELD_STYLE {
    U16 focusStyle:     2,          // How field does selection and target
        capOutput:      3,          // Upper case writer cap rules for xlate
        popUpType:      3,          // Insertion pad style for fipReplaceAll
        editType:       2,          // Type of editing in field
        xlateType:      1,          // 0=xlate object, 1=xtemplate
        clientValidate: 1,          // client performs validation
        clientPreValidate:    1,    // Notify client before validation
        clientPostValidate:   1,    // Notify client after successful valid
        clientNotifyInvalid:  1,    // Notify client when invalid
        clientNotifyReadOnly: 1;    // Notify client when attempt to modify
                                    // readonly field
    U16 clientNotifyModified: 1,    // Notify client when field modified
```

```
        validatePending:    1,    // Field not valid since last modification
        delayed:            1,    // Delayed translation field. Capture
                                  // strokes till msgFieldTranslateDelayed
        upperCase:          1,    // Field and IP forced to upper case
        noSpace:            1,    // Turn on no space in fld created xlate
        privateData1:       1,    // Internal use only
        veto:               1,    // Turn on veto in fld created xlate
        privateData2:       1,    // Internal use only
        boxMemory:          2,    // Enable box memory in field and IP
        dataMoveable:       1,
        dataCopyable:       1,
        reserved:           5;    // Reserved for future use
} FIELD_STYLE, *P_FIELD_STYLE;
```

Comments

If the field is active, will return **stsFailed**. Setting or clearing the delayed flag will cause changes in wm.flags necessary to implement delayed fields. Setting the **editType** to **fstOverWrite** will set label.style.**displayType** to **lsBoxTicks**. Will cancel any current delayed translation taking place and remove the scribbles in the field.

Return Value

stsFailed The field is currently being edited. This is either through the pen, or a pop up IP.

msgFieldGetXlate

Passes back the translator information for the field.

Takes P_UNKNOWN, returns STATUS.

```
#define msgFieldGetXlate            MakeMsg(clsField, 3)
```

Comments

If **xlateType** is 0, the parameter is assumed to be a P_OBJECT and the translator object id is returned. Otherwise the parameter is assumed to be a P_UNKNOWN and the COMPILED template is returned.

See Also

xtemplate.h.h

msgFieldSetXlate

Specifies the translator information for the field.

Takes P_UNKNOWN, returns STATUS.

```
#define msgFieldSetXlate            MakeMsg(clsField, 4)
```

Comments

If **xlateType** is 0, the argument is assumed to be P_OBJECT being a translator. The old translator is not destroyed. If **xlateType** is 1, the argument is assumed to be an uncompiled template (P_XTM_ARGS). The field code will compile the template and use it to create a translator. Any old compiled template will not be freed, and must be done so by a call to XTemplateFree() by the client. Calling on a delayed field will cancel the delayed field, destroying any scribbles captured by the field.

Return Value

stsFailed The field is currently being edited with the pen, or through an IP.

See Also

msgFieldCreateTranslator.h.h

msgFieldGetMaxLen

Passes back the maximum length allowed for input in the field.

Takes P_U16, returns STATUS.

```
#define msgFieldGetMaxLen           MakeMsg(clsField, 5)
```

msgFieldSetMaxLen

Sets the Maximum length for input in the field.

Takes P_U16, returns STATUS.

```
#define msgFieldSetMaxLen          MakeMsg(clsField, 6)
```

Comments

Sets the limit for the number of characters that are allowed in a field. If **maxLen** is 0, the **maxLen** is assumed to be a **maxU16**. However, it is not recommended that fields of that size be created. If the value is less than the old value, the value displayed in the field will be truncated to the new value during the next edit.

msgFieldSetCursorPosition

Sets the cursor position of the keyboard insertion point in the field.

Takes P_U16, returns STATUS.

```
#define msgFieldSetCursorPosition   MakeMsg(clsField, 7)
```

Comments

The cursor position will not be displayed unless the field has the input target. As a performance optimization, this message is not self-sent to set the cursor position.

msgFieldGetCursorPosition

Passes the current keyboard insertion cursor position in the field.

Takes P_U16, returns STATUS.

```
#define msgFieldGetCursorPosition   MakeMsg(clsField, 8)
```

Comments

If no cursor position has been set, 0 is returned. As a performance optimization, this message is not self-sent to inquire cursor position.

Insertion Pad Messages

msgFieldActivatePopUp

Called to cause an Insertion pad to be brought up for the field.

Takes P_FIELD_ACTIVATE_POPUP, returns STATUS.

```
#define msgFieldActivatePopUp          MakeMsg(clsField, 18)
```

Arguments

```
typedef struct {
    U16         type;
    P_RECT32    pRect;
    U32         reserved;
} FIELD_ACTIVATE_POPUP, * P_FIELD_ACTIVATE_POPUP;
```

Comments

If **msgFieldActivate** has not been called (due to pen input into the field) it will be called. Will bring the up the IP at the passed in **pRect** location. If NULL, the IP will be centered over the field. The type of IP will be passed to **msgFieldCreatePopUP**. Will return **stsFailed** if the pop-up is not valid given the type and state of the field. For example, an **fipInsert** on a filled to **maxLen** field will return **stsFailed**.

Return Value

stsFailed A popup up could not be created given the state of the field.

msgFieldAcceptPopUp

Causes the Insertion pad to be accepted.

Takes void, returns STATUS.

```
#define msgFieldAcceptPopUp              MakeMsg(clsField, 19)
```

Comments — Called when the user collapses the insertion pad by hitting the OK button or accepts the IP. Can be called programatically as well.

msgFieldCancelPopUp

Cancels the edit in the pop-up insertion pad.

Takes void, returns STATUS.

```
#define msgFieldCancelPopUp              MakeMsg(clsField, 20)
```

Comments — Causes the old value to be preserved unchanged. Called when the user hits the cancel button or cancels the IP. Can be called programatically as well.

msgFieldCreatePopUp

Creates and passes back the insertion pad when the pop up is invoked.

Takes P_FIELD_CREATE_POPUP, returns STATUS.

```
#define msgFieldCreatePopUp                MakeMsg(clsField, 27)
```

Arguments

```
typedef struct {
    U16     type;
    OBJECT  ip;
    U32 reserved;
} FIELD_CREATE_POPUP, * P_FIELD_CREATE_POPUP;
```

Comments — Will create the insertion pad for use in the field. If type is **fipReplaceAll**, will look at style.**popUpType** to determine the type of IP to create. If type is **fipInsert**, will look at the system preferences for writing style and create the appropriate type of Insertion pad. Will return **stsFailed** if the type is **fipInsert** and the field data length is equal to **maxLen**.

Return Value — **stsFailed** The pop-up could not be created for the field.

Delayed Field Messages

msgFieldTranslateDelayed

Translates a field with delayed captured strokes.

Takes NULL, returns STATUS.

```
#define msgFieldTranslateDelayed         MakeMsg(clsField, 25)
```

Comments — Causes translation to occur for a field that has style.delayed and has captured strokes pending translation. Returns **stsMessageIgnored** if style.delayed is not set, or if there is no pending translation.

Return Value — **stsMessageIgnore** The field did not have a delayed scribble to translate.

msgFieldGetDelayScribble

Returns the delayed scribble for delayed fields.

Takes P_OBJECT, returns STATUS.

```
#define msgFieldGetDelayScribble          MakeMsg(clsField, 26)
```

Return Value **stsMessageIgnore** The field did not have a delayed scribble to translate. Either not a delayed field or no scribbles in the field.

msgFieldSetDelayScribble

Puts the field in delayed mode with the given scribble.

Takes P_OBJECT, returns STATUS.

```
#define msgFieldSetDelayScribble    MakeMsg(clsField, 30)
```

Return Value **stsFailed** The field is currently being edited. This is either through the pen, an IP, or the field contains delayed strokes in delayed mode. Undefined behavior if called on a field with delayed scribbles.

Miscellaneous Messages

msgFieldClear

Clears the value of the field.

Takes NULL, returns STATUS.

```
#define msgFieldClear               MakeMsg(clsField, 29)
```

Comments Clears the delay scribble if one exists, otherwise clears the value of the field.

msgFieldReadOnly

Self called when an attempt is made to modify a read only field.

Takes self, returns STATUS.

```
#define msgFieldReadOnly                MakeMsg(clsField, 21)
```

Comments Will send **msgFieldReadOnly** to control.client if **clientNotifyReadOnly** is set. it exists.

msgFieldModified

Self called when a a field is modified.

Takes self, returns STATUS.

```
#define msgFieldModified                MakeMsg(clsField, 22)
```

Comments If the control.dirty bit is clear and the **clientNotifyModified** bit is set, will send **msgFieldModified** to control.client. Will set the control.dirty bit. It is the clients responsibility to clear this bit. Will also set the **validatePending** bit. This bit is cleared after successful validation.

msgFieldKeyboardActivate

Activates field for keyboard use.

Takes void, returns STATUS.

```
#define msgFieldKeyboardActivate        MakeMsg(clsField, 23)
```

Comments Called by client whenever the field is activated for use with the keyboard. Primarily useful for item managers that are dealing with keyboard navigation between fields.

msgFieldCreateTranslator

Self called to create a translator. Passes back the translator.

Takes P_OBJECT, returns STATUS.

```
#define msgFieldCreateTranslator        MakeMsg(clsField, 15)
```

Comments Used to create the translator based on the compiled template. Called when xlate.**xlateType** = 1 or when xlate.**xlateType** = 0 and xlate.translator = NULL to create the translator. Will create the translator and respect the style.**noSpace**, style.veto, and style.**capOutput** settings (for all caps writers). This translator will be destroyed when **msgFieldDeactivate** is called.

Validation Messages

msgFieldValidate

Peforms the validation protocall for a field.

Takes void, returns STATUS.

```
#define msgFieldValidate            MakeMsg(clsField, 9)
```

Comments Forces validation of a field. Called when the field loses the input target and **validatePending** is TRUE. Also called when translation is completed in a previouisly empty field. Returns non-error status for failed validation, or **stsOK** for a valid field.

- calls **msgFieldPreValidate** on client if field.style.**clientPreValidate**
- calls **msgFieldValidateEdit** on client or on self, depending on style.**clientValidate**
- calls **msgFieldNotifyInvalid** if **msgFieldValidateEdit** returns > **stsOK**
- calls **msgFieldPostValidate** on client if field.style.**clientPostValidate** and **msgFieldValidateEdit** returns **stsOK**
- calls **msgFieldFormat** to format the field if **msgFieldValidateEdit** returns **stsOK**.
- sets the **validatePending** bit to 0

See Also **msgFieldValidateEdit**

msgFieldPreValidate

Called on client if the field.style.**clientPreValidate** is set before validation.

Takes self, returns STATUS.

```
#define msgFieldPreValidate         MakeMsg(clsField, 10)
```

Comments Called on the control.client if **clientPreValidate** is set before validation. Allows clients to pre-process the value of a field before validation occurs.

msgFieldValidateEdit

Self call to perform validation on the field.

Takes P_FIELD_NOTIFY, returns STATUS.

```
#define msgFieldValidateEdit        MakeMsg(clsField, 11)
```

Message Arguments

```
typedef struct {
    MESSAGE         failureMessage; // Reason validation failed
    OBJECT          field;          // Field to validate
} FIELD_NOTIFY, *P_FIELD_NOTIFY;
```

Comments

Called on self if **clientValidate** is false, or on the client if **clientValidate** is set. Returns **stsOK** when successful. Puts a failure message in the **failureMessage** field of P_FIELD_NOTIFY if not successful, and returns a non-error return code. Default returns **stsOK**.

msgFieldNotifyInvalid

Called to notify a field was invalid.

Takes P_FIELD_NOTIFY, returns STATUS.

```
#define msgFieldNotifyInvalid       MakeMsg(clsField, 12)
```

Message Arguments

```
typedef struct {
    MESSAGE         failureMessage; // Reason validation failed
    OBJECT          field;          // Field to validate
} FIELD_NOTIFY, *P_FIELD_NOTIFY;
```

Comments

Called on client if fld.field.style.**notifyInvalid** bit is set and the **msgFieldValidateEdit** returns a > **stsOK** return code. Allows clients to post a failure message for validation.

msgFieldPostValidate

Self call to perform post-validation processing.

Takes self, returns STATUS.

```
#define msgFieldPostValidate        MakeMsg(clsField, 13)
```

Comments

Called on client if field.style.**clientPostValidate** is set. Only called if **msgFieldValidateEdit** returns **stsOK**. Allows client to perform post validation processing.

msgFieldFormat

Self call to perform formatting.

Takes void, returns STATUS.

```
#define msgFieldFormat              MakeMsg(clsField, 14)
```

Comments

Self called after validation to perform any formatted the field requires to display itself correctly. Intended to be overridden by clients to support field formatting. Only called when **msgFieldValidateEdit** returns **stsOK**.

Messages from other classes

msgFree

Defined in object.h.

Takes OBJ_KEY, returns STATUS.

Comments

Deactivates the field if necessary. Will free the translator if **xlateType** is 0 and a translator was handed to the field. Will free the compiled template if **xlateType** is 1. Inherits ancestor behavior.

See Also

object.h

msgSave

Defined in object.h.

Takes P_OBJ_SAVE, returns STATUS.

Comments — Inherits ancestor behavior first and then stores in the resource file all information about the current state of the field, including the translator or template information or the delayed strokes the field contains. Fields will not save any information about a current editing operation (through a pop-up, keyboard, or pen) in effect.

See Also — object.h

msgRestore

Defined in object.h.

Takes P_OBJ_RESTORE, returns STATUS.

Comments — Inherits ancestor information and restores all information about the field including translator information or the delayed strokes the field contains.

See Also — msgSave.h

msgIPDataAvailable

Defined in insert.h.

Takes OBJECT, returns STATUS.

Comments — Sent to the field from an insertion pad when there is data to retrieve from the pop-up pad. Depending on the operation that brought up the pad (an insert or edit gesture), will either insert the text from the pad at the current insertion point, or replace the value of the field with the IP value. Will destroy the pop-up pad created.

See Also — insert.h

msgIPCancelled

Defined in insert.h.

Takes OBJECT, returns STATUS.

Comments — Sent to the field when the insertion pad has been canceled. Will destroy the pad and any changes to the text in the pad are ignored.

See Also — insert.h

msgControlSetDirty

Defined in control.h.

Takes BOOLEAN, returns STATUS.

Comments — Inherits behavior from superclass. Will clear all character box memory stored for an overwrite field, allowing characters to be returned immediatly from the translator.

See Also — control.h

FONTLBOX.H

This file contains the API for **clsFontListBox.**

clsFontListBox inherits from **clsStringListBox.**

Provides a listbox that is based on the list of currently installed fonts.

```
#ifndef FONTLBOX_INCLUDED
#define FONTLBOX_INCLUDED

#include <strlbox.h>
```

```
#ifndef STRLBOX_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef struct {
    U16  prune : 16;  // FIM_PRUNE_CONTROL (see fontmgr.h)
    U16  spare : 16;  // reserved
} FONTLB_STYLE, *P_FONTLB_STYLE;
```

Default FONTLB_STYLE:

prune = **fimNoPruning** (see fontmgr.h)

---

msgNew

Creates a font list box window.

Takes P_FONTLB_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct {
    FONTLB_STYLE    style;      // overall style
    U32             spare;      // reserved
} FONTLB_NEW_ONLY, *P_FONTLB_NEW_ONLY;
#define fontListBoxNewFields    \
    stringListBoxNewFields      \
    FONTLB_NEW_ONLY             fontListBox;
typedef struct {
    fontListBoxNewFields
} FONTLB_NEW, *P_FONTLB_NEW;
```

Comments

In response to **msgNew**, **clsFontListBox** will set **pArgs**->listBox.**nEntries** to zero and then call ancestor. It will then use **msgFIMGetInstalledIdList** to get the list of fonts currently installed in the system. For each font, **clsFontListBox** will add an entry using **msgListBoxInsertEntry** that has 'freeEntry' set to **lbFreeDataDefault** and 'data' set to the IM_HANDLE of the font.

As a last step, the new **listBox** instance will be added as an observer of **theInstalledFonts.**

We recommend that clients set **pArgs**->listBox.style.filing = **lbFileMin** to avoid unexpected results after a font **listBox** has been restored. See the documentation for **msgRestore** below.

See Also

msgFIMGetInstalledIdList obtain the short IDs of all installed fonts.

msgNewDefaults

Initializes the FONTLB_NEW structure to default values.

Takes P_FONTLB_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct {
    fontListBoxNewFields
} FONTLB_NEW, *P_FONTLB_NEW;
```

Comments

Zeroes out **pArgs**->fontListBox and sets:

```
pArgs->stringListBox.style.role = slbRoleChoice01;
```

msgFontListBoxGetStyle

Gets the style of a font listbox.

Takes P_FONTLB_STYLE, returns STATUS.

```
#define msgFontListBoxGetStyle              MakeMsg(clsFontListBox, 1)
```

Message Arguments

```
typedef struct {
    U16  prune : 16;  // FIM_PRUNE_CONTROL (see fontmgr.h)
    U16  spare : 16;  // reserved
} FONTLB_STYLE, *P_FONTLB_STYLE;
```

Messages from Other Classes

msgFree

Sent as the last of three msgs to destroy an object.

Takes OBJ_KEY, returns STATUS.

Comments

The receiver will remove itself as an observer of **theInstalledFonts**.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsFontListBox responds by restoring its style values and resynchronizing its entries with respect to the list of installed fonts, as is done in **msgNew**. The restored instance is added as an observer of **theInstalledFonts**.

Note that this new information may differ from that which had been used the last time the **listBox** was saved, because the list of fonts installed in the system may have changed. Depending on how **clsListBox** filed its entry data, this may lead to odd behavior. The best approach is to use a LIST_BOX_STYLE.filing of **lbFileMin** so that **clsListBox** won't file any entry information or windows. Because after **msgRestore** the value obtained via **msgStrListBoxGetValue** may no longer match any entry, clients should use **msgStrListBoxSetValue** to change the value to a short ID from the new list of installed fonts.

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

clsFontListBox responds by writing out its style values.

msgStrListBoxGetValue

Passes back the value of a string listbox.

Takes P_U32, returns STATUS.

Comments **clsFontListBox** responds by calling ancestor, converting the resulting IM_HANDLE *pArgs into the FIM_SHORT_ID via **msgFIMGetId**, and setting *pArgs to this short id.

msgStrListBoxSetValue

Sets the value of a string listbox whose role is one of **slbRoleChoice***.

Takes U32, returns STATUS.

Comments **clsFontListBox** responds by converting the incoming **pArgs** from a FIM_SHORT_ID into the IM_HANDLE for the font (**msgFIMFindId**) and then calling ancestor with this new **pArgs**.

msgStrListBoxProvideString

This message requests the client (or subclass) to provide a string.

Takes P_STRLB_PROVIDE, returns STATUS. Category: self-sent/client responsibility.

Comments **clsFontListBox** first checks whether **pArgs**->position is >= the number of fonts described by its cached information. If so, **clsFontListBox** returns **stsFailed**.

Otherwise, **clsFontListBox** fills out **pArgs**->pString with the font name (obtained by using **msgIMGetName** and the IM_HANDLE **pArgs**->data) and returns **stsOK**.

Return Value **stsFailed** pArgs->position >= number of fonts

msgIMInstalled

A new item was installed.

Takes P_IM_NOTIFY, returns STATUS. Category: observer notification.

Comments **clsFontListBox** responds by resynchronizing its entries with respect to the list of installed fonts, as is done in **msgNew**.

msgIMDeinstalled

An item has been deinstalled.

Takes P_IM_DEINSTALL_NOTIFY, returns STATUS. Category: observer notification.

Comments **clsFontListBox** responds by resynchronizing its entries with respect to the list of installed fonts, as is done in **msgNew**.

FRAME.H

This file contains the API definition for **clsFrame**.

clsFrame inherits from **clsShadow**.

Frames support a single client window, surrounded by a host of optional "decorations" -- title bar, menu bar, close box, tab bar, command bar, etc.

```
#ifndef FRAME_INCLUDED
#define FRAME_INCLUDED

#include <shadow.h>
```

```
#ifndef SHADOW_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT  FRAME;
typedef struct FRAME_STYLE {
    U16 titleBar        : 1,    // show/don't show decoration
        menuBar         : 1,    //      "
        closeBox        : 1,    //      "
        cmdBar          : 1,    //      "
        tabBar          : 1,    //      "
        pageNum         : 1,    //      "
        zoomable        : 1,    // true => zoom is allowed
        clipBoard       : 1,    // true => look like a clip board
        maskTitleLine   : 1,    // mask out the closeBox, titleBar, pageNum
        maskMenuLine    : 1,    // mask out the menuBar
        maskAll         : 1,    // mask out title, menu and cmd lines
        maskCmdLine     : 1,    // mask out the cmdBar
        useAltVisuals   : 1,    // use alternate border visuals
        spare1          : 3;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} FRAME_STYLE, *P_FRAME_STYLE;
```

Default FRAME_STYLE:

```
    titleBar            = true
    menuBar             = false
    closeBox            = true
    cmdBar              = false
    tabBar              = false
    pageNum             = false
    zoomable            = true
    clipBoard           = false
    maskTitleLine       = false
    maskMenuLine        = false
    maskAll             = false
    useAltVisuals       = false
```

for **msgFrameZoomOK**, **msgFrameZoomed**

```
typedef struct FRAME_ZOOM {
    FRAME       frame;      // in: Frame to zoom.
    BOOLEAN     up;         // in: True=zoom up, False=zoom down
    WIN         toWin;      // out: Window to zoom to
    U32         spare;      // unused (reserved)
} FRAME_ZOOM, *P_FRAME_ZOOM;
```

Messages

msgNew

Creates a frame window. Passes back the resulting FRAME_METRICS in **pArgs**->frame.

Takes P_FRAME_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct FRAME_NEW_ONLY {
    FRAME_STYLE     style;
    WIN             clientWin;
    WIN             titleBar;
    WIN             menuBar;
    WIN             closeBox;
    WIN             cmdBar;
    P_CHAR          pTitle;         // in only for msgNew
    OBJECT          client;
    WIN             tabBar;
    WIN             pageNum;        // page number
    U32             spare1;         // unused (reserved)
    U32             spare2;         // unused (reserved)
} FRAME_NEW_ONLY, *P_FRAME_NEW_ONLY,
  FRAME_METRICS, *P_FRAME_METRICS;
#define frameNewFields  \
    shadowNewFields     \
    FRAME_NEW_ONLY      frame;
typedef struct FRAME_NEW {
    frameNewFields
} FRAME_NEW, *P_FRAME_NEW;
```

Comments

clsFrame creates an instance of **clsFrameBorder** as the frame's border window to be the parent of all of the frame decorations (except the **tabBar**, which is a direct child of the frame). The border window is inserted as a child of the frame.

If **pArgs**->frame.style.**clipBoard** is true, the frame is made opaque and many of the border.style values are changed to produce a clipboard style look.

For each of the decoration visibility style bits (e.g. style.**titleBar**), the following is done:

If the style value is true, and the corresponding decoration window (e.g..**titleBar**) is not **objNull**, the window provided is inserted aschild of the frame border window.

If the style value is true and no window is provided (e.g. **titleBar objNull**), a default instance of the decoration is created (e.g. **msgNew clsTitleBar**) and inserted as a child of the frame border window.

If the style value is false, the provided decoration window is rememberedused when the style value is set to true.

If style.**menuBar** is true, the border style of the **menuBar** is altered to have a bottom edge with thickness **bsThicknessDouble** and **borderInk bsInkGray66**.

If style.**titleBar** is true, the border style of the **titleBar** is altered to have a bottom edge with thickness **bsThicknessDouble** (if style.**menuBar** is false) or **bsThicknessSingle** (if style.**menuBar** is true) and **borderInk bsInkGray66**.

If style.**closeBox** is true, the border style of the **closeBox** is altered to match that of the **titleBar**.

If style.**cmdBar** is true and style.**clipBoard** is false, the border style of the **cmdBar** is altered to have a top edge with thickness **bsThicknessDouble** and **borderInk bsInkGray33**.

If style.**maskTitleLine** is true, style.**closeBox**, style.**titleBar** and style.**pageNum** are all treated as though they are false.

If style.**maskMenuLine** is true, style.**menuBar** is treated as though it is false.

If style.**maskCmdLine** is true, style.**cmdBar** is treated as though it is false.

If style.**maskAll** is true, style.**maskTitleLine**, style.**maskMenuLine**, and style.**maskCmdLine** are all is treated as though they are true.

msgNewDefaults

Initializes the FRAME_NEW structure to default values.

Takes P_FRAME_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct FRAME_NEW {
    frameNewFields
} FRAME_NEW, *P_FRAME_NEW;
```

Comments

Zeroes out **pArgs**->frame and sets

```
pArgs->win.flags.style &= ~wsParentClip;
pArgs->win.flags.style |= wsClipChildren | wsClipSiblings;
pArgs->embeddedWin.style.selection = ewSelect;
pArgs->frame.style.titleBar = true;
pArgs->frame.style.closeBox = true;
pArgs->frame.style.zoomable = true;
```

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

If the client of the frame is OSThisAPP(), this is remembered and reinstated in **msgRestore**. In any case, the client is not saved.

Each of the frame decorations, including the **clientWin**, with WIN_METRICS.flags.style.**wsSendFile** on is filed, even if the corresponding visibility style bit (e.g. style.**titleBar**) is false.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsFrame restores the instance from the file. If the client of the frame was OSThisApp() when filed, the client is set to OSThisApp(), otherwise **objNull**.

Each of the filed decoration windows and the **clientWin** are restored. If the frame was zoomed when filed, the frame is unzoomed as in **msgFrameZoom**(false).

For each of the following, if the corresponding child windows were not filed (i.e. **wsSendFile** was not on), and the visibility style is on, default instances will not be created and the visibility style will be set to false: **menuBar**, **cmdBar**, and **tabBar**. For example, if the frame was filed with style.**menuBar** true and the **menuBar** did not have **wsSendFile** on, the restored frame will have style.**menuBar** false, and the **menuBar** in FRAME_METRICS set to **objNull**.

msgFree

Sent as the last of three msgs to destroy an object.

Takes OBJ_KEY, returns STATUS.

Comments

All children of the frame border window are destroyed. Decoration windows with visibility style bits off are also destroyed.

msgFrameGetMetrics

Passes back the metrics.

Takes P_FRAME_METRICS, returns STATUS.

```
#define msgFrameGetMetrics      MakeMsg(clsFrame, 1)
```

msgFrameSetMetrics

Sets the metrics.

Takes P_FRAME_METRICS, returns STATUS.

```
#define msgFrameSetMetrics      MakeMsg(clsFrame, 2)
```

Comments

clsFrame replaces existing decoration windows with those provided. For example, if **pArgs**->titleBar specifies a new **titleBar**, the existing **titleBar** is extracted from the window tree and the new **titleBar** inserted as a child of the frame border window.

Note that the old decoration windows are not destroyed and are no longer referenced by the frame (the client is free to destroy them at this point).

Frame style values are changed as in **msgFrameSetStyle**.

msgFrameGetStyle

Passes back the current style values.

Takes P_FRAME_STYLE, returns STATUS.

```
#define msgFrameGetStyle        MakeMsg(clsFrame, 22)
```

Message Arguments

```
typedef struct FRAME_STYLE {
    U16 titleBar        : 1,    // show/don't show decoration
        menuBar         : 1,    //      "
        closeBox        : 1,    //      "
        cmdBar          : 1,    //      "
        tabBar          : 1,    //      "
        pageNum         : 1,    //      "
        zoomable        : 1,    // true => zoom is allowed
        clipBoard       : 1,    // true => look like a clip board
        maskTitleLine   : 1,    // mask out the closeBox, titleBar, pageNum
        maskMenuLine    : 1,    // mask out the menuBar
        maskAll         : 1,    // mask out title, menu and cmd lines
        maskCmdLine     : 1,    // mask out the cmdBar
        useAltVisuals   : 1,    // use alternate border visuals
        spare1          : 3;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} FRAME_STYLE, *P_FRAME_STYLE;
```

msgFrameSetStyle

Sets the style.

Takes P_FRAME_STYLE, returns STATUS.

```
#define msgFrameSetStyle        MakeMsg(clsFrame, 23)
```

Message Arguments

```
typedef struct FRAME_STYLE {
    U16 titleBar        : 1,    // show/don't show decoration
        menuBar         : 1,    //      "
        closeBox        : 1,    //      "
        cmdBar          : 1,    //      "
        tabBar          : 1,    //      "
        pageNum         : 1,    //      "
        zoomable        : 1,    // true => zoom is allowed
        clipBoard       : 1,    // true => look like a clip board
        maskTitleLine   : 1,    // mask out the closeBox, titleBar, pageNum
        maskMenuLine    : 1,    // mask out the menuBar
        maskAll         : 1,    // mask out title, menu and cmd lines
        maskCmdLine     : 1,    // mask out the cmdBar
        useAltVisuals   : 1,    // use alternate border visuals
        spare1          : 3;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} FRAME_STYLE, *P_FRAME_STYLE;
```

Comments

The new decoration visibility style bits (e.g. style.**titleBar**) are treated as in **msgNew**. Setting a visibility bit to false results in extracting the corresponding decoration window (e.g. metrics.**titleBar**) from the frame border window. Note that the extracted decoration window is not destroyed; but remembered for later use when the visibility bit is set to true.

If style.**useAltVisuals** is changed from false to true, the alternate frame border visuals are applied to the frame's border style.

If style.**useAltVisuals** is changed from true to false, the normal frame border visuals are applied to the frame's border style.

Note that changing style.**clipBoard** is not implemented.

msgFrameGetClientWin

Passes back metrics.**clientWin**.

Takes P_WIN, returns STATUS.

```
#define msgFrameGetClientWin    MakeMsg(clsFrame, 24)
```

msgFrameSetClientWin

Sets metrics.**clientWin**.

Takes WIN, returns STATUS.

```
#define msgFrameSetClientWin    MakeMsg(clsFrame, 25)
```

Comments

The old **clientWin**, if any, is not destroyed and is no longer referenced by the frame.

msgFrameGetMenuBar

Passes back metrics.**menuBar**.

Takes P_WIN, returns STATUS.

```
#define msgFrameGetMenuBar  MakeMsg(clsFrame, 26)
```

msgFrameSetMenuBar

Sets metrics.**menuBar**; also sets style.**menuBar** to true if **pArgs** is not **objNull**, else false.

Takes WIN, returns STATUS.

```
#define msgFrameSetMenuBar  MakeMsg(clsFrame, 27)
```

Comments

The **menuBar** is changed as in **msgFrameSetMetrics**.

msgFrameDestroyMenuBar

Sets style.**menuBar** to false and destroys the existing menu bar, if any.

Takes VOID, returns STATUS.

```
#define msgFrameDestroyMenuBar  MakeMsg(clsFrame, 28)
```

msgFrameSetTitle

Sets the string in the metrics.**titleBar**.

Takes P_CHAR, returns STATUS.

```
#define msgFrameSetTitle        MakeMsg(clsFrame, 3)
```

Comments

This results in **msgLabelSetString** to metrics.**titleBar**.

msgFrameGetClient

Passes back metrics.client.

Takes P_OBJECT, returns STATUS.

```
#define msgFrameGetClient       MakeMsg(clsFrame, 4)
```

msgFrameSetClient

Sets metrics.client.

Takes OBJECT, returns STATUS.

```
#define msgFrameSetClient       MakeMsg(clsFrame, 5)
```

msgFrameGetAltVisuals

Passes back the alternate border visuals.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgFrameGetAltVisuals       MakeMsg(clsFrame, 29)
```

msgFrameSetAltVisuals

Sets the alternate border visuals.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgFrameSetAltVisuals       MakeMsg(clsFrame, 30)
```

Comments

If style.**useAltVisuals** is true, the new alternate visuals are applied to the frame's border style.

msgFrameGetNormalVisuals

Passes back the normal border visuals.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgFrameGetNormalVisuals        MakeMsg(clsFrame, 31)
```

Comments This is equivalent to **msgBorderGetStyle** if style.**useAltVisuals** is false.

msgFrameSetNormalVisuals

Sets the normal border visuals.

Takes P_BORDER_STYLE, returns STATUS.

```
#define msgFrameSetNormalVisuals        MakeMsg(clsFrame, 32)
```

Comments If style.**useAltVisuals** is false, the new normal visuals are applied to the frame's border style.

msgFrameShowSelected

Makes the frame look selected or not.

Takes BOOLEAN, returns STATUS.

```
#define msgFrameShowSelected    MakeMsg(clsFrame, 17)
```

msgFrameMoveEnable

Enables or disables UI for moving.

Takes BOOLEAN, returns STATUS.

```
#define msgFrameMoveEnable      MakeMsg(clsFrame, 19)
```

Comments **clsFrame** alters the border.style.drag of the metrics.**titleBar** to be **bsDragHoldDown** if **pArgs** is true, **bsDragNone** otherwise.

msgFrameResizeEnable

Enables or disables UI for resizing.

Takes BOOLEAN, returns STATUS.

```
#define msgFrameResizeEnable    MakeMsg(clsFrame, 20)
```

Comments **clsFrame** alters the border.style.resize of self to be **bsResizeCorner** if **pArgs** is true, **bsResizeNone** otherwise.

msgFrameIsZoomed

Passes back true if the frame is currently zoomed.

Takes P_BOOLEAN, returns STATUS.

```
#define msgFrameIsZoomed        MakeMsg(clsFrame, 21)
```

msgFrameDelete

Asks the frame's client to delete the frame.

Takes nothing, returns STATUS.

```
#define msgFrameDelete          MakeMsg(clsFrame, 7)
```

clsFrame forwards this message to the client with self as the **pArgs.**

msgFrameClose

Asks the frame's client to close the frame.

Takes nothing, returns STATUS.

```
#define msgFrameClose           MakeMsg(clsFrame, 8)
```

clsFrame forwards this message to the client with self as the **pArgs**.

msgFrameFloat

Asks the frame's client to float the frame.

Takes VOID, returns STATUS.

```
#define msgFrameFloat           MakeMsg(clsFrame, 9)
```

clsFrame forwards this message to the client with self as the **pArgs**.

msgFrameZoom

Zooms the frame up or down.

Takes BOOLEAN, returns STATUS.

```
#define msgFrameZoom            MakeMsg(clsFrame, 6)
```

Comments

If style.zoomable is false, nothing is done and **stsOK** is returned.

Otherwise, **msgFrameZoomOK** is sent to the client with the following FRAME_ZOOM parameters:

```
frame   = self;
up      = pArgs;
toWin   = objNull;
```

If the client returns **stsRequestDenied** or does not set the FRAME_ZOOM.**toWin**, the client's status is returned.

If the frame is already zoomed as **pArgs** requests, nothing is done and **stsOK** is returned.

If **pArgs** is true and style.**clipBoard** is false, the frame is zoomed up as follows:

- The frame is made opaque by turning off **wsTransparent** in WIN_METRICS.flags.style and turning off **inputTransparent** in WIN_METRICS.flags.input.
- The border edges, shadow, margin and resize handles on the frame are all turned off.
- The current frame window bounds and parent are remembered for restoration in unzoom.
- The frame is extracted from its current parent and inserted as a child of the FRAME_ZOOM.**toWin** with a window bounds computed to zoom the inner rect of the frame into the FRAME_ZOOM.**toWin**. The inner rect is computed using **msgBorderGetOuterOffsets** on the frame.

If **pArgs** is false and style.**clipBoard** is false, the frame is zoomed down as follows:

- The frame is made transparent by turning on **wsTransparent** in WIN_METRICS.flags.style and turning on **inputTransparent** in WIN_METRICS.flags.input.
- The border edges, shadow, margin and resize handles on the frame are all restored to their values before the zoom.
- The frame is extracted from its current parent and inserted in its original parent with its original window bounds.

After the frame is zoomed/unzoomed it is layed out via **msgWinLayout** to self.

clsFrame then sends the following notifications of the zoom/unzoom:

- self-send **msgFrameZoomed** with the FRAME_ZOOM as **pArgs**.
- msgFrameZoomed to its client with the FRAME_ZOOM as **pArgs**.
- self-sends **msgNotifyObservers** with the following OBJ_NOTIFY_OBSERVERS parameters:

```
msg     = msgFrameZoomed;
pArgs   = address of FRAME_ZOOM used to zoom/unzoom;
lenSend = sizeof(FRAME_ZOOM);
```


msgFrameSelect

Selects the frame.

Takes VOID, returns STATUS.

```
#define msgFrameSelect          MakeMsg(clsFrame, 18)
```

msgFrameSelectOK(self) is sent to the client.

msgFrameZoomOK

Sent to the client when **msgFrameZoom** is received.

Takes P_FRAME_ZOOM, returns STATUS. Category: client notification.

```
#define msgFrameZoomOK          MakeMsg(clsFrame, 11)
```

Message Arguments

```
typedef struct FRAME_ZOOM {
    FRAME       frame;      // in: Frame to zoom.
    BOOLEAN     up;         // in: True=zoom up, False=zoom down
    WIN         toWin;      // out: Window to zoom to
    U32         spare;      // unused (reserved)
} FRAME_ZOOM, *P_FRAME_ZOOM;
```

msgFrameSelectOK

Sent to the client when **msgFrameSelect** is received.

Takes FRAME, returns STATUS. Category: client notification.

```
#define msgFrameSelectOK        MakeMsg(clsFrame, 16)
```

The client should alter the frame to look selected.

msgFrameZoomed

Sent to client and observers after frame is zoomed.

Takes P_FRAME_ZOOM, returns STATUS. Category: client & observer notification.

```
#define msgFrameZoomed          MakeMsg(clsFrame, 12)
```

Message Arguments

```
typedef struct FRAME_ZOOM {
    FRAME       frame;      // in: Frame to zoom.
    BOOLEAN     up;         // in: True=zoom up, False=zoom down
    WIN         toWin;      // out: Window to zoom to
    U32         spare;      // unused (reserved)
} FRAME_ZOOM, *P_FRAME_ZOOM;
```

msgFrameClosed

Sent to client and observers after frame is closed. **pArgs** is the frame.

Takes WIN, returns STATUS. Category: client & observer notification.

```
#define msgFrameClosed          MakeMsg(clsFrame, 13)
```

Comments

Note: not implemented.

msgFrameFloated

Sent to client and observers after frame is floated.

Takes VOID, returns STATUS. Category: client & observer notification.

```
#define msgFrameFloated         MakeMsg(clsFrame, 14)
```

Comments

Note: not implemented.

msgFrameTopped

Sent to client and observers after frame is brought to top.

Takes VOID, returns STATUS. Category: client & observer notification.

```
#define msgFrameTopped          MakeMsg(clsFrame, 15)
```

Comments

Note: not implemented.

Messages from Other Classes

msgGWinForwardedGesture:

Called to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

clsFrame maps certain gestures forwarded from the frame's **titleBar** into self-sent messages. Other gestures are forwarded to the frame's client.

If the **pArgs**->uid is not metrics.**titleBar** or a direct child of metrics.**titleBar**, **msgGWinForwardedGesture(pArgs)** will be sent to the frame's client. **clsFrame** will return the client's return status from this message.

The value of **pArgs**->msg is processed as follows:

- If **xgsFlickUp/Down** and the system preference with tag **tagPrDocZooming** is **prDocZoomingOn**, **msgFrameZoom**(true/false) is self-sent.
- If **xgsCross**, **msgFrameDelete(pNull)** is self-sent.
- If **xgsPlus**, **msgFrameSelect(pNull)** is self-sent.
- If xgs2Tap, **msgFrameFloat(pNull)** is self-sent.
- If xgs3Tap, the frame's WIN_METRICS.flags.style.**wsMaskWrapWidth/Height** flags are cleared and **msgWinLayout**(WIN_METRICS.options=wsLayoutDefault) is self-sent. This results in a re-layout to the frame's desired size.

- If **xgsTrplFlickUp** and the DEBUG version of tk.dll is installed, **msgWinDumpTree** is self-sent with **pArgs** of self or **theRootWindow** if the '!' debug flag has value 1. Note that **msgWinDumpTree** requires the debug version of win.dll to be installed. This is usefull for debugging window layout problems.
- All other gestures result in **msgGWinForwardedGesture(pArgs)** to the frame's client.

msgTrackProvideMetrics

Sent to a tracker client before tracker is created.

Takes P_TRACK_METRICS, returns STATUS. Category: third-party notification.

Comments

If **pArgs**->minWH and **pArgs**->maxWH allow the width to change, **pArgs**->minWH.w is set to a small value to prevent the frame from being resized to zero.

If **pArgs**->minWH and **pArgs**->maxWH allow the height to change, **pArgs**->minWH.h is set to prevent the frame from being resized smaller than the sum of the metrics.**titleBar** and metrics.**menuBar** heights.

The value of **pArgs**->style.draw is altered to present the proper visual given the frame's style.**tabBar** and style.**cmdBar**.

msgTrackProvideMetrics(pArgs) is sent to the frame's client.

msgWinSetFlags

Sets the window flags.

Takes P_WIN_METRICS, returns STATUS.

Comments

clsFrame alters the metric.**clientWin**'s window flags to match the **wsShrinkWrapWidth/Height** flags of the frame.

msgCstmLayoutGetChildSpec

Passes back the current spec for the specified child.

Takes P_CSTM_LAYOUT_CHILD_SPEC, returns STATUS. Category: self-sent.

Comments

clsFrame responds by providing the custom layout constraints for metrics.**tabBar**, metrics.**cmdBar**, and the frame's border window.

Note that the decoration windows and the metrics.**clientWin** are actually children of the frame's border window, which is an instance of **clsFrameBorder**. **clsFrameBorder** responds to **msgCstLayoutGetChildSpec** by providing the custom layout constraints for its children (e.g. **titleBar** at the top, **menuBar** below **titleBar**, etc.).

msgWinSend

Sends a message up a window ancestry chain.

Takes WIN_SEND, returns STATUS.

Comments

If **pArgs**->msg is **msgBorderProvideDeltaWin** and the frame is zoomed, **clsFrame** returns **stsOK**. This prevents a zoomed frame from being resized.

GRABBOX.H

This file contains the API definition for **clsGrabBox**.

clsGrabBox inherits from **clsObject**.

Provides popup grab handles; uses **clsTrack** internally.

GrabBoxes are used primarily by **clsBorder** to display resize handles, although other uses are possible.

```
#ifndef GRABBOX_INCLUDED
#define GRABBOX_INCLUDED

#include <clsmgr.h>


#include <sysgraf.h>
```

```
#ifndef CLSMGR_INCLUDED

#endif
#ifndef SYSGRAF_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT          GRAB_BOX;
```

Type styles

```
#define gbTypeResize    0   // resize
//                      1   // unused (reserved)
//                      ...
//                      3   // unused (reserved)
```

Locations styles

```
#define gbLocULCorner       0   // upper-left corner
#define gbLocURCorner       1   // upper-right corner
#define gbLocLRCorner       2   // lower-right corner
#define gbLocLLCorner       3   // lower-left corner
#define gbLocLeftEdge       4   // left edge
#define gbLocRightEdge      5   // right edge
#define gbLocBottomEdge     6   // bottom edge
#define gbLocTopEdge        7   // top edge
#define gbLocNone           8   // no edge
typedef struct GRAB_BOX_STYLE {
    U16 type            : 2,    // type of grab box
        loc             : 4,    // location of grab box
        autoDestroy     : 1,    // destroy self on take down
        autoTakeDown    : 1,    // take down if pen is outside grab box
        spare           : 8;    // unused (reserved)
} GRAB_BOX_STYLE, *P_GRAB_BOX_STYLE;
```

Default GRAB_BOX_STYLE:

```
type            = gbTypeResize
loc             = gbLocULCorner
autoDestroy     = true
autoTakeDown    = true
```

```
typedef struct GRAB_BOX_INFO {
    WIN     win;            // window over which grab box will be drawn
    U16     thickness;      // thickness of visible grab area, in twips
    U16     length;         // length of visible grab area, in twips
    RECT32  outerMargin;    // thickness of invisible grab area, in twips
    BOOLEAN includeOuter;   // true to include invisible area
    BOOLEAN penIsDown;      // true if pen is down (for msgGrabBoxShow)
    XY32    downXY;         // xy on pen down in win space (for msgGrabBoxShow)
    U16     visualInset;    // amount to inset length for visual, in twips
    U16     cornerRadius;   // radius for round corners (zero for square), in twips
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} GRAB_BOX_INFO, *P_GRAB_BOX_INFO;
```

msgNew

Creates a grab box object.

Takes P_GRAB_BOX_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct GRAB_BOX_NEW_ONLY {
    GRAB_BOX_STYLE      style;      // overall style
    WIN                 client;     // window to grab
    XY32                xy;         // unused
    WIN                 xyWin;      // unused
    U8                  margin;     // unused
    U32                 spare;      // unused (reserved)
} GRAB_BOX_NEW_ONLY, *P_GRAB_BOX_NEW_ONLY,
  GRAB_BOX_METRICS, *P_GRAB_BOX_METRICS;
#define grabBoxNewFields    \
    objectNewFields         \
    GRAB_BOX_NEW_ONLY       grabBox;
typedef struct {
    grabBoxNewFields
} GRAB_BOX_NEW, *P_GRAB_BOX_NEW;
```

msgNewDefaults

Initializes the GRAB_BOX_NEW structure to default values.

Takes P_GRAB_BOX_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct {
    grabBoxNewFields
} GRAB_BOX_NEW, *P_GRAB_BOX_NEW;
```

Comments

Zeroes out pArgs->grabBox and sets

```
pArgs->grabBox.style.autoDestroy    = true;
pArgs->grabBox.style.autoTakeDown   = true;
```

msgGrabBoxGetStyle

Passes back current style values.

Takes P_GRAB_BOX_STYLE, returns STATUS.

```
#define msgGrabBoxGetStyle      MakeMsg(clsGrabBox, 1)
```

Message Arguments

```
typedef struct GRAB_BOX_STYLE {
    U16 type            : 2,    // type of grab box
        loc             : 4,    // location of grab box
        autoDestroy     : 1,    // destroy self on take down
        autoTakeDown    : 1,    // take down if pen is outside grab box
        spare           : 8;    // unused (reserved)
} GRAB_BOX_STYLE, *P_GRAB_BOX_STYLE;
```

msgGrabBoxSetStyle

Sets style values.

Takes P_GRAB_BOX_STYLE, returns STATUS.

```
#define msgGrabBoxSetStyle      MakeMsg(clsGrabBox, 2)
```

Message Arguments

```
typedef struct GRAB_BOX_STYLE {
    U16 type            : 2,    // type of grab box
        loc             : 4,    // location of grab box
        autoDestroy     : 1,    // destroy self on take down
        autoTakeDown    : 1,    // take down if pen is outside grab box
        spare           : 8;    // unused (reserved)
} GRAB_BOX_STYLE, *P_GRAB_BOX_STYLE;
```

Comments

Note that changing style.loc or style.type while the grab box is being shown is not supported.

msgGrabBoxGetMetrics

Passes back current metrics.

Takes P_GRAB_BOX_METRICS, returns STATUS.

```
#define msgGrabBoxGetMetrics    MakeMsg(clsGrabBox, 3)
```

msgGrabBoxSetMetrics

Sets metrics.

Takes P_GRAB_BOX_METRICS, returns STATUS.

```
#define msgGrabBoxSetMetrics    MakeMsg(clsGrabBox, 4)
```

Comments

Sets the style as in **msgGrabBoxSetStyle**.

msgGrabBoxShow

Puts up or takes down the grab box.

Takes P_GRAB_BOX_INFO, returns STATUS.

```
#define msgGrabBoxShow          MakeMsg(clsGrabBox, 5)
```

Message Arguments

```
typedef struct GRAB_BOX_INFO {
    WIN     win;            // window over which grab box will be drawn
    U16     thickness;      // thickness of visible grab area, in twips
    U16     length;         // length of visible grab area, in twips
    RECT32  outerMargin;    // thickness of invisible grab area, in twips
    BOOLEAN includeOuter;   // true to include invisible area
    BOOLEAN penIsDown;      // true if pen is down (for msgGrabBoxShow)
    XY32    downXY;         // xy on pen down in win space (for msgGrabBoxShow)
    U16     visualInset;    // amount to inset length for visual, in twips
    U16     cornerRadius;   // radius for round corners (zero for square), in twips
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} GRAB_BOX_INFO, *P_GRAB_BOX_INFO;
```

Comments

If **pArgs** is not **pNull**, **clsGrabBox** will grab input using InputSetGrab() and paint the grab box. If style.**autoTakeDown** is true, the grab box will be taken down when the pen leaves proximity or moves out of the grab box with the pen up.

If **pArgs** is **pNull**, **clsGrabBox** will take down the grab box and self-send **msgDestroy**(**pNull**) if style.**autoDestroy** is true.

The area on which the grab box was drawn will be damaged with **msgWinDirtyRect** when the grab box is taken down.

The grab box is drawn in the rectangle computed by GrabBoxLocToRect().

Public Functions

GrabBoxIntersect

Determines where **pRect** is in win. Returns a grab box location, e.g. **gbLocLRCorner**.

Returns U16.

Function Prototype

```
U16 EXPORTED GrabBoxIntersect(
    P_GRAB_BOX_INFO pInfo,  // info about grab box locations
    P_RECT32        pRect   // Rect to intersect
);
```

Comments

pRect->origin is commonly the coordinate of an event in **pInfo**->win's space, in device units.

pInfo->thickness is the thickness (in twips) of the visible grab-sensitive area within **pInfo**->win.

pInfo->outerMargin is the thickness (in twips) of the invisible grab-sensitive area within **pInfo**->win.
pInfo->outerMargin.{origin.x, size.w} are margins for the left and right, respectively.
pInfo->outerMargin.{origin.y, size.h} are margins for the bottom and top, respectively.

pInfo->length is the length of each grab-sensitive area, in twips.

If **pInfo**->includeOuter is true, the outer margin area is included in the rect for each grab box.

This is used by **clsBorder** to place a grab box over the resize handles.

GrabBoxLocToRect

Computes the rectangle of the **grabBox** at the given location.

Returns void.

Function Prototype

```
void EXPORTED GrabBoxLocToRect(
    P_GRAB_BOX_INFO pInfo,      // info about grab box locations
    U16             location,   // e.g. gbLocBottom
    P_RECT32        pRect       // Rect to locate
);
```

Comments

pInfo is as described in GrabBoxIntersect().

The corresponding rect for location is returned in **pRect**, in device units.

GrabBoxPaint

Paints the grab box at the specified location.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED GrabBoxPaint(
    P_GRAB_BOX_INFO pInfo,
    U16             loc,
    SYSDC           dc,
    P_RECT32        pRect,
    BOOLEAN         clearOuter,
    BOOLEAN         on
);
```

Comments

pInfo is as described in GrabBoxIntersect().

If dc is not **objNull**, it will be used for the painting.

If **pRect** is **pNull**, the corresponding rect for location will be used; otherwise **pRect** will be used.

If **clearOuter** is true, all of **pRect** will be cleared before painting.

If on is true, the grab box will be painted in black, otherwise gray66.

This is used by **clsBorder** to paint the resize handles.

Messages from other classes

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments

clsGrabBox will respond to input events that trigger resizing.

If **pArgs**->devCode is **msgPenUp**, **msgPenOutProxUp**, **msgPenOutProxDown**, or **msgPenMoveUp** and **pArgs**->xy is not in the rectangle of the grab box and style.**autoTakeDown** is true or **msgPenDown** has been received, the grab box is taken down as in **msgGrabBoxShow**(false).

If **pArgs**->devCode is **msgPenDown** the following is done:

msgTrackProvideMetrics is sent to metrics.client with the following_METRICS parameters:

msgNewDefaults is sent to **clsTrack** to initialize a TRACK_METRICS struct and then:

```
style.track      = tsTrackResize;
style.anchor     = computed from self's style.loc;
win              = parent of metrics.client;
client           = self;
clientData       = window to be resized;
initRect         = bounds of metrics.client;
minWH            = small rectangle;
maxWH            = limited to stay within parent of metrics.client
tag              = tagBorderResize;
```

If style.loc is **gbLocLeftEdge** or **gbLocRightEdge**, **maxWH** is altered toto horizontal resize.

If style.loc is **gbLocBottomEdge** or **gbLocTopEdge**, **maxWH** is altered toto vertical resize.

An instance of **clsTrack** is created and started via **msgTrackStart.**

msgTrackDone

Sent by a tracker when it's done.

Takes P_TRACK_METRICS, returns STATUS. Category: client notification.

Comments

clsGrabBox responds by resizing metrics.client to **pArgs**->rect.size.

If the width/height is changed, **wsMaskWrapWidth/Height** will be turned on in WIN_METRICS.flags.style for metrics.client.

The client window is resized by sending **msgWinLayout** with the following WIN_METRICS parameters:

options = 0;

bounds = **pArgs**->rect;

If style.**autoDestroy** is true, **msgDestroy**(**pNull**) is self-posted.

ICHOICE.H

This file contains the API for **clsIconChoice.**

clsIconChoice inherits from **clsChoice.**

IconChoices are exclusive choices with icon buttons and boxed-style previewing/on feedback.

See the documentation for **msgTkTableChildDefaults** below.

```
#ifndef ICHOICE_INCLUDED
#define ICHOICE_INCLUDED

#include <choice.h>

#include <icon.h>
```

```
#ifndef CHOICE_INCLUDED

#endif
#ifndef ICON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT ICON_CHOICE;
typedef struct ICON_CHOICE_STYLE {
    U16 spare   : 16;  // unused (reserved)
} ICON_CHOICE_STYLE, *P_ICON_CHOICE_STYLE;
```

---

msgNew

Creates an **iconChoice** (and its nested icon windows).

Takes P_ICON_CHOICE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct ICON_CHOICE_NEW_ONLY {
    ICON_CHOICE_STYLE   style;      // overall style
    ICON_NEW            iconNew;    // storage for default child new struct
    U32                 spare;      // unused (reserved)
} ICON_CHOICE_NEW_ONLY, *P_ICON_CHOICE_NEW_ONLY;
#define iconChoiceNewFields \
    choiceNewFields         \
    ICON_CHOICE_NEW_ONLY    iconChoice;
typedef struct ICON_CHOICE_NEW {
    iconChoiceNewFields
} ICON_CHOICE_NEW, *P_ICON_CHOICE_NEW;
```

---

msgNewDefaults

Initializes the ICON_CHOICE_NEW structure to default values.

Takes P_ICON_CHOICE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct ICON_CHOICE_NEW {
    iconChoiceNewFields
} ICON_CHOICE_NEW, *P_ICON_CHOICE_NEW;
```

Comments

Sets up **pArgs->tkTable.pButtonNew** to create instances of **clsIcon** with boxed-style previewing/on feedback by default as follows:

```
pButtonNew->button.feedback = bsFeedbackBox;
```

Zeroes out **pNew.iconChoice.**

Messages from Other Classes

msgTkTableChildDefaults

Sets the defaults in P_ARGS for a common child.

Takes P_UNKNOWN, returns STATUS.

Comments

Here is how an **iconChoice** processes this message:

```
if <pArgs->object.class inherits from clsButton> {
    pArgs->button.style.feedback    = bsFeedbackBox;
}
```

ICON.H

This file contains the API definition for **clsIcon**.

clsIcon inherits from **clsMenuButton.**

Icons support drawing a picture as well as a label string. Several picture types are supported, including bitmap.

```
#ifndef ICON_INCLUDED
#define ICON_INCLUDED

#include <mbutton.h>
```

```
#ifndef MBUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT ICON;
```

Picture Styles

```
#define isPictureBitmap         0   // picture is a bitmap
#define isPictureNone           1   // no picture
#define isPicturePixelmap       2   // picture is a pixelmap
//                              3   // unused (reserved)
```

Aspect Ratio Styles

```
#define isAspectWidthFromHeight     0   // compute width from height & sample size
#define isAspectHeightFromWidth     1   // compute height from width & sample size
#define isAspectAsIs                2   // use the width and height as-is
//                                  3   // unused (reserved)
```

Common Layout Units Picture Sizes

```
#define iconSizeNormal          21  // standard size, both width and height
#define iconSizeSmall           10  // standard small size
typedef struct ICON_STYLE {
    U16 transparent     : 2,    // make the background transparent
        picture         : 2,    // type of picture
        freeBitmap      : 1,    // true => msgDestroy to bitmap after provide
        open            : 1,    // modify picture to look open
        sizeUnits       : 6,    // units for pictureSize, e.g. bsUnitsPoints
        sampleBias      : 1,    // true => alter pictureSize for quality
        aspect          : 2,    // aspect ration rule (e.g. isAspectWidthFromHeight)
        spare1          : 1;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} ICON_STYLE, *P_ICON_STYLE;
```

Messages

msgNew

Creates an icon window.

Takes P_ICON_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct ICON_NEW_ONLY {
    ICON_STYLE          style;          // overall style
    SIZE16              pictureSize;    // picture size, in device units
    U32                 spare;          // unused (reserved)
} ICON_NEW_ONLY, *P_ICON_NEW_ONLY;

#define iconNewFields       \
    menuButtonNewFields     \
    ICON_NEW_ONLY           icon;

typedef struct ICON_NEW {
    iconNewFields
} ICON_NEW, *P_ICON_NEW;
```

Comments

If **pArgs**->icon.style.transparent is true, **wsTransparent** is turned on in **pArgs**->win.flags.style and **bsInkExclusive** will be or-ed into **pArgs**->border.style.**backgroundInk**.

msgNewDefaults

Initializes the ICON_NEW structure to default values.

Takes P_ICON_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct ICON_NEW {
    iconNewFields
} ICON_NEW, *P_ICON_NEW;
```

Comments

Zeroes out **pArgs**->icon and sets

```
pArgs->gWin.style.gestureEnable = true;

pArgs->border.style.backgroundInk = bsInkWhite | bsInkExclusive;
pArgs->border.style.borderInk = bsInkWhite | bsInkExclusive;

pArgs->border.style.previewAlter = bsAlterBorders;
pArgs->border.style.selectedAlter = bsAlterBorders;
pArgs->border.style.edge = bsEdgeBottom;
pArgs->border.style.shadow = bsShadowNone;

pArgs->control.style.showDirty = true;

pArgs->label.style.xAlignment = lsAlignCenter;

pArgs->icon.style.freeBitmap    = true;
pArgs->icon.style.sampleBias    = true;
pArgs->icon.pictureSize.w = pArgs->icon.pictureSize.h = iconSizeNormal;
```

Default ICON_STYLE:

```
transparent     = false
picture         = isPictureBitmap
freeBitmap      = true
open            = false
sizeUnits       = bsUnitsLayout
sampleBias      = true
aspect          = isAspectWidthFromHeight
```

msgIconGetStyle

Passes back the current style values.

Takes P_ICON_STYLE, returns STATUS.

```
#define msgIconGetStyle MakeMsg(clsIcon, 1)
```

Message Arguments

```
typedef struct ICON_STYLE {
    U16 transparent     : 2,    // make the background transparent
        picture         : 2,    // type of picture
        freeBitmap      : 1,    // true => msgDestroy to bitmap after provide
        open            : 1,    // modify picture to look open
        sizeUnits       : 6,    // units for pictureSize, e.g. bsUnitsPoints
        sampleBias      : 1,    // true => alter pictureSize for quality
        aspect          : 2,    // aspect ration rule (e.g. isAspectWidthFromHeight)
        spare1          : 1;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} ICON_STYLE, *P_ICON_STYLE;
```

msgIconSetStyle

Sets the style values.

Takes P_ICON_STYLE, returns STATUS.

```
#define msgIconSetStyle MakeMsg(clsIcon, 2)
```

Message Arguments

```
typedef struct ICON_STYLE {
    U16 transparent     : 2,    // make the background transparent
        picture         : 2,    // type of picture
        freeBitmap      : 1,    // true => msgDestroy to bitmap after provide
        open            : 1,    // modify picture to look open
        sizeUnits       : 6,    // units for pictureSize, e.g. bsUnitsPoints
        sampleBias      : 1,    // true => alter pictureSize for quality
        aspect          : 2,    // aspect ration rule (e.g. isAspectWidthFromHeight)
        spare1          : 1;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} ICON_STYLE, *P_ICON_STYLE;
```

Comments

If style.open changes, the rect of the picture is dirtied by self-sending **msgWinDirtyRect**.

Note that changing style.transparent is not implemented.

msgIconGetPictureSize

Passes back the picture size in style.**sizeUnits**.

Takes P_SIZE16, returns STATUS.

```
#define msgIconGetPictureSize   MakeMsg(clsIcon, 3)
```

msgIconSetPictureSize

Sets the picture size.

Takes P_SIZE16, returns STATUS.

```
#define msgIconSetPictureSize   MakeMsg(clsIcon, 4)
```

Comments

The new picture size should be in style.**sizeUnits** (e.g. **bsUnitsLayout**). **clsIcon** will free the cached picture as in **msgIconFreeCache**.

msgIconGetActualPictureSize

Computes and passes back the actual picture size in device units.

Takes P_SIZE16, returns STATUS.

```
#define msgIconGetActualPictureSize MakeMsg(clsIcon, 10)
```

Comments

This is equivalent using **msgIconGetPictureSize** and converting to device units if style.**sampleBias** is false or style.picture is not **isPictureBitmap**.

Otherwise, **clsIcon** will compute and pass back the actual picture size used based on the sample size of the bitmap, the specified picture size and style.**sizeUnits**, style.aspect, and the device resolution of the icon's window device.

msgIconFreeCache

Frees the cached picture, if any.

Takes **pNull**, returns STATUS.

```
#define msgIconFreeCache            MakeMsg(clsIcon, 8)
```

Comments

If style.picture **isPictureBitmap**, is **clsIcon** will send **msgIconProvideBitmap** on the next **msgWinRepaint**.

Note that **clsIcon** does not self-send **msgWinDirtyRect** here. You should send **msgWinDirty** rect after **msgIconFreeCache** if you want the icon to repaint before it is otherwise damaged.

msgIconGetRects

Passes back the bounds for the picture in **pArgs**[**0**] and the label in **pArgs**[1].

Takes P_RECT32, returns STATUS.

```
#define msgIconGetRects          MakeMsg(clsIcon, 6)
```

Comments

Note that **pArgs** is an array of two RECT32 structs. Bounds are in device units, relative to the origin of the icon.

msgIconProvideBitmap

Sent to control client when icon needs the picture bitmap.

Takes P_ICON_PROVIDE_BITMAP, returns STATUS. Category: self-sent and client notification.

```
#define msgIconProvideBitmap    MakeMsg(clsIcon, 7)
```

Arguments

```
typedef struct ICON_PROVIDE_BITMAP {
    WIN             icon;           // in: icon asking for the bitmap
    TAG             tag;            // in: window tag of icon
    OBJECT          device;         // in: device on which bitmap will be rendered
    SIZE16          pictureSize;    // in: size of picture, device units
    OBJECT          bitmap;         // out: bitmap to render
    U32             spare1;         // unused (reserved)
    U32             spare2;         // unused (reserved)
} ICON_PROVIDE_BITMAP, *P_ICON_PROVIDE_BITMAP;
```

Comments

clsIcon will self-send this message when it needs the picture bitmap. Subclasses can catch this message and provide the appropriate bitmap.

If **clsIcon** receives this message, the message will be forwarded on to the icon's control client.

After the subclass or client provides the bitmap, **clsIcon** will copy the bitmap to a cached data structure for use when painting. If style.**freeBitmap** is true, **clsIcon** will send **msgDestroy** to the bitmap after creating the cache.

msgIconCopyPixels

Causes the icon to copy pixels from **pArgs**->srcWin to a pixelmap.

Takes P_ICON_COPY_PIXELS, returns STATUS.

```
#define msgIconCopyPixels       MakeMsg(clsIcon, 9)
```

Arguments

```
typedef struct ICON_COPY_PIXELS {
    WIN             srcWin;         // in: source window
    XY32            srcXY;          // in: origin of area to copy, srcWin space
    U32             spare1;         // unused (reserved)
} ICON_COPY_PIXELS, *P_ICON_COPY_PIXELS;
```

Comments

If style.picture is not **isPicturePixelmap** or **pArgs**->srcWin is **objNull**, **clsIcon** will return **stsBadParam.**

The area copied has size of **pictureSize** and origin **pArgs**->srcXY in **pArgs**->srcWin space. The pixelmap will be used during **msgWinRepaint.**

msgIconSampleBias

Computes the sample-biased size for a given picture size.

Takes P_ICON_SAMPLE_BIAS, returns STATUS. Category: class message.

```
#define msgIconSampleBias           MakeMsg(clsIcon, 11)
// default tolerance used buy clsIcon
// amount a picture size can be adjusted up or down for sample bias,
// in layout units
#define iconSampleTolerance     4
```

Arguments

```
typedef struct ICON_SAMPLE_BIAS {
    WIN     win;                // in: device window
    U32     tolerance;          // in: snap-to tolerance, in layout units
    SIZE32  sampleSize;         // in: sample size, in device units
    SIZE32  size;               // in/out: picture size, in device units
    U16     sizeUnits   : 6,    // in: units for size
            aspect      : 2,    // in: aspect ratio style
            spare1      : 8;    // unused (reserved)
    U32     spare2;             // unused (reserved)
} ICON_SAMPLE_BIAS, *P_ICON_SAMPLE_BIAS;
```

Comments

clsIcon will alter **pArgs**->size.w/h to be a multiple of **pArgs**->sampleSize.w/h. If the new **pArgs**->size.w/h is within **pArgs**->tolerance units from **pArgs**->sampleSize.w/h, the size is rounded up or down to the sample size.

pArgs->sampleSize should be in device units. **pArgs**->size should be in the units described by **pArgs**->sizeUnits (e.g. **bsUnitsLayout**). **pArgs**->tolerance should be in layout units. **pArgs**->win is any window on the related device.

If **pArgs**->aspect is **isAspectWidthFromHeight**, the width will be computed from the final height as

size.w = size.h * (**sampleSize.w / sampleSize.h**);

If **pArgs**->aspect is **isAspectHeightFromWidth**, the height will be computed from the final width as

size.h = size.w * (**sampleSize.h / sampleSize.w**);

This message can be sent to **clsIcon** or any instance of **clsIcon.**

Here is the current "size bias" code. In this fragment **sampleSize** is the sample's width or height, size is the proposed picture with or height, tolerance is the "snap-to" tolerance. All values are in device units. The computed value is the sample-biased picture width or height.

```
if (size > sampleSize) {
    S32     mult;
    S32     lowerValue, lowerDelta;
    S32     upperValue, upperDelta;

    mult = size / sampleSize;
    lowerValue = mult * sampleSize;
    lowerDelta = size - lowerValue;
    upperValue = (mult + 1) * sampleSize;
    upperDelta = upperValue - size;
    if (lowerDelta < upperDelta) {
        value = lowerValue;
        delta = lowerDelta;
    } else {
        value = upperValue;
        delta = upperDelta;
    }
} else {
    delta = sampleSize - size;
    value = sampleSize;
}

if (delta <= tolerance)
    size = value;

return size;
```

Messages from other classes

msgWinSetTag

Sets the window tag.

Takes P_WIN_METRICS, returns STATUS.

Comments

If **pArgs->**tag is the same as the current window tag, nothing is done and **stsOK** is returned.

If style.picture is **isPictureBitmap**, **clsIcon** will self-send **msgIconFreeCache** followed by **msgWinDirtyRect** to force a redraw of the icon picture.

ITABLE.H

This file contains the API for **clsIconChoice**.

clsIconTable inherits from **clsToggleTable.**

IconTables are non-exclusive toggle tables with icon buttons and boxed-style previewing/on feedback.

See the documentation for **msgTkTableChildDefaults** below.

```
#ifndef ITABLE_INCLUDED
#define ITABLE_INCLUDED

#include <ttable.h>

#include <icon.h>
```

```
#ifndef TTABLE_INCLUDED

#endif
#ifndef ICON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT ICON_TABLE;
typedef struct ICON_TABLE_STYLE {
    U16 spare   : 16;  // unused (reserved)
} ICON_TABLE_STYLE, *P_ICON_TABLE_STYLE;
```

---

msgNew

Creates an **iconTable** (and its nested icon windows).

Takes P_ICON_TABLE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct ICON_TABLE_NEW_ONLY {
    ICON_TABLE_STYLE    style;      // overall style
    ICON_NEW            iconNew;    // storage for default child new struct
    U32                 spare;      // unused (reserved)
} ICON_TABLE_NEW_ONLY, *P_ICON_TABLE_NEW_ONLY;
#define iconTableNewFields  \
    toggleTableNewFields    \
    ICON_TABLE_NEW_ONLY     iconTable;
typedef struct ICON_TABLE_NEW {
    iconTableNewFields
} ICON_TABLE_NEW, *P_ICON_TABLE_NEW;
```

---

msgNewDefaults

Initializes the ICON_TABLE_NEW structure to default values.

Takes P_ICON_TABLE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct ICON_TABLE_NEW {
    iconTableNewFields
} ICON_TABLE_NEW, *P_ICON_TABLE_NEW;
```

Comments

Sets up **pArgs**->tkTable.**pButtonNew** to create instances of **clsIcon** with boxed-style previewing/on feedback by default as follows:

```
pButtonNew->button.style.feedback   = bsFeedbackBox;
pButtonNew->button.style.contact    = bsContactToggle;
```

Zeroes out **pNew.iconTable**.

Messages from Other Classes

msgTkTableChildDefaults

Sets the defaults in P_ARGS for a common child.

Takes P_UNKNOWN, returns STATUS.

Comments

Here is how an **iconTable** processes this message:

```
if <pArgs->object.class inherits from clsButton> {
    pArgs->button.style.feedback = bsFeedbackBox;
}
```

ITOGGLE.H

This file contains the API definition for **clsIconToggle**.

clsIconToggle inherits from **clsIcon**.

Icon toggles are toggle buttons with pictures for on and off states. These can be used to display an on/off mode switch.

```
#ifndef ITOGGLE_INCLUDED
#define ITOGGLE_INCLUDED

#include <icon.h>
```

```
#ifndef ICON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT ICON_TOGGLE;
typedef struct ICON_TOGGLE_STYLE {
    U16 spare   : 16;   // unused (reserved)
} ICON_TOGGLE_STYLE, *P_ICON_TOGGLE_STYLE;
```

Default off/on picture tags These are the resids for bitmaps in the system resource file The default bitmaps represent "ink mode" for off (a picture of a pencil) and "gesture mode" for on (a picture of a check mark)

```
#define tagIconToggleOff        MakeTag(clsIconToggle, 1)
#define tagIconToggleOn         MakeTag(clsIconToggle, 2)
```

Messages

msgNew

Creates an icon toggle window.

Takes P_ICON_TOGGLE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct ICON_TOGGLE_NEW_ONLY {
    ICON_TOGGLE_STYLE   style;  // overall style
    TAG                 offTag; // picture tag to use when off
    TAG                 onTag;  // picture tag to use when on
    U32                 spare1; // unused (reserved)
    U32                 spare2; // unused (reserved)
} ICON_TOGGLE_NEW_ONLY, *P_ICON_TOGGLE_NEW_ONLY;
#define iconToggleNewFields     \
    iconNewFields               \
    ICON_TOGGLE_NEW_ONLY        iconToggle;
typedef struct ICON_TOGGLE_NEW {
    iconToggleNewFields
} ICON_TOGGLE_NEW, *P_ICON_TOGGLE_NEW;
```

Comments

The fields you commonly set are:

pArgs->iconToggle.offTag picture tag to use when button is off

pArgs->iconToggle.onTag picture tag to use when button is on

msgNewDefaults

Initializes the ICON_TOGGLE_NEW structure to default values.

Takes P_ICON_TOGGLE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct ICON_TOGGLE_NEW {
    iconToggleNewFields
} ICON_TOGGLE_NEW, *P_ICON_TOGGLE_NEW;
```

Comments

Zeroes out **pArgs**->iconToggle and sets:

```
pArgs->gWin.style.gestureEnable = false;

pArgs->button.style.feedback    = bsFeedbackNone;
pArgs->button.style.contact     = bsContactToggle;

pArgs->icon.pictureSize.w   = 8
pArgs->icon.pictureSize.h   = 8

pArgs->iconToggle.offTag    = tagIconToggleOff;
pArgs->iconToggle.onTag     = tagIconToggleOn;
```

Note that the default picture size is set to 8x8 layout units, which is the width and height of the system font.

The default off and on tags represent bitmaps stored in the system resource file. These are the bitmaps for "ink mode" (off) and "gesture mode" (on).

msgIconToggleGetStyle

Passes back the current style values.

Takes P_ICON_TOGGLE_STYLE, returns STATUS.

```
#define msgIconToggleGetStyle   MakeMsg(clsIconToggle, 1)
```

Message Arguments

```
typedef struct ICON_TOGGLE_STYLE {
    U16 spare   : 16;   // unused (reserved)
} ICON_TOGGLE_STYLE, *P_ICON_TOGGLE_STYLE;
```

msgIconToggleSetStyle

Sets the style values.

Takes P_ICON_TOGGLE_STYLE, returns STATUS.

```
#define msgIconToggleSetStyle   MakeMsg(clsIconToggle, 2)
```

Message Arguments

```
typedef struct ICON_TOGGLE_STYLE {
    U16 spare   : 16;   // unused (reserved)
} ICON_TOGGLE_STYLE, *P_ICON_TOGGLE_STYLE;
```

msgIconToggleGetOnTag

Passes back the **onTag**.

Takes P_TAG, returns STATUS.

```
#define msgIconToggleGetOnTag   MakeMsg(clsIconToggle, 3)
```

msgIconToggleGetOffTag

Passes back the **offTag**.

Takes P_TAG, returns STATUS.

```
#define msgIconToggleGetOffTag  MakeMsg(clsIconToggle, 4)
```

msgIconToggleSetOnTag

Sets the **onTag**.

Takes TAG, returns STATUS.

```
#define msgIconToggleSetOnTag   MakeMsg(clsIconToggle, 5)
```

Comments **clsIconToggle** will remember the **onTag** for use when the button is on. If the button is currently on, **msgIconFreeCache** will be self-sent to free the current picture bitmap and use the new one.

msgIconToggleSetOffTag

Sets the **offTag**.

Takes TAG, returns STATUS.

```
#define msgIconToggleSetOffTag  MakeMsg(clsIconToggle, 6)
```

Comments **clsIconToggle** will remember the **offTag** for use when the button is off. If the button is currently off, **msgIconFreeCache** will be self-sent to free the current picture bitmap and use the new one.

Messages from Other Classes

msgButtonShowFeedback

Shows the feedback for an on/off button if **pArgs** is true/false.

Takes BOOLEAN, returns STATUS. Category: self-sent.

Comments **clsIconToggle** will free the old bitmap via **msgIconFreeCache** and cause the new one to be displayed by damaging the picture rectangle. The current feedback state will be remembered for use in **msgIconProvideBitmap**, at which time the picture tag will be set to either the **onTag** (**pArgs** == true) or the **offTag** (**pArgs** == false).

See Also **msgIconProvideBitmap**

msgIconProvideBitmap

Sent to control client when icon needs the picture bitmap.

Takes P_ICON_PROVIDE_BITMAP, returns STATUS. Category: client notification.

Comments **clsIconToggle** will alter **pArgs**->tag to be **onTag** if the current feedback state is on, or the **offTag** otherwise. This results in the client of the icon receiving this message and providing the on or off bitmap.

LABEL.H

This file contains the API definition for **clsLabel.**

clsLabel inherits from **clsControl.**

Implements much of the appearance of many toolkit components inside the border: font, decoration, scale, orientation, etc.

Debugging Flags

The **clsLabel** debugging flag is '%'. Defined values are:

flag4 (0x0010) msgSave/msgRestore info

flag5 (0x0020) boxed string/paint dc

```
#ifndef LABEL_INCLUDED
#define LABEL_INCLUDED

#include <control.h>

#include <sysgraf.h>
```

```
#ifndef CONTROL_INCLUDED

#endif
#ifndef SYSGRAF_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT LABEL;
```

Info style

```
#define lsInfoString            0   // info is pString
#define lsInfoWindow            1   // info is WIN
#define lsInfoStringId          2   // info is a resource file string id
//                              3   // unused (reserved)
```

X and Y alignment styles

```
#define lsAlignLeft             0               // left-justified
#define lsAlignCenter           1               // centered
#define lsAlignRight            2               // right-justified
#define lsAlignBottom           lsAlignLeft     // bottom-justified
#define lsAlignTop              lsAlignRight    // top-justified
#define lsAlignCustom           3               // send msgLabelAlign to self
```

Decoration style

```
#define lsDecorationNone            0   // no decoration
#define lsDecorationBlank           1   // blank space on left
#define lsDecorationNonExclusiveOn  2   // left check and double bar
#define lsDecorationExclusiveOff    3   // left blank and single bar
#define lsDecorationExclusiveOn     4   // left check and single bar
#define lsDecorationPullRight       5   // pull-right arrow on right
#define lsDecorationNonExclusiveOff 6   // left blank and double bar
```

```
#define lsDecorationCheck           7   // left checkmark
#define lsDecorationCircle          8   // left empty circle
#define lsDecorationBox             9   // left empty box
#define lsDecorationCheckedBox      10  // left checked box
#define lsDecorationCheckedCircle   11  // left checked circle
#define lsDecorationHollowLeft      12  // left hollow left delta
#define lsDecorationHollowRight     13  // left hollow right delta
#define lsDecorationSolidLeft       14  // left solid left delta
#define lsDecorationSolidRight      15  // left solid right delta
#define lsDecorationPopup           16  // left solid right delta w/space
#define lsDecorationButtonOff       17  // left off button glyph
#define lsDecorationButtonOn        18  // left on button glyph
#define lsDecorationCustomLeft      19  // left custom decoration
#define lsDecorationCustomRight     20  // right custom decoration
//                                  21  // unused (reserved)
//                                  .. // unused (reserved)
//                                  31  // unused (reserved)
```

Font Type

```
#define lsFontSystem                0   // use the system font
#define lsFontCustom                1   // use the specified font
#define lsFontUser                  2   // use the system user font
//                                  3   // unused (reserved)
```

Common Scale Values, in layout units

```
#define lsScaleTiny                 2   //  2/8 x normal
#define lsScaleSmall                4   //  4/8 x normal
#define lsScaleMedium               6   //  6/8 x normal
#define lsScaleNormal               8   //  8/8 x normal
#define lsScaleLarge                10  // 10/8 x normal
#define lsScaleJumbo                12  // 12/8 x normal
#define lsScaleHuge                 14  // 14/8 x normal
```

Rotation styles

```
#define lsRotateNone        0   //   0 degrees (horizontal, left to right)
#define lsRotate90          1   //  90 degrees (vertical, bottom to top)
#define lsRotate180         2   // 180 degrees (horizontal, right to left)
#define lsRotate270         3   // 270 degrees (vertical, top to bottom)
```

Underline styles

```
#define lsUnderlineNone     0   // no underline
#define lsUnderlineSingle   1   // single underline
#define lsUnderlineDouble   2   // double underline
//                          3   // unused (reserved)
```

Box styles

```
#define lsBoxNone           0   // no boxes
#define lsBoxSquare         1   // square box around each character
#define lsBoxTicks          2   // tick mark between characters
#define lsBoxInvisible      3   // don't draw the box lines
```

Number of rows/columns

```
#define lsNumAsNeeded       0   // as many rows/columns as needed
#define lsNumAbsolute       1   // fixed number: rows/cols
//                          2   // unused (reserved)
//                          3   // unused (reserved)
typedef struct LABEL_STYLE {
    U16 infoType        : 2,    // type of pString field
        xAlignment      : 2,    // x alignment style
        yAlignment      : 2,    // y alignment style
        rotation        : 2,    // text rotation
        underline       : 2,    // underline style
        strikeout       : 1,    // strikeout during msgDcDrawText
        decoration      : 5;    // decoration style
    U16 numCols         : 2,    // style for number of columns
        numRows         : 2,    // style for number of rows
        box             : 2,    // boxing style
        wordWrap        : 1,    // word wrap to next row
        fontType        : 2,    // system or custom font
        scaleUnits      : 6,    // scale units style, e.g. bsUnitsLayout
        stringSelected  : 1;    // whether content string shows sel'd visual
    U16 spare2          : 16;   // unused (reserved)
} LABEL_STYLE, *P_LABEL_STYLE;
```

Default LABEL_STYLE:

```
infoType        = lsInfoString
xAlignment      = lsLeft
yAlignment      = lsBottom
decoration      = lsDecorationNone
scaleUnits      = bsUnitsLayout
rotation        = lsRotateNone
underline       = lsUnderlineNone
strikeout       = false
box             = lsBoxNone
numCols         = lsNumAsNeeded
numRows         = lsNumAsNeeded
wordWrap        = false
fontType        = lsFontSystem
scaleUnits      = bsUnitsLayout
stringSelected  = false
```

Messages

msgNew

Creates a label window.

Takes P_LABEL_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct LABEL_NEW_ONLY {
    LABEL_STYLE     style;      // overall style
    P_CHAR          pString;    // string to display or child window
    SYSDC_FONT_SPEC font;   // spec to open if style.fontType == lsFontCustom
    P_CHAR          fontName;   // font name from which to derive font.id
    U8              scale;      // scale in scaleUnits
    U8              rows;       // number of rows
    U8              cols;       // number of columns (or zero for infinite)
    U16             customGlyph;// custom decoration glyph
    U32             spare1;     // unused (reserved)
    U32             spare2;     // unused (reserved)
} LABEL_NEW_ONLY, *P_LABEL_NEW_ONLY;
```

```
#define labelNewFields  \
    controlNewFields    \
    LABEL_NEW_ONLY      label;
typedef struct LABEL_NEW {
    labelNewFields
} LABEL_NEW, *P_LABEL_NEW;
```

Comments

The fields you commonly set are:

pArgs->label.style appropriate style values

pArgs->label.**pString** string or child window uid

In response to **msgNew**, the label initializes all of its state. This is the only time **pArgs**->fontName would be used.

Since **clsLabel** copies the bytes pointed to by **pArgs**->pString (when style.**infoType** is **lsInfoString**), the client may free the string after **msgNew** if the string was allocated.

If style.**infoType** is **lsInfoStringId**, **clsLabel** self-sends **msgLabelBindStringId** to bind the resid to a string.

msgNewDefaults

Initializes the LABEL_NEW structure to default values.

Takes P_LABEL_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct LABEL_NEW {
    labelNewFields
} LABEL_NEW, *P_LABEL_NEW;
```

Comments

Zeroes out **pArgs**->label and sets:

```
pArgs->win.flags.style |= wsShrinkWrapWidth | wsShrinkWrapHeight;

pArgs->border.style.leftMargin = bsMarginSmall;
pArgs->border.style.rightMargin = bsMarginSmall;
pArgs->border.style.bottomMargin = bsMarginSmall;
pArgs->border.style.topMargin = bsMarginSmall;

pArgs->label.style.scaleUnits = bsUnitsLayout;
pArgs->label.scale = lsScaleNormal;
```

Also sets **pArgs**->label.font to the default system font.

msgLabelGetStyle

Passes back the current style values.

Takes P_LABEL_STYLE, returns STATUS.

```
#define msgLabelGetStyle        MakeMsg(clsLabel, 1)
```

Message Arguments

```
typedef struct LABEL_STYLE {
    U16 infoType        : 2,    // type of pString field
        xAlignment      : 2,    // x alignment style
        yAlignment      : 2,    // y alignment style
        rotation        : 2,    // text rotation
        underline       : 2,    // underline style
        strikeout       : 1,    // strikeout during msgDcDrawText
        decoration      : 5;    // decoration style
    U16 numCols         : 2,    // style for number of columns
        numRows         : 2,    // style for number of rows
        box             : 2,    // boxing style
```

```
        wordWrap        : 1,    // word wrap to next row
        fontType        : 2,    // system or custom font
        scaleUnits      : 6,    // scale units style, e.g. bsUnitsLayout
        stringSelected  : 1;    // whether content string shows sel'd visual
    U16 spare2          : 16;   // unused (reserved)
} LABEL_STYLE, *P_LABEL_STYLE;
```

msgLabelSetStyle

Sets the style fields.

Takes P_LABEL_STYLE, returns STATUS.

```
#define msgLabelSetStyle        MakeMsg(clsLabel, 2)
```

Message Arguments

```
typedef struct LABEL_STYLE {
    U16 infoType        : 2,    // type of pString field
        xAlignment      : 2,    // x alignment style
        yAlignment      : 2,    // y alignment style
        rotation        : 2,    // text rotation
        underline       : 2,    // underline style
        strikeout       : 1,    // strikeout during msgDcDrawText
        decoration      : 5;    // decoration style
    U16 numCols         : 2,    // style for number of columns
        numRows         : 2,    // style for number of rows
        box             : 2,    // boxing style
        wordWrap        : 1,    // word wrap to next row
        fontType        : 2,    // system or custom font
        scaleUnits      : 6,    // scale units style, e.g. bsUnitsLayout
        stringSelected  : 1;    // whether content string shows sel'd visual
    U16 spare2          : 16;   // unused (reserved)
} LABEL_STYLE, *P_LABEL_STYLE;
```

Comments

If the decoration style changes, the label uses **msgWinDirtyRect** to dirty the appropriate portion of itself.

If the new style.box is not **lsBoxNone**, then the label self-sends **msgLabelProvideBoxSize** to obtain the width and height the boxes should be. If either of these differ from the old values, then the label self-sends **msgWinSetLayoutDirty**(true).

If the style.**numCols** or style.**numRows** change, or any of the other style values that might require relayout change, label self-sends **msgWinSetLayoutDirty**(true).

It is the caller's responsibility to re-layout the label if the caller has changed any style that affects the layout of the label.

msgLabelGetString

Fills P_ARGS->pString with the current string.

Takes P_CONTROL_STRING, returns STATUS.

```
#define msgLabelGetString       MakeMsg(clsLabel, 3)
```

Comments

Will fill the passed buffer up to len bytes worth of the string. The copied string is not null-terminated if the passed len wasn't large enough.

If the passed len is zero, **clsLabel** sets len to the number of bytes the buffer would have to be in order to hold the entire label's string (including the terminating null).

msgLabelSetString

Sets the label string.

Takes P_CHAR, returns STATUS.

```
#define msgLabelSetString       MakeMsg(clsLabel, 4)
```

Comments

Allocates storage and copies P_ARGS. Note that **clsLabel** allocates within the context of the current process.

msgLabelGetUnicode

Fills P_ARGS->pString with the current string.

Takes P_CONTROL_STRING, returns STATUS.

```
#define msgLabelGetUnicode      MakeMsg(clsLabel, 21)
```

Comments

Like **msgLabelGetString**, except that the client is requesting the string in unicode format (where a character is represented in 16 bits).

Will fill the passed buffer up to len characters worth of the string. The copied string is not null-terminated if the passed len wasn't large enough.

If the passed len is zero, **clsLabel** sets len to the number of characters the buffer would have to be in order to hold the entire label's string (including the terminating null). Note that the number of bytes would be twice this number.

msgLabelSetUnicode

Sets the label string.

Takes P_U16 (P_CHAR after its 16-bit), returns STATUS.

```
#define msgLabelSetUnicode      MakeMsg(clsLabel, 22)
```

Comments

Like **msgLabelSetString**, except that the client is specifying the string in unicode format (where a character is represented in 16 bits).

Allocates storage and copies P_ARGS. Note that **clsLabel** allocates within the context of the current process.

msgLabelGetStringId

Passes back the string resource id; zero if none.

Takes P_RESID, returns STATUS.

```
#define msgLabelGetStringId     MakeMsg(clsLabel, 25)
```

Comments

clsLabel returns **stsFailed** if style.**infoType** is not **lsInfoStringId**.

msgLabelSetStringId

Sets the string resource id.

Takes RESID, returns STATUS.

```
#define msgLabelSetStringId         MakeMsg(clsLabel, 26)
```

Comments

clsLabel immediately binds the specified string id to a string by self-sending **msgLabelBindStringId**.

The string id is remembered and saved during **msgSave**.

msgLabelBindStringId

Binds the string resource id to a string.

Takes VOID, returns STATUS.

```
#define msgLabelBindStringId            MakeMsg(clsLabel, 27)
```

Comments

clsLabel returns **stsFailed** if style.**infoType** is not **lsInfoStringId**.

clsLabel binds the current string id to a string by loading the string from **theProcessResList**.

msgLabelGetWin

Passes back the child window.

Takes P_WIN, returns STATUS.

```
#define msgLabelGetWin          MakeMsg(clsLabel, 5)
```

Comments

clsLabel returns **stsFailed** if style.**infoType** is not **lsInfoWin**.

msgLabelSetWin

Sets the child window.

Takes WIN, returns STATUS.

```
#define msgLabelSetWin          MakeMsg(clsLabel, 6)
```

Comments

clsLabel returns **stsFailed** if style.**infoType** is not **lsInfoWin**.

Since changing the window within the label sets the label's **wsLayoutDirty** bit, the caller should re-layout the label.

msgLabelGetFontSpec

Passes back the font spec.

Takes P_SYSDC_FONT_SPEC, returns STATUS.

```
#define msgLabelGetFontSpec     MakeMsg(clsLabel, 8)
```

Comments

Note that this font spec is not used unless style.**fontType** is **lsFontCustom**.

msgLabelSetFontSpec

Sets the font spec.

Takes P_SYSDC_FONT_SPEC, returns STATUS.

```
#define msgLabelSetFontSpec     MakeMsg(clsLabel, 9)
```

Comments

Note that this font spec is not used unless style.**fontType** is **lsFontCustom**.

As with **msgLabelSetStyle**, it is the caller's responsibility to re-layout the label if the caller has changed any style that affects the layout of the label (such as certain fields in the font spec). Note that the label does not currently explicitly set its **wsLayoutDirty** bit in response to **msgLabelSetFontSpec**, but that this may change in the future.

msgLabelGetScale

Passes back the font scale.

Takes P_U8, returns STATUS.

```
#define msgLabelGetScale        MakeMsg(clsLabel, 10)
```

Comments

Note that the units of this scale are determined by style.**scaleUnits**.

msgLabelSetScale

Sets the font scale.

Takes U8, returns STATUS.

```
#define msgLabelSetScale        MakeMsg(clsLabel, 11)
```

Comments

Note that the units of this scale are determined by style.**scaleUnits**.

As with **msgLabelSetStyle**, it is the caller's responsibility to re-layout the label if the caller has changed any style that affects the layout of the label (such as the font scale). Note that the label does not currently explicitly set its **wsLayoutDirty** bit in response to **msgLabelSetScale**, but that this may change in the future.

msgLabelGetRows

Passes back the number of rows the label will size itself to.

Takes P_U8, returns STATUS.

```
#define msgLabelGetRows         MakeMsg(clsLabel, 12)
```

Comments

Note that this is not used unless style.**numRows** is **lsNumAbsolute**.

msgLabelSetRows

Sets the number of rows the label will size itself to.

Takes U8, returns STATUS.

```
#define msgLabelSetRows         MakeMsg(clsLabel, 13)
```

Comments

Note that this is not used unless style.**numRows** is **lsNumAbsolute**.

As with **msgLabelSetStyle**, it is the caller's responsibility to re-layout the label if the caller has changed any style that affects the layout of the label (such as the number of rows). Note that the label does not currently explicitly set its **wsLayoutDirty** bit in response to **msgLabelSetRows**, but that this may change in the future.

msgLabelGetCols

Passes back the number of columns the label will size itself to.

Takes P_U8, returns STATUS.

```
#define msgLabelGetCols         MakeMsg(clsLabel, 14)
```

Comments

Note that this is not used unless style.**numCols** is **lsNumAbsolute**.

msgLabelSetCols

Sets the number of columns the label will size itself to.

Takes U8, returns STATUS.

```
#define msgLabelSetCols          MakeMsg(clsLabel, 15)
```

Comments

Note that this is not used unless style.**numCols** is **lsNumAbsolute**.

As with **msgLabelSetStyle**, it is the caller's responsibility to re-layout the label if the caller has changed any style that affects the layout of the label (such as the number of columnss). Note that the label does not currently explicitly set its **wsLayoutDirty** bit in response to **msgLabelSetCols**, but that this may change in the future.

msgLabelGetCustomGlyph

Passes back the custom decoration glyph, zero if none.

Takes P_U16, returns STATUS.

```
#define msgLabelGetCustomGlyph  MakeMsg(clsLabel, 23)
```

Comments

Note that this is not used unless style.decoration is **lsDecorationCustomLeft** or **lsDecorationCustomRight**.

msgLabelSetCustomGlyph

Sets the custom decoration glyph.

Takes U16, returns STATUS.

```
#define msgLabelSetCustomGlyph  MakeMsg(clsLabel, 24)
```

Comments

Note that this is not used unless style.decoration is **lsDecorationCustomLeft** or **lsDecorationCustomRight**.

msgLabelGetBoxMetrics

Passes back the current box metrics.

Takes P_LABEL_BOX_METRICS, returns STATUS.

```
#define msgLabelGetBoxMetrics   MakeMsg(clsLabel, 16)
```

Arguments

```
typedef struct LABEL_BOX_METRICS {
    RECT32  boxRect;        // origin and size of boxed area
    SIZE32  singleBoxSize;  // size of a single box
    U16     rows, cols;     // current # of rows and columns
    U16     baseline;       // positive baseline offset from bottom of box
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
    U32     spare3;         // unused (reserved)
} LABEL_BOX_METRICS, *P_LABEL_BOX_METRICS;
```

Comments

The box metrics describe the arrangement and size of the box cells imaged by the label. These metrics are valid only if style.box is not **lsBoxNone**.

All origins and sizes are in device units.

msgLabelResolveXY

Resolves a point to a character in the string.

Takes P_LABEL_RESOLVE, returns STATUS.

```
#define msgLabelResolveXY       MakeMsg(clsLabel, 17)
```

Arguments

```
typedef struct LABEL_RESOLVE {
    XY32    xy;             // in: point to resolve
    S32     index;          // out: index of char at point
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} LABEL_RESOLVE, *P_LABEL_RESOLVE;
```

Comments

An index of -1 indicates point is not over any character. The xy should be relative to the label and expressed in device units.

msgLabelAlign

Self-sent if style.**xAlignment** or style.**yAlignment** is **lsAlignCustom**.

Takes P_LABEL_ALIGN, returns STATUS. Category: self-sent.

```
#define msgLabelAlign           MakeMsg(clsLabel, 7)
```

Arguments

```
typedef struct LABEL_ALIGN {
    BOOLEAN alignX;         // in: true if x alignment
    SIZE16  outerSize;      // in: size of label outer rect (in twips)
    SIZE16  innerSize;      // in: size of label inner rect (in twips)
    SIZE16  contentsSize;   // in: size of label contents (in twips)
    COORD16 offset;         // out: computed x or y offset from origin
    U32     spare;          // unused (reserved)
} LABEL_ALIGN, *P_LABEL_ALIGN;
```

Comments

Allows subclasses to compute alignment. The subclass should fill in **pArgs**->offset.

msgLabelProvideInsPt

Self-sent message to obtain where to render insertion point.

Takes P_S16, returns STATUS. Category: self-sent.

```
#define msgLabelProvideInsPt        MakeMsg(clsLabel, 18)
```

Comments

Receiver should return the zero-based index of the character at which the insertion point should be drawn. Non-boxed styles draw the insertion point before this character, boxed styles highlight the box around this character.

If the returned index is -1, no insertion point is drawn. **clsLabel** responds by default with -1.

msgLabelGetRects

Computes the rectangle for each given character index.

Takes P_LABEL_RECT, returns STATUS.

```
#define msgLabelGetRects            MakeMsg(clsLabel, 19)
#define lgrInsPtRect    flag0
```

Arguments

```
typedef struct {
    S16     index;
    RECT32  rect;
    U16     flags;
    U16     spare;
} LABEL_RECT, *P_LABEL_RECT;
```

Comments

pArgs points to an array of LABEL_RECTs. The receiver computes the rectangle for the character at the index for each index until it encounters one whose value is -1. The rects are relative to the label, and are expressed in device units.

The indices should be sorted in increasing order.

msgLabelProvideBoxSize

Self-sent message to obtain the char box size.

Takes P_SIZE16, returns STATUS. Category: self-sent.

```
#define msgLabelProvideBoxSize      MakeMsg(clsLabel, 20)
```

Comments

Receiver should fill in *pArgs with the size of a character box, in points. This message is self-sent when a boxed label is processing the following messages: **msgInit**, **msgRestore**, **msgLabelSetString**, and **msgLabelSetStyle**.

clsLabel responds by filling in *pArgs from the user preferences (using **prCharBoxWidth** and **prCharBoxHeight** from prefs.h).

Messages from Other Classes

msgWinLayoutSelf

Tell a window to layout its children.

Takes P_WIN_METRICS, returns STATUS.

Comments

clsLabel responds by recomputing its layout parameters and by using **msgWinDelta** on its child window (if style.**infoType** is **lsInfoWindow**).

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

clsLabel responds by filing away all its state, including its string (if style.**infoType** is **lsInfoString**) or child window (if style.**infoType** is **lsInfoWindow**).

Note that the child window must have **wsSendFile** set to be filed. If **wsSendFile** is not set, then **msgSave** does not save it, and a subsequent **msgRestore** sets the label's **pString** field to **objNull**. (**wsSendFile** is the default for **clsBorder** and its descendents).

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsLabel responds by restoring all of its state, including its string (if style.**infoType** is **lsInfoString**) or child window (if style.**infoType** is **lsInfoWindow**).

If the child window was not filed during the **msgSave**, then after **msgRestore** the label's **pString** value is **objNull**.

msgFree

Sent as the last of three msgs to destroy an object.

Takes OBJ_KEY, returns STATUS.

Comments **clsLabel** responds by freeing its string if style.**infoType** is **lsInfoString** and the string pointer is not null. **clsLabel** uses OSHeapBlockFree.

msgWinRepaint

Tells a window to repaint itself.

Takes nothing, returns STATUS. Category: descendant responsibility.

Comments **clsLabel** responds by painting its decoration and string as appropriate.

msgWinGetBaseline

Gets the desired x,y alignment of a window.

Takes P_WIN_METRICS, returns STATUS.

Comments **clsLabel** responds by setting **pArgs**->bounds.origin.

If the label is displaying a decoration, the x coordinate is set to the x offset of the rightmost decoration position (there's a small gap between this position and the start of the string/window). If the label has no decoration, then the x coordinate is set to the offset of the left side of the string/window.

The y coordinate is set to a value derived from the label's **innerRect** origin and the baseline information from the label's font. This value is accurate in those cases where the label's bottom fits snugly around the string/window, but is incorrect in cases where this doesn't hold (e.g., a non-wsShrinkWrapHeight label that is taller than it needs to be).

See Also **msgBorderGetInnerRect** baseline coordinates are derived from this

msgEmbeddedWinGetMark

Get an embedded window mark.

Takes P_EMBEDDED_WIN_MARK, returns STATUS.

Comments **clsLabel** responds by copying into **pArgs**->label, then ensures that the buffer is terminated with a null character.

If style.**infoType** is not **lsInfoString**, or the label's string is null or empty, then **clsLabel** does nothing.

msgBorderPaintForeground

catagory: subclass window responsibility Receiver must paint the foreground, if any.

Takes VOID, returns STATUS.

Comments **clsLabel** responds by using **msgWinBeginPaint**, painting its decoration and string as appropriate, and then sending **msgWinEndPaint**.

msgControlSetDirty

Clears the dirty bit.

Takes BOOLEAN, returns STATUS.

Comments **clsLabel** responds by calling ancestor, then checking the CONTROL_STYLE.**showDirty** value. If this is false, **clsLabel** just returns. Otherwise, if the old CONTROL_STYLE.dirty value is different from the new value, then **clsLabel** uses **msgWinDirtyRect** to dirty its decoration (if it has one).

See Also **msgControlSetStyle** sets the CONTROL_STYLE values

msgControlSetMetrics sets the CONTROL_METRICS values

msgWinDirtyRect dirties a portion of a window

msgControlSetStyle

Sets the style values.

Takes P_CONTROL_STYLE, returns STATUS.

Comments **clsLabel** responds by calling ancestor, then checking the CONTROL_STYLE.**showDirty** value. If this is false, **clsLabel** just returns. Otherwise, if the old CONTROL_STYLE.dirty value is different from the new value, then **clsLabel** uses **msgWinDirtyRect** to dirty its decoration (if it has one).

See Also **msgControlSetDirty** sets the CONTROL_STYLE.dirty bit

msgControlSetMetrics sets the CONTROL_METRICS values

msgWinDirtyRect dirties a portion of a window

msgControlSetMetrics

Sets the metrics.

Takes P_CONTROL_METRICS, returns STATUS.

Comments **clsLabel** responds by calling ancestor, then checking the CONTROL_STYLE.**showDirty** value. If this is false, **clsLabel** just returns. Otherwise, if the old CONTROL_STYLE.dirty value is different from the new value, then **clsLabel** uses **msgWinDirtyRect** to dirty its decoration (if it has one).

See Also **msgControlSetStyle** sets the CONTROL_STYLE values

msgControlSetDirty sets the CONTROL_STYLE.dirty bit

msgWinDirtyRect dirties a portion of a window

LISTBOX.H

This file contains the API for **clsListBox.**

clsListBox inherits from **clsScrollWin.**

Implements a scrolling list of windows (of arbitrary length).

The windows that the **listBox** manages may be of any class, and they may be of different classes within a **listBox**. The windows may have different heights as well. The **listBox** will constrain their widths as per various style settings.

A **listBox** is useful when the number of windows that could be displayed is unknown, variable, or large (say 30 or more). The **listBox** will, by default, destroy those windows that have scrolled out of view, thus keeping the number of windows in existence to a reasonable quantity.

By using a **listBox**, you trade performance for generality. If the number of windows is likely to be small and not particularly variable, you may choose to put a **tableLayout** window in as the **clientWin** of a **scrollWin** instead. The visual effect would be the same as for a **listBox**, but each of the **tableLayout**'s child windows would, by default, be around for the lifetime of the parent (and as more windows are put on the screen, the overall performance of the UI degrades).

As with most UI Toolkit classes, you may use **clsListBox** as-is, or create your own subclass for special purposes. Since a common use of a **listBox** is to present a simple list of strings to the user, you may use **clsStringListBox** instead (see strlbox.h). That class presents a somewhat simpler API for this common usage. A subclass of **clsStringListBox** is **clsFontListBox**, which gets its strings from the list of currently installed fonts on the system. **clsFontListBox** proves useful in situations such as option sheets (see fontlbox.h).

Debugging Flags

The **clsListBox** debugging flag is 'K'. Defined values are:

flag12 (0x1000) general

```
#ifndef LISTBOX_INCLUDED
#define LISTBOX_INCLUDED

#include <swin.h>
```

```
#ifndef SWIN_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT LIST_BOX;
```

ListBox Filing Styles

```
#define lbFileMin           0       // file minimum data necessary
#define lbFileEntryInfo     1       // lbFileMin + entry info except windows
#define lbFileAll           2       // lbFileEntryInfo + windows

typedef struct {
    U16     filing  :  2,
            spare   : 14;
} LIST_BOX_STYLE, *P_LIST_BOX_STYLE;
```

Default style:

```
    filing = lbFileAll
typedef struct {
    LIST_BOX_STYLE  style;
    OBJECT          client;         // client to send list box messages to.
    U16             nEntries;       // total number of entries in list box.
    U16             nEntriesToView; // show this many entries at a time.
    U32             spare;
} LIST_BOX_METRICS, *P_LIST_BOX_METRICS;
Enum16(LIST_BOX_DATA_FREE_MODE) {
    lbFreeDataNotVisible    = flag0,
    lbFreeDataWhenDestroyed = flag1,
    lbFreeDataByMessage     = flag2,
    lbFreeDataDefault       = lbFreeDataNotVisible | lbFreeDataWhenDestroyed
};
Enum16(LIST_BOX_ENTRY_STATE) {
    lbSelected      = flag0,
    lbOpen          = flag1,
    lbBusy          = flag2,
    lbStateDefault  = 0         // Not selected, not open
};
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
typedef struct LIST_BOX_POSITION_XY {
    XY32        place;      // in
    U16         position;   // in/out
    U32         spare;      // unused (reserved)
} LIST_BOX_POSITION_XY, *P_LIST_BOX_POSITION_XY;
typedef struct LIST_BOX_ENTRY_ENUM {
    U16                 max;    // in   = size of pEntry[] array.
    U16                 count;  // in   = # of entries to return in array.
                                //        If count > max then memory may be
                                //        allocated.
                                // out  = # of valid entries in array.
    U16                 next;   // in   = 0 to start at beginning
                                //        OR previous out value to pick up
                                //        where we left off.
    P_LIST_BOX_ENTRY    pEntry; // in   = Ptr to array of entries.
                                // out  = If memory was allocated client
                                //        should free the memory.
    U16                 flags;  // in   = state flags to filter on.
    U32                 spare;  // unused (reserved)
} LIST_BOX_ENTRY_ENUM, *P_LIST_BOX_ENTRY_ENUM;
#define stsListBoxEmpty                     MakeStatus(clsListBox, 1)
```

msgNew

Creates a list box (initially empty).

Takes P_LIST_BOX_NEW, returns STATUS. Category: class message.

```
typedef LIST_BOX_METRICS LIST_BOX_NEW_ONLY, *P_LIST_BOX_NEW_ONLY;
#define listBoxNewFields    \
    scrollWinNewFields      \
    LIST_BOX_NEW_ONLY       listBox;
```

Arguments

```
typedef struct {
    listBoxNewFields
} LIST_BOX_NEW, *P_LIST_BOX_NEW;
```

Comments

clsListBox sets the following values before calling its ancestor:

```
pArgs->scrollWin.style.getDelta = false;
pArgs->scrollWin.style.vertClient = swClientWin;
pArgs->scrollWin.style.horizClient = swClientScrollWin;
pArgs->scrollWin.style.getSize = true;
pArgs->scrollWin.style.forward = swForwardGesture;
```


msgNewDefaults

Initializes the LIST_BOX_NEW structure to default values.

Takes P_LIST_BOX_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct {
    listBoxNewFields
} LIST_BOX_NEW, *P_LIST_BOX_NEW;
```

Comments

clsListBox sets the following values:

```
pArgs->win.flags.style |= wsShrinkWrapHeight;
pArgs->win.flags.style &= ~wsShrinkWrapWidth;
pArgs->border.style.edge = bsEdgeAll;
pArgs->scrollWin.style.expandChildWidth = true;
pArgs->listBox.style.filing = lbFileAll;
pArgs->listBox.client = objNull;
pArgs->listBox.nEntries = 0;
pArgs->listBox.nEntriesToView = 6;
pArgs->listBox.spare = 0;
```

msgListBoxGetMetrics

Passes back the metrics for a **listBox**.

Takes P_LIST_BOX_METRICS, returns STATUS.

```
#define msgListBoxGetMetrics                MakeMsg(clsListBox, 1)
```

Message Arguments

```
typedef struct {
    LIST_BOX_STYLE  style;
    OBJECT          client;         // client to send list box messages to.
    U16             nEntries;       // total number of entries in list box.
    U16             nEntriesToView; // show this many entries at a time.
    U32             spare;
} LIST_BOX_METRICS, *P_LIST_BOX_METRICS;
```

msgListBoxSetMetrics

Sets the metrics for a **listBox**.

Takes P_LIST_BOX_METRICS, returns STATUS.

```
#define msgListBoxSetMetrics                MakeMsg(clsListBox, 2)
```

Message Arguments

```
typedef struct {
    LIST_BOX_STYLE  style;
    OBJECT          client;         // client to send list box messages to.
    U16             nEntries;       // total number of entries in list box.
    U16             nEntriesToView; // show this many entries at a time.
    U32             spare;
} LIST_BOX_METRICS, *P_LIST_BOX_METRICS;
```

Comments

You should send **msgWinLayout** to the **listBox** if the value of **nEntriesToView** has changed.

The **listBox** might ask for new entries after the SetMetrics call returns if the value of **nEntries** has changed.

msgListBoxAppendEntry

Appends an entry to the list box after the specified position.

Takes P_LIST_BOX_ENTRY, returns STATUS.

```
#define msgListBoxAppendEntry                MakeMsg(clsListBox, 3)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

If win is **objNull**, the client will receive **msgListBoxProvideEntry** when the entry needs to be displayed.

This is computationally expensive when the **listBox** has a parent. In other words, all work necessary to fix up the **listBox** is performed immediately. If you want to batch several calls, consider extracting the **listBox** first.

See Also

msgListBoxInsertEntry similar, but inserts before

msgListBoxInsertEntry

Insert an entry to the list box before the specified position.

Takes P_LIST_BOX_ENTRY, returns STATUS.

```
#define msgListBoxInsertEntry                MakeMsg(clsListBox, 4)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

If win is **objNull**, the client will receive **msgListBoxProvideEntry** when the entry needs to be displayed.

This is computationally expensive when the **listBox** has a parent. In other words, all work necessary to fix up the **listBox** is performed immediately. If you want to batch several calls, consider extracting the **listBox** first.

See Also

msgListBoxAppendEntry similar, but appends after

msgListBoxRemoveEntry

Removes an entry from the list box.

Takes U16, returns STATUS.

```
#define msgListBoxRemoveEntry                MakeMsg(clsListBox, 5)
```

Comments

If the item was added with **freeEntry** != 0, then the item is freed automatically by the list box.

This is computationally expensive when the **listBox** has a parent. In other words, all work necessary to fix up the **listBox** is performed immediately. If you want to batch several calls, consider extracting the **listBox** first.

Return Value

stsBadParam the specified position is >= number of entries

msgListBoxGetEntry

Gets an entry in a **listBox** by position.

Takes P_LIST_BOX_ENTRY, returns STATUS.

```
#define msgListBoxGetEntry                   MakeMsg(clsListBox, 6)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

Will pass back the last one if the passed position is **maxU16**.

Return Value

stsListBoxEmpty the list box has no entries

stsNoMatch the list box has no entry at that position

msgListBoxSetEntry

Sets an entry's information.

Takes P_LIST_BOX_ENTRY, returns STATUS.

```
#define msgListBoxSetEntry                   MakeMsg(clsListBox, 7)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

Typically this message is used to set an entry's data or flag values.

This message prohibits the caller from changing whether the entry has a window (by specifying an **objNull pArgs**->win when the entry has a window or vice versa). Clients should use

Append/Insert/Remove for this purpose. **msgListBoxSetEntry** does support replacing a window with a different one.

Replacing an entry window is computationally expensive when the **listBox** has a parent.

Return Value

stsListBoxEmpty the list box has no entries

stsBadParam attempt to add or remove an entry

msgListBoxFindEntry

Finds the position of the given entry window/data.

Takes P_LIST_BOX_ENTRY, returns STATUS.

```
#define msgListBoxFindEntry                MakeMsg(clsListBox, 8)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

If **pArgs**->win is non-null, **clsListBox** searches for an entry whose window matches **pArgs**->win. If **pArgs**->win is null, then **clsListBox** searches for an entry whose data fields matches **pArgs**->data.

Return Value

stsListBoxEmpty the list box has no entries

stsNoMatch the list box had no matching entry

msgListBoxEnum

Enumerates the entries of a **listBox** according to the given flags.

Takes P_LIST_BOX_ENTRY_ENUM, returns STATUS.

```
#define msgListBoxEnum                     MakeMsg(clsListBox, 9)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY_ENUM {
    U16                 max;    // in   = size of pEntry[] array.
    U16                 count;  // in   = # of entries to return in array.
                                //        If count > max then memory may be
                                //        allocated.
                                // out  = # of valid entries in array.
    U16                 next;   // in   = 0 to start at beginning
                                //        OR previous out value to pick up
                                //        where we left off.
    P_LIST_BOX_ENTRY    pEntry; // in   = Ptr to array of entries.
                                // out  = If memory was allocated client
                                //        should free the memory.
    U16                 flags;  // in   = state flags to filter on.
    U32                 spare;  // unused (reserved)
} LIST_BOX_ENTRY_ENUM, *P_LIST_BOX_ENTRY_ENUM;
```

msgListBoxEntryIsVisible

Passes back the visibility of an entry in a **listBox**.

Takes P_LIST_BOX_ENTRY, returns STATUS.

```
#define msgListBoxEntryIsVisible          MakeMsg(clsListBox, 10)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

Sets the 'arg' field to zero if not visible, non-zero if visible. If the position is **maxU16**, then uses **pArgs**->win instead.

msgListBoxXYToPosition

Gets the position for a given **listBox** window coordinate.

Takes P_LIST_BOX_POSITION_XY, returns STATUS.

```
#define msgListBoxXYToPosition            MakeMsg(clsListBox, 11)
```

Message Arguments

```
typedef struct LIST_BOX_POSITION_XY {
    XY32        place;      // in
    U16         position;   // in/out
    U32         spare;      // unused (reserved)
} LIST_BOX_POSITION_XY, *P_LIST_BOX_POSITION_XY;
```

Comments

This message resolves positions only to currently visible entry windows. It does not attempt to interpolate arbitrary coordinates to positions.

pArgs->place should be in the **listBox**'s **clientWin** space.

Return Value

stsNoMatch the place did not intersect any currently visible entry windows

msgListBoxMakeEntryVisible

Makes the specified entry visible.

Takes P_LIST_BOX_ENTRY, returns STATUS.

```
#define msgListBoxMakeEntryVisible        MakeMsg(clsListBox, 12)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

If the specified position is **maxU16**, **msgListBoxFindEntry** is first used to find the given window. If the position is not visible, it will be scrolled so that its top is at the center of the view. Otherwise, the minimum amount is scrolled. No **msgWinUpdate** is required.

Self-Sent/Client Messages

All of the messages in this section are first sent to the **listBox** itself. This is so that subclasses of **clsListBox** may intercept these messages and process them as desired. If these messages reach the **clsListBox** message handler, they will be forwarded on to the **listBox** client.

msgListBoxProvideEntry

Self-sent when a **listBox** needs a window for display.

Takes P_LIST_BOX_ENTRY, returns STATUS. Category: self-sent/client responsibility.

```
#define msgListBoxProvideEntry              MakeMsg(clsListBox, 13)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

The client should pass back a window UID in the win field. The client should also set the **freeEntry**, state, and data fields as desired. Note that the state and data fields have no meaning to **clsListBox**; they're uninterpreted fields for the client to use for any purpose.

A **listBox** will send this message even when the position it's asking for is >= the number of entries specified for the **listBox**. In this case, the client is free to return a non-zero status value, indicating to the **listBox** that no entry should be created for that position. Providing another entry window in this case allows the user to create new entries by merely scrolling past the end of the list.

If the message reaches the standard **listBox** message procedure, the **listBox** will forward the message to the client. This scheme allows subclasses of **clsListBox** to handle the message in a different way.

msgListBoxDestroyEntry

Sent to the client for an entry that has **lbFreeDataByMessage** enabled.

Takes P_LIST_BOX_ENTRY, returns STATUS. Category: self-sent/client responsibility.

```
#define msgListBoxDestroyEntry              MakeMsg(clsListBox, 14)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

The client should destroy the entry win and free any storage pointed to by the entry's 'data' field.

msgListBoxEntryGesture

Notifies the subclass / client that a gesture occurred over an entry.

Takes P_LIST_BOX_ENTRY, returns STATUS. Category: self-sent/client responsibility.

```
#define msgListBoxEntryGesture              MakeMsg(clsListBox, 15)
```

Message Arguments

```
typedef struct LIST_BOX_ENTRY {
    WIN         listBox;    // in/out:  requestor
    U16         position;   // in:      entry position
    WIN         win;        // in/out:  entry window to display
    U16         freeEntry;  // in/out:  LIST_BOX_DATA_FREE_MODE
    U16         state;      // in/out:  LIST_BOX_ENTRY_STATE
    P_UNKNOWN   data;       // in/out:  client data
    P_UNKNOWN   arg;        // message specific argument
    U32         spare;      // reserved
} LIST_BOX_ENTRY, *P_LIST_BOX_ENTRY;
```

Comments

The 'arg' field contains a P_GWIN_GESTURE pointer.

If the position is **maxU16**, this means that the listbox currently has no entry windows. Any other value indicates the position of the entry window to which the gesture is directed. The listbox will use **msgGWinTransformGesture** to translate the coordinates in the GWIN_GESTURE to be relative to the entry window.

The listbox returns (from its **msgGWinGesture/msgGWinForwardedGesture** handler) the status resulting from self-sending **msgListBoxEntryGesture**. This means that the client should return **stsOK**, **stsRequestDenied**, or **stsRequestForward** as appropriate. See gwin.h.

Messages from Other Classes

msgWinStartPage

Advises window that it is on a printer, and printing is about to start.

Takes **pNull**, returns STATUS. Category: advisory message.

Comments

clsListBox responds by ensuring that its **clientWin** is appropriately populated with entry windows.

msgWinGetBaseline

Gets the desired x,y alignment of a window.

Takes P_WIN_METRICS, returns STATUS.

Comments

clsListBox will set **pArgs**->bounds.origin.x to 0. If there is an entry window visible, **pArgs**->bounds.origin.y is set to:

<top of **scrollWin**'s inner window> - <row height>

+ <y baseline of first visible entry window>

If no entry window is visible, the y is set to 0.

MANAGER.H

This file contains the API for **clsManager**.

clsManager inherits from **clsObject.**

Provides an abstract manager class and associated protocol.

Managers are used to implement group behavior for collections of components. For example, each instance of **clsChoice** uses one to change the state of child buttons when the user is tapping on the choice's children. Also, the menu button holding onto a menu uid acts as a manager for that menu. Manager uids are held by instances of **clsTkTable**.

```
#ifndef MANAGER_INCLUDED
#define MANAGER_INCLUDED
#define managerNewFields    \
    objectNewFields
```

A manager returns **stsManagerContinue** if it wishes **msgWinSend** propogation to continue. Any other return value causes propogation to stop and the return value to be passed back to the original **msgWinSend** sender.

```
#define stsManagerContinue                      MakeMsg(clsManager, 1)
```

MBUTTON.H

This file contains the API definition for **clsMenuButton.**

clsMenuButton inherits from **clsButton.**

Menu buttons support an optional pull-down or pull-right pop-up menu.

```
#ifndef MBUTTON_INCLUDED
#define MBUTTON_INCLUDED

#include <button.h>
```

```
#ifndef BUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT MENU_BUTTON;
```

Submenu Types

```
#define mbMenuNone          0   // no sub-menu defined
#define mbMenuPullDown      1   // sub-menu is pull-down
#define mbMenuPullRight     2   // sub-menu is pull-right
#define mbMenuPopup         3   // sub-menu is popup
#define mbMenuSibling       4   // sub-menu is a window sibling
//                          5   // unused (reserved)
//                          .. // unused (reserved)
//                          7   // unused (reserved)
```

Menu Actions

```
#define mbAction1Tap        0   // menu up/down on xgs1Tap or msgPenUp
#define mbAction2Tap        1   // menu up/down on xgs2Tap
typedef struct MENU_BUTTON_STYLE {
    U16 subMenuType         : 3,    // sub-menu type
        getWidth            : 1,    // self-send msgMenuButtonProvideWidth
        getMenu             : 1,    // send msgMenuButtonProvideMenu to client
        enableMenu          : 1,    // send msgControlEnable to menu
        menuAction          : 2,    // action to bring up/down menu
        menuIsUp            : 1,    // read-only: true => menu is up
        spare               : 7;    // unused (reserved)
} MENU_BUTTON_STYLE, *P_MENU_BUTTON_STYLE;
```

Default MENU_BUTTON_STYLE:

```
    subMenuType     = mbMenuNone
    getWidth            = false
    getMenu         = false
    enableMenu      = false
   menuAction       = mbAction1Tap
    menuIsUp            = false
```

```
typedef struct MENU_BUTTON_PROVIDE_MENU {
    MENU_BUTTON     menuButton;     // In: requestor
    WIN             menu;           // In/Out: uid of menu
    U32             spare;          // reserved (unused)
} MENU_BUTTON_PROVIDE_MENU, *P_MENU_BUTTON_PROVIDE_MENU;
```

Messages

msgNew

Creates a menu button window.

Takes P_MENU_BUTTON_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct MENU_BUTTON_NEW_ONLY {
    MENU_BUTTON_STYLE   style;  // overall style
    WIN                 menu;   // sub-menu or objNull
    U32                 spare1; // unused (reserved)
    U32                 spare2; // unused (reserved)
} MENU_BUTTON_NEW_ONLY, *P_MENU_BUTTON_NEW_ONLY;
#define menuButtonNewFields     \
    buttonNewFields             \
    MENU_BUTTON_NEW_ONLY        menuButton;
typedef struct MENU_BUTTON_NEW {
    menuButtonNewFields
} MENU_BUTTON_NEW, *P_MENU_BUTTON_NEW;
```

Comments

The fields you commonly set are:

pArgs->menuButton.style.**subMenuType** kind of **subMenu**

pArgs->menuButton.menu uid of menu window

If **pArgs**->menuButton.style.**subMenuType** is **mbMenuPullRight**, sets **pArgs**->label.style.decoration to **lsDecorationPullRight**.

If **pArgs**->menuButton.style.**subMenuType** is not **mbMenuNone**, sets **pArgs**->button.style.contact to **bsContactToggle**.

If **pArgs**->menuButton.menu is not **objNull**, it self-sends **msgWinSetPopup** with WIN_METRICS parameters of child = menu;

msgNewDefaults

Initializes the MENU_BUTTON_NEW structure to default values.

Takes P_MENU_BUTTON_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct MENU_BUTTON_NEW {
    menuButtonNewFields
} MENU_BUTTON_NEW, *P_MENU_BUTTON_NEW;
```

Comments

Zeroes out **pArgs**->menuButton and sets:

```
pArgs->win.flags.style |= wsFileNoBounds;

pArgs->border.style.edge = bsEdgeNone;
pArgs->border.style.join = bsJoinSquare;
pArgs->border.style.shadow = bsShadowNone;

pArgs->gWin.style.gestureEnable = false;

pArgs->control.style.showDirty = false;

pArgs->label.style.xAlignment = lsAlignLeft;
pArgs->label.style.yAlignment = lsAlignBottom;
```

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

If the menu button has a menu, and the menu has **wsSendFile** on, **msgSave** be sent to the menu passing along **pArgs.**

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

clsMenuButton restores the instance from the file. If the menu buttona menu when filed, the menu is restored and the following is done:Sends **msgTkTableSetManager**, with **pArgs** of self to the menu. Self-sends **msgWinSetPopup** with WIN_METRICS parameters of child = menu;

msgFree

Sent as the last of three msgs to destroy an object.

Takes OBJ_KEY, returns STATUS.

If the menu button has a menu, **msgDestroy** is sent to the menu.

msgMenuButtonGetStyle

Passes back the current style values.

Takes P_MENU_BUTTON_STYLE, returns STATUS.

```
#define msgMenuButtonGetStyle   MakeMsg(clsMenuButton, 1)
```

Message Arguments

```
typedef struct MENU_BUTTON_STYLE {
    U16 subMenuType         : 3,    // sub-menu type
        getWidth            : 1,    // self-send msgMenuButtonProvideWidth
        getMenu             : 1,    // send msgMenuButtonProvideMenu to client
        enableMenu          : 1,    // send msgControlEnable to menu
        menuAction          : 2,    // action to bring up/down menu
        menuIsUp            : 1,    // read-only: true => menu is up
        spare               : 7;    // unused (reserved)
} MENU_BUTTON_STYLE, *P_MENU_BUTTON_STYLE;
```

msgMenuButtonSetStyle

Sets the style values.

Takes P_MENU_BUTTON_STYLE, returns STATUS.

```
#define msgMenuButtonSetStyle   MakeMsg(clsMenuButton, 2)
```

Message Arguments

```
typedef struct MENU_BUTTON_STYLE {
    U16 subMenuType         : 3,    // sub-menu type
        getWidth            : 1,    // self-send msgMenuButtonProvideWidth
        getMenu             : 1,    // send msgMenuButtonProvideMenu to client
        enableMenu          : 1,    // send msgControlEnable to menu
        menuAction          : 2,    // action to bring up/down menu
        menuIsUp            : 1,    // read-only: true => menu is up
        spare               : 7;    // unused (reserved)
} MENU_BUTTON_STYLE, *P_MENU_BUTTON_STYLE;
```

Comments

Note that style.**menuIsUp** is read-only -- **pArgs**->menuIsUp will be ignored.

If style.**subMenuType** changes the following is done:

- if style.**subMenuType** is **mbMenuPullRight**, the label.style.decoration is set to to **lsDecoratePullRight**, otherwise it is set to **lsDecorateNone**.
- if the menu button has a menu, button.style.contact is set to **bsContactToggle**, otherwise **bsContactMomentary**.
- if the menu button has a menu, self-sends **msgWinSetPopup** with WIN_METRICS parameters of child = menu;

msgMenuButtonGetMenu

Passes back the menu, **objNull** if none.

Takes P_MENU, returns STATUS.

```
#define msgMenuButtonGetMenu    MakeMsg(clsMenuButton, 3)
```

Comments

Note that this message does not result in **msgMenuButtonProvideMenu** to the menu button's client, even if style.**getMenu** is true. To retrieve the menu that will be shown, send **msgMenuButtonProvideMenu** to the menu button.

See Also

msgMenuButtonProvideMenu

msgMenuButtonSetMenu

Sets the menu.

Takes MENU, returns STATUS.

```
#define msgMenuButtonSetMenu    MakeMsg(clsMenuButton, 4)
```

Comments

The submenu is only used if style.**subMenuType** is not **mbMenuNone**. Note that the old menu, if any, is not freed. If the new menu is not **objNull**, self-sends **msgWinSetPopup** with WIN_METRICS parameters of

child = menu;

msgMenuButtonProvideWidth

Self-sent when style.**getWidth** is true.

Takes P_S32, returns STATUS. Category: self-sent.

```
#define msgMenuButtonProvideWidth   MakeMsg(clsMenuButton, 7)
```

Comments

Subclasses should respond with the desired width of the menu button. **clsMenuButton** responds with self's current window width.

msgMenuButtonInsertMenu

Self-sent when style.**menuAction** is detected.

Takes WIN, returns STATUS. Category: self-sent.

```
#define msgMenuButtonInsertMenu MakeMsg(clsMenuButton, 10)
```

Comments

Subclasses should respond by inserting **pArgs** into the window tree. If style.**subMenuType** is **mbMenuSibling**, **clsMenuButton** responds by inserting **pArgs** as a window sibling to self. Otherwise, **msgMenuShow**(true), is sent to **pArgs**.

msgMenuButtonExtractMenu

Self-sent when style.**menuAction** is detected.

Takes WIN, returns STATUS. Category: self-sent.

```
#define msgMenuButtonExtractMenu    MakeMsg(clsMenuButton, 11)
```

Comments

Subclasses should respond by extracting **pArgs** from the window tree. **clsMenuButton** responds by sending **msgMenuShow**(false) to **pArgs**. If style.**subMenuType** is **mbMenuSibling**, **clsMenuButton** responds by sending **msgWinExtract** to **pArgs**. Otherwise, **msgMenuShow**(false), is sent to **pArgs**.

msgMenuButtonShowMenu Arguments

```
Enum16(MENU_BUTTON_SHOW_MENU) {
    mbShowToggle    = 0,    // toggle the state of the menu
    mbShowExtract   = 1,    // take down the menu
    mbShowInsert    = 2     // put up the menu
};
```

msgMenuButtonShowMenu

Puts up or takes down the menu.

Takes MENU_BUTTON_SHOW_MENU, returns STATUS.

```
#define msgMenuButtonShowMenu   MakeMsg(clsMenuButton, 5)
```

Message Arguments

```
Enum16(MENU_BUTTON_SHOW_MENU) {
    mbShowToggle    = 0,    // toggle the state of the menu
    mbShowExtract   = 1,    // take down the menu
    mbShowInsert    = 2     // put up the menu
};
```

Comments

If the menu is currently up, and **pArgs** is **mbShowToggle** or **mbShowExtract**, does the following:

- self-sends **msgMenuButtonExtractMenu**(menu).
- if style.**getMenu** is true, sends **msgMenuButtonMenuDone** with the following MENU_BUTTON_PROVIDE_MENU parameters to the menu button's client:

```
menuButton  = self;
menu        = menu;
```

If the menu is currently down, and **pArgs** is **mbShowToggle** or **mbShowInsert**, does the following:

- if style.**subMenuType** is not **mbMenuSibling** and the menu has **wsLayoutDirty** set in its WIN_METRICS.flags.style, sends **msgWinLayout** with the following WIN_METRICS parameters to the menu:

```
options = wsLayoutResize;
```

- if style.**getMenu** is true, sends **msgMenuButtonProvideMenu** with the following MENU_BUTTON_PROVIDE_MENU parameters to the menu button's client (and then the resulting MENU_BUTTON_PROVIDE_MENU.menu will be used):

```
menuButton  = self;
menu        = menu;
```

- if style.**enableMenu** is true, the process of the selection owner is compared against the process of OSThisApp(). The menu is sent **msgControlEnable** with the following CONTROL_ENABLE parameters:

```
root    = self;
enable  = true if processes match, false otherwise
```

- msgMenuButtonPlaceMenu is self-sent with the following WIN_METRICS parameters:

```
bounds.size     = current menu size;
bounds.origin   = origin of self, in theRootWindow space;
```

- msgWinDelta is sent to the menu to position it at the resulting origin.
- msgTkTableSetManager(self) is sent to the menu.
- self-sends **msgMenuButtonInsertMenu**(menu).

Note that if style.**subMenuType** is **mbMenuSibling**, **msgWinLayout** is not sent to self's parent. The caller must do this to insure the correct layout.

msgMenuButtonPlaceMenu

Self-sent whenever a menu button needs to position its associated menu.

Takes P_WIN_METRICS, returns STATUS. Category: self-sent.

```
#define msgMenuButtonPlaceMenu  MakeMsg(clsMenuButton, 6)
```

Comments

If this message reaches **clsMenuButton**, that class will do some default positioning. In the message arguments:

bounds.origin In origin of menu *button* wrt/theRootWindow Out: origin of *menu* wrt/theRootWindow

bounds.size In size of menu

Since **clsMenuButton** uses **msgMenuShow** to display the menu, and that message always ensures that the menu lies within **theRootWindow**, there's no need in the method for **msgMenuButtonPlaceMenu** to check the bounds of the menu against **theRootWindow**.

msgMenuButtonProvideMenu

Sent to the client if style.**getMenu** is true.

Takes P_MENU_BUTTON_PROVIDE_MENU, returns STATUS. Category: client responsibility.

```
#define msgMenuButtonProvideMenu    MakeMsg(clsMenuButton, 8)
```

Message Arguments

```
typedef struct MENU_BUTTON_PROVIDE_MENU {
    MENU_BUTTON     menuButton;     // In: requestor
    WIN             menu;           // In/Out: uid of menu
    U32             spare;          // reserved (unused)
} MENU_BUTTON_PROVIDE_MENU, *P_MENU_BUTTON_PROVIDE_MENU;
```

Comments

clsMenuButton will send this message to the client of the menu button just before showing the menu. The MENU_BUTTON_PROVIDE_MENU parameters will be set as follows:

menuButton = uid of menu button needing the menu

menu = uid of last provided or set (via **msgMenuButtonSetMenu**) menu

The client may modify the passed menu or supply a different menu uid. If the client makes changes to the menu that invalidate its layout or supplies a different uid, the client should lay out the menu before returning. If the client changes the uid of the menu, **clsMenuButton** will self-send **msgMenuButtonSetMenu**(**pArgs**->menu) (i.e. the menu button will remember the provided menu for future use). The client will be sent **msgMenuButtonMenuDone** when the menu button is finished with the menu.

Note that this message can also be sent to a menu button to retrieve the actual menu that would be shown by the menu button. If style.**getMenu** is true, **clsMenuButton** will send **msgMenuButtonProvideMenu** to the menu button's client. In this case, the caller must send **msgMenuButtonMenuDone** to the menu button when finished with the menu.

See Also **msgMenuButtonMenuDone**

---

msgMenuButtonMenuDone

Sent to the client if style.**getMenu** is true.

Takes P_MENU_BUTTON_PROVIDE_MENU, returns STATUS. Category: client responsibility.

```
#define msgMenuButtonMenuDone       MsgNoError(MakeMsg(clsMenuButton, 9))
```

Message Arguments

```
typedef struct MENU_BUTTON_PROVIDE_MENU {
    MENU_BUTTON     menuButton;     // In: requestor
    WIN             menu;           // In/Out: uid of menu
    U32             spare;          // reserved (unused)
} MENU_BUTTON_PROVIDE_MENU, *P_MENU_BUTTON_PROVIDE_MENU;
```

Comments **clsMenuButton** will send this message to the menu button's client when the menu button has taken down the menu and style.**getMenu** is true. Note that **clsMenuButton** does remember the uid of the menu even after sending this message. If the client destroys the menu, **msgMenuButtonSetMenu(objNull)** should be sent to the menu button.

If **clsMenuButton** receives this message, and style.**getMenu** is true, this message will be forwarded to the menu button's client.

Messages from Other Classes

---

msgWinLayoutSelf

Tell a window to layout its children.

Takes P_WIN_METRICS, returns STATUS.

Comments If the menu button has a menu, and style.**getWidth** is true and **pArgs**->options has **wsLayoutResize** set and the menu button has **wsShrinkWrapWidth** on, **clsButton** self-sends **msgMenuButtonProvideWidth** to compute **pArgs**->bounds.size.w.

---

msgWinSend

Sends a message up a window ancestry chain.

Takes WIN_SEND, returns STATUS.

Comments **clsMenuButton** acts as the manager for its menu, and looks for **msgMenuDone** to be sent via **msgWinSend**.

If style.**subMenuType** is not **mbMenuNone** and **pArgs**->msg is **msgMenuDone**, and the menu is currently up, and **pArgs**->data[0] is not self, **clsMenuButton** will do the following:

- take down the menu as in **msgMenuButtonShowMenu**.
- self-send **msgButtonSetNoNotify**, false to turn off the menu button.
- ObjectCallAncestor() to all the **msgWinSend** to continue up the window tree.

If **pArgs**->data[0] is self, nothing is done and **stsOK** is returned without calling ancestor. This allows, for example, prevents a menu button with a pull-right menu from taking down the menu containing the menu button.

msgGWinGesture:

Called to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

If **pArgs**->msg is xgs2Tap and style.**menuAction** is **mbAction2Tap** and style.**subMenuType** is not **mbMenuNone**, the menu will be inserted/removed as in **msgMenuButtonShow**.

clsMenuButton will notify its manager after any gesture.

clsMenuButton self-sends **msgButtonNotifyManager** with the following BUTTON_NOTIFY parameters:

```
msg     = msgMenuDone;
data    = self;
button  = self;
```

This is followed by ObjectCallAncestor(), to allow the gesture to be processed normally.

msgControlSetClient

Sets the control metrics.client.

Takes UID, returns STATUS.

Comments

clsMenuButton will send **msgTkTableSetClient**(**pArgs**) to the menu.

MCICON.H

This file contains the API definition for **clsMoveCopyIcon**.

clsMoveCopyIcon inherits from **clsIcon.**

Move-copy icons support the move/copy UI. Move-copy icon with drag style **mcDragMove** will appear with a single marquee. Move-copy icon with drag style **mcDragCopy** will appear with a double marquee.

```
#ifndef MCICON_INCLUDED
#define MCICON_INCLUDED

#include <icon.h>
```

```
#ifndef ICON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT MOVE_COPY_ICON;
```

Drag Styles

```
#define mcDragNone              0   // disabled
#define mcDragMove              1   // drag means move
#define mcDragCopy              2   // drag means copy
//                              3   // unused (reserved)
typedef struct MOVE_COPY_ICON_STYLE {
    U16 move                : 2,    // private
        copy                : 2,    // private
        drag                : 2,    // drag behavior
        destroyOnSelChange  : 1,    // destroy self on msgSelChangedOwners
        spare               : 9;    // unused (reserved)
} MOVE_COPY_ICON_STYLE, *P_MOVE_COPY_ICON_STYLE;
```

tag for **clsTrack** instances created by **clsMoveCopyIcon**

```
#define tagMoveCopyIconTrack            MakeTag(clsMoveCopyIcon, 1)
```

Messages

msgNew

Creates a move-copy icon window.

Takes P_MOVE_COPY_ICON_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct MOVE_COPY_ICON_NEW_ONLY {
    MOVE_COPY_ICON_STYLE        style;          // overall style
    U32                         spare;          // unused (reserved)
} MOVE_COPY_ICON_NEW_ONLY, *P_MOVE_COPY_ICON_NEW_ONLY;
#define moveCopyIconNewFields       \
    iconNewFields                   \
    MOVE_COPY_ICON_NEW_ONLY         moveCopyIcon;
```

```
typedef struct MOVE_COPY_ICON_NEW {
    moveCopyIconNewFields
} MOVE_COPY_ICON_NEW, *P_MOVE_COPY_ICON_NEW;
```

Comments

If style.drag is not **mcDragNone**, sets the following:

```
pArgs->win.flags.input |= inputMoveDown | inputMoveDelta;
pArgs->win.flags.input &= ~inputLRContinue;

pArgs->gWin.style.gestureEnable = false;

pArgs->border.style.edge            = bsEdgeAll;
pArgs->border.style.leftMargin      = bsMarginSmall;
pArgs->border.style.rightMargin     = bsMarginSmall;
pArgs->border.style.bottomMargin    = bsMarginSmall;
pArgs->border.style.topMargin       = bsMarginSmall;
pArgs->border.style.borderInk       = bsInkBlack;
pArgs->border.style.lineStyle       =
    (pArgs->moveCopyIcon.style.drag == mcDragMove) ?
    bsLineMarquee : bsLineDoubleMarquee;
pArgs->border.style.selected        = true;
```

Note that if you set style.**destroyOnSelChanged** to true, you must add the move copy icon as an observer of **theSelectionManager** to have the move copy icon notified when the selection changes.

msgNewDefaults

Initializes the MOVE_COPY_ICON_NEW structure to default values.

Takes P_MOVE_COPY_ICON_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct MOVE_COPY_ICON_NEW {
    moveCopyIconNewFields
} MOVE_COPY_ICON_NEW, *P_MOVE_COPY_ICON_NEW;
```

Comments

Zeroes out **pArgs**->moveCopyIcon and sets

```
pArgs->moveCopyIcon.style.move = mcMoveCopyEnable;
pArgs->moveCopyIcon.style.copy = mcMoveCopyEnable;
```

Default MOVE_COPY_ICON_STYLE:

```
drag                = mcDragNone
destroyOnSelChange  = false
```

msgMoveCopyIconGetStyle

Passes back the current style values.

Takes P_MOVE_COPY_ICON_STYLE, returns STATUS.

```
#define msgMoveCopyIconGetStyle     MakeMsg(clsMoveCopyIcon, 1)
```

Message Arguments

```
typedef struct MOVE_COPY_ICON_STYLE {
    U16 move                : 2,    // private
        copy                : 2,    // private
        drag                : 2,    // drag behavior
        destroyOnSelChange  : 1,    // destroy self on msgSelChangedOwners
        spare               : 9;    // unused (reserved)
} MOVE_COPY_ICON_STYLE, *P_MOVE_COPY_ICON_STYLE;
```

msgMoveCopyIconSetStyle

Sets the style values.

Takes P_MOVE_COPY_ICON_STYLE, returns STATUS.

```
#define msgMoveCopyIconSetStyle     MakeMsg(clsMoveCopyIcon, 2)
```

Message Arguments

```
typedef struct MOVE_COPY_ICON_STYLE {
    U16 move                : 2,    // private
        copy                : 2,    // private
        drag                : 2,    // drag behavior
        destroyOnSelChange  : 1,    // destroy self on msgSelChangedOwners
        spare               : 9;    // unused (reserved)
} MOVE_COPY_ICON_STYLE, *P_MOVE_COPY_ICON_STYLE;
```

Comments

Note that changing style.drag is not implemented.

msgMoveCopyIconDone

Sent to the control.client when the icon completes move or copy mode.

Takes P_MOVE_COPY_ICON_DONE, returns STATUS. Category: client notification.

```
#define msgMoveCopyIconDone     MakeMsg(clsMoveCopyIcon, 6)
```

Arguments

```
typedef struct MOVE_COPY_ICON_DONE {
    WIN         icon;       // icon sending msg
    BOOLEAN     move;       // true for Move, false for Copy
    WIN         dest;       // destination window to move/copy to
    XY32        destXY;     // point to move/copy to in dest space
    XY32        penOffset;  // offset of pen from icon origin (grab point)
    SIZE32      iconSize;   // unused (reserved)
    U32         spare1;     // unused (reserved)
    U32         spare2;     // unused (reserved)
    U32         spare3;     // unused (reserved)
} MOVE_COPY_ICON_DONE, *P_MOVE_COPY_ICON_DONE;
```

Comments

If the client responds with **stsRequestDenied**, **stsMessageIgnored**, or a status < **stsOK**, the **moveCopyIcon** will be jumped to **pArgs**->rect.origin and the single or double marquee will be restarted. Otherwise, **msgDestroy** will be self-sent.

msgMoveCopyIconCancel

Sent to the control.client when the icon cancels move or copy mode.

Takes OBJECT, returns STATUS. Category: client notification.

```
#define msgMoveCopyIconCancel   MakeMsg(clsMoveCopyIcon, 5)
```

Comments

clsMoveCopyIcon will send self as **pArgs**. This is sent when style.**destroyOnSelChange** is true, and **msgSelChangedOwners** is received.

Messages from other classes

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments

If style.drag is not **mcDragNone**, **clsMoveCopyIcon** responds as follows:

If **pArgs**->devCode is **msgPenMoveDown** and the pen has moved beyonddefined threshold, or **pArgs**->devCode is **msgPenExitDown**, an instance ofwill be created to indicate the move/copy.

If **pArgs**->devCode is **msgPenUp**, and **msgPenDown** has already been seen,is sent to the client.

msgTrackProvideMetrics

Sent to a track client before track is created.

Takes P_TRACK_METRICS, returns STATUS. Category: third-party notification.

Comments

If **pArgs**->tag is **tagMoveCopyIconTrack**, **msgTrackProvideMetrics(pArgs)** is sent to the **moveCopyIcon**'s client.

msgTrackDone

Sent by a tracker when it's done.

Takes P_TRACK_METRICS, returns STATUS. Category: client notification.

```
#define msgTrackDone            MakeMsg(clsTrack, 6)
```

Comments

clsMoveCopyIcon will hit-detect **pArgs**->curXY to locate the window over which the track was dropped. The client will be sent **msgMoveCopyIconDone** with the following MOVE_COPY_ICON_DONE parameters:

```
icon        = self;
move        = true for move, false for copy;
dest        = destination window;
destXY      = pArgs->curXY in dest window's space;
penOffset   = pArgs->curXY in pArgs->rect-relative space;
```

msgSelChangedOwners

Notify the observers when either of the selection owners have changed.

Takes P_SEL_OWNERS, returns STATUS.

Comments

If style.**destroyOnSelChange** is true, **clsMoveCopyIcon** will send **msgMoveCopyIconCancel**(self) to its client followed by **msgDestroy** to self.

MENU.H

This file contains the API definition for **clsMenu**.

clsMenu inherits from **clsTkTable**.

Menus are collections of menu buttons (each of the latter may have a submenu associated with it, which in turn is a collection of menu buttons...).

```
#ifndef MENU_INCLUDED
#define MENU_INCLUDED

#include <tktable.h>

#include <mbutton.h>
```

```
#ifndef TKTABLE_INCLUDED

#endif
#ifndef MBUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT MENU, *P_MENU;
```

Menu Type Styles

```
#define msTypeMenuBar   0       // horizontal menu bar
#define msTypeMenu      1       // pull-down or pull-right
//                      2       // unused (reserved)
//                      3       // unused (reserved)
typedef struct MENU_STYLE {
    U16 type    : 2,    // menu type
        spare   : 14;   // unused (reserved)
} MENU_STYLE, *P_MENU_STYLE;
```

Messages

msgNew

Creates a menu window, together with the child windows specified in **pEntries**.

Takes P_MENU_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct MENU_NEW_ONLY {
    MENU_STYLE      style;          // overall style
    MENU_BUTTON_NEW menuButtonNew;  // storage for default child new struct
    U32             spare;          // unused (reserved)
} MENU_NEW_ONLY, *P_MENU_NEW_ONLY;
#define menuNewFields       \
    tkTableNewFields    \
    MENU_NEW_ONLY           menu;
typedef struct MENU_NEW {
    menuNewFields
} MENU_NEW, *P_MENU_NEW;
```

Comments

If **pArgs**->menu.style.type is **msTypeMenu**, the following is done before ObjectCallAncestor():

```
pArgs->win.flags.style |= wsSaveUnder;
pArgs->win.flags.style |= wsClipSiblings;
pArgs->win.flags.style &= ~(U32)wsParentClip;

pArgs->border.style.shadow          = bsShadowThinBlack;
pArgs->border.style.shadowGap       = bsGapTransparent;

pArgs->border.style.leftMargin      = bsMarginMedium;
pArgs->border.style.rightMargin     = bsMarginMedium;
pArgs->border.style.bottomMargin    = bsMarginMedium;
pArgs->border.style.topMargin       = bsMarginMedium;

pArgs->tableLayout.style.growChildWidth = true;
pArgs->tableLayout.style.wrap = false;

pArgs->tableLayout.numRows.constraint   = tlInfinite;
pArgs->tableLayout.numCols.constraint   = tlAbsolute;
pArgs->tableLayout.numCols.value        = 1;
pArgs->tableLayout.colWidth.constraint  = tlChildrenMax;
```

msgNewDefaults

Initializes the MENU_NEW structure to default values.

Takes P_MENU_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct MENU_NEW {
    menuNewFields
} MENU_NEW, *P_MENU_NEW;
```

Comments

Zeroes out **pArgs**->menu and sets

```
pArgs->win.flags.style |= wsFileNoBounds;

pArgs->embeddedWin.style.selection = ewSelectPreserve;

pArgs->gWin.style.gestureEnable = false;

pArgs->border.style.edge = bsEdgeAll;
pArgs->border.style.leftMargin = bsMarginMedium;
pArgs->border.style.rightMargin = bsMarginMedium;
pArgs->border.style.bottomMargin = bsMarginSmall;
pArgs->border.style.topMargin = bsMarginMedium;

// layout for msTypeMenuBar
pArgs->tableLayout.style.growChildWidth = false;
pArgs->tableLayout.style.growChildHeight = false;
pArgs->tableLayout.style.wrap = true;

pArgs->tableLayout.colWidth.gap = defaultColGap;
pArgs->tableLayout.rowHeight.constraint = tlGroupMax;
pArgs->tableLayout.rowHeight.gap = defaultRowGap;

pArgs->menu.style.type = msTypeMenuBar;
```

The menu is a table of **clsMenuButton** buttons, so **pArgs**->tkTable.**pButtonNew** is set to the address of **pArgs**->menu.**menuButtonNew**. This **menuButtonNew** is initialized using **msgNewDefaults** to **clsMenuButton**, then altered as in **msgTkTableChildDefaults**. See **msgTkTableChildDefaults** for more info.

Default Menu style:

```
type = msTypeMenuBar
```

msgMenuGetStyle

Passes back the current style values.

Takes P_MENU_STYLE, returns STATUS.

```
#define msgMenuGetStyle     MakeMsg(clsMenu, 4)
```

Message Arguments

```
typedef struct MENU_STYLE {
    U16 type    : 2,    // menu type
        spare   : 14;   // unused (reserved)
} MENU_STYLE, *P_MENU_STYLE;
```

msgMenuSetStyle

Sets the style values.

Takes P_MENU_STYLE, returns STATUS.

```
#define msgMenuSetStyle     MakeMsg(clsMenu, 5)
```

Message Arguments

```
typedef struct MENU_STYLE {
    U16 type    : 2,    // menu type
        spare   : 14;   // unused (reserved)
} MENU_STYLE, *P_MENU_STYLE;
```

Comments

Note: setting style.type is not implemented.

msgMenuShow

Puts up or takes down the menu by inserting or extracting it as a child of **theRootWindow**.

Takes BOOLEAN, returns STATUS.

```
#define msgMenuShow         MakeMsg(clsMenu, 1)
```

Comments

To show the menu, first delta the menu to the desired position, in root window space and use **pArgs** of true. To hide the menu, use **pArgs** of false.

Before showing the menu, the menu's origin is altered as follows (in this order):

- If the menu is wider or taller than **theRootWindow**, the menu will be placed in an instance of **clsScrollWin** to allow the user to scroll through the menu contents.
- If the menu falls off the right edge of the root window, the menu is right-justified.
- If the menu falls off the left edge of the root window, the menu is left-justified.
- If the menu falls below the bottom edge of the root window, the menu is bottom-justified.
- If the menu falls above the top edge of the root window, the menu is top-justified.

The menu will insert itself as an input filter when shown, and remove itself when hidden. The menu will be extracted from the root window when hidden.

msgMenuDone

Sent via **msgWinSend** to the manager when the menu is "done".

Takes WIN, returns STATUS. Category: manager notification.

```
#define msgMenuDone         MakeMsg(clsMenu, 2)
```

Comments

The manager should use **msgMenuShow** to take down the menu. See **msgWinSend** for **clsMenu**'s response to **msgMenuDone** via **msgWinSend**.

msgMenuAdjustSections

Adjusts the border edges and margins of children to correctly reflect a sectioned menu.

Takes BOOLEAN, returns STATUS.

```
#define msgMenuAdjustSections       MakeMsg(clsMenu, 3)
```

Comments

This message is provided for compatibility and results in a self-send of **msgTblLayoutAdjustSections**. New clients should use **msgTblLayoutAdjustSections** directly.

See Also

msgTblLayoutAdjustSections

Messages from other classes

msgTkTableChildDefaults

Sets the defaults in **pArgs** for a common child.

Takes P_UNKNOWN, returns STATUS.

Comments

clsMenu sets up defaults for each child as follows:

```
pArgs->win.flags.style |= wsParentClip;
pArgs->win.flags.style &= ~(U32)(wsClipSiblings|wsClipChildren);
```

If the child is a descendant of **clsBorder**, then

```
pArgs->border.style.backgroundInk |= bsInkExclusive;
```

If the child is a descendant of **clsButton**, then

```
pArgs->button.style.manager = bsManagerParent;
```

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments

clsMenu receives input events as a result of the InputFilterAdd() done during **msgMenuShow**. The events are handled as follows:

- If **pArgs**->destination is self, **stsInputSkip** returned.
- If **pArgs**->destination is a descendant of self (i.e. in the menu's window tree), the event is passed through to the destination by returning **stsInputSkip**.
- If the **pArgs**->devCode is **msgPenDown**, **clsMenu** will ObjectCallAncestor() **msgWinSend** with the following WIN_SEND parameters:

```
msg     = msgMenuDone;
data[0] = pArgs->destination;
flags   = wsSendDefault;
lenSend = SizeOf(WIN_SEND);
```

  This is intended as a notification to the menu's manager that themenu is ready to be taken down. If **pArgs**->destination is a descendant of **clsMenuButton**, **stsInputContinue** is returned to allow the input event to continue; otherwise, the event is terminated by returning **stsInputTerminateRemoveStroke**.

- All other input events result in a return status of **stsInputContinue**.

msgWinSend

Sends a message up a window ancestry chain.

Takes WIN_SEND, returns STATUS.

Comments

clsMenu looks for manager notifications of **msgMenuDone** or **msgButtonDone** via **msgWinSend**.

If **pArgs**->msg is **msgMenuDone** and **pArgs**->data[0] is a descendant of self, **clsMenu** will return **stsOK**. This prevents self's manager from receiving the **msgMenuDone** and taking down the menu. This prevents, for example, a pull-right menu coming down from taking down its main menu.

If **pArgs**->msg is **msgButtonDone**, **pArgs**->msg is replaced with **msgMenuDone** before calling ObjectCallAncestor(). This results, for example, in the menu coming down when a button in the menu is hit.

All other values of **pArgs**->msg result in ObjectCallAncestor().

MFILTER.H

This file contains the API for **clsModalFilter**.

clsModalFilter inherits from **clsObject.**

Modal filters implement window-relative input modality.

Modal filters are useful for making a window tree behave in a modal fashion: the user must interact with the windows in the tree (and make it go away) before they can use other windows in the application (or system).

Here is an example of how to set up a modal filter object:

```
MODAL_FILTER_NEW    mfn;

// Create it.
ObjCallWarn(msgNewDefaults, clsModalFilter, &mfn);
mfn.modalFilter.flags = <appropriate flags>;
mfn.modalFilter.process = OSThisProcess();
mfn.modalFilter.subTreeRoot = <root of window tree to make modal>;
ObjCallRet(msgNew, clsModalFilter, &mfn, s);

// Activate it.
ObjCallRet(msgModalFilterActivate, mfn.object.uid, pNull, s);

// Tell input system about it.
StsRet(InputFilterAdd( \
    mfn.object.uid, inputAllRealEventsFlags, 0, <priority>), s);
```

See input.h for a discussion of filter priorities and tips on choosing a priority.

Debugging Flags

The **clsModalFilter** debugging flag is 'K'. Defined values are:

flag10 (0x0400) general

```
#ifndef MFILTER_INCLUDED
#define MFILTER_INCLUDED

#include <clsmgr.h>

#include <ostypes.h>

#include <win.h>
```

```
#ifndef CLSMGR_INCLUDED

#endif
#ifndef OSTYPES_INCLUDED

#endif
#ifndef WIN_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT MODAL_FILTER, *P_MODAL_FILTER;
// Flags
#define mfSystemModal       flag0
#define mfAutoDismiss       flag1
#define mfDefaultFlags      mfAutoDismiss
```

```
typedef struct MODAL_FILTER_METRICS {
    U16         flags;
    OS_TASK_ID  process;        // app process for filter; ignored for mfSystemModal
    WIN         subTreeRoot;    // window tree to which to give events
    U32         spare;          // reserved
} MODAL_FILTER_METRICS,  *P_MODAL_FILTER_METRICS;
```

msgNew

Creates a modal filter.

Takes P_MODAL_FILTER_NEW, returns STATUS. Category: class message.

```
typedef MODAL_FILTER_METRICS    MODAL_FILTER_NEW_ONLY, *P_MODAL_FILTER_NEW_ONLY;
#define modalFilterNewFields    \
    objectNewFields             \
    MODAL_FILTER_NEW_ONLY       modalFilter;
```

Arguments

```
typedef struct MODAL_FILTER_NEW {
    modalFilterNewFields
} MODAL_FILTER_NEW, *P_MODAL_FILTER_NEW;
```

Comments

The fields you commonly set are:

pArgs->modalFilter.flags appropriate flags

pArgs->modalFilter.process process owning the window tree

pArgs->modalFilter.**subTreeRoot** root of window tree for which to filter

A filter is active after **msgNew**, and becomes deactivated only after it has dismissed its window.

msgNewDefaults

Initializes the MODAL_FILTER_NEW structure to default values.

Takes P_MODAL_FILTER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct MODAL_FILTER_NEW {
    modalFilterNewFields
} MODAL_FILTER_NEW, *P_MODAL_FILTER_NEW;
```

Comments

Zeroes out **pArgs**->modalFilter and sets:

```
pArgs->modalFilter.flags = mfDefaultFlags;
```

msgModalFilterGetFlags

Passes back the receiver's flags.

Takes P_U16, returns STATUS.

```
#define msgModalFilterGetFlags      MakeMsg(clsModalFilter, 1)
```

msgModalFilterSetFlags

Sets the receiver's flags.

Takes P_U16, returns STATUS.

```
#define msgModalFilterSetFlags      MakeMsg(clsModalFilter, 2)
```

msgModalFilterActivate

Activates the filter.

Takes nothing, returns STATUS.

```
#define msgModalFilterActivate      MakeMsg(clsModalFilter, 3)
```

Comments A filter is active after **msgNew**, and becomes deactivated only after it has dismissed its window.

msgModalFilterDeactivate

Deactivates the filter.

Takes nothing, returns STATUS.

```
#define msgModalFilterDeactivate    MakeMsg(clsModalFilter, 4)
```

Comments A filter is active after **msgNew**, and becomes deactivated only after it has dismissed its window.

msgModalFilterDismissWin

Sent to the **subTreeRoot** if the win should be dismissed.

Takes nothing, returns STATUS. Category: third-party notification.

```
#define msgModalFilterDismissWin    MakeMsg(clsModalFilter, 5)
```

Messages from Other Classes

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments If the filter is inactive, or the input event's **devCode** is not of **clsPen**, or the **evfGrabTracker** flag is set in **pArgs**->flags, or there's a grabber object present (InputGetGrab), then the filter just returns **stsInputContinue**.

Next, if the **pArgs**->destination is not a valid object, the filter returns **stsInputTerminate**.

If, at this point, the **mfSystemModal** flag is clear and the process of the **pArgs**->destination doesn't match MODAL_FILTER_METRICS.process, the filter does the following:

```
if mfAutoDismiss is on
    if the pArgs->devCode is msgPenDown
        self-send msgModalFilterDeactivate
        send msgModalFilterDismissWin to MODAL_FILTER_METRICS.subTreeRoot
            (and if that returns an error status, top and flash subTreeRoot)
        return stsInputTerminate.
    otherwise return stsInputContinue.
otherwise return stsInputContinue.
```

Now, if **pArgs**->destination is within **subTreeRoot**, return **stsInputSkipTo4**. (See input.h)

Next, if the **subTreeRoot** is not a valid object, return **stsFailed**.

Next, if **mfAutoDismiss** is on and **pArgs**->devCode is **msgPenDown**:

```
self-send msgModalFilterDeactivate
send msgModalFilterDismissWin to MODAL_FILTER_METRICS.subTreeRoot
    (and if that returns an error status, top and flash subTreeRoot)
return stsInputTerminate.
```

Finally, if **pArgs**->devCode is **msgPenDown**, the filter tops the **subTreeRoot**, flashes it, and returns **stsInputTerminate.**

Return Value **stsInputContinue**

See Also **msgWinInsert** used by a filter to top the **subTreeRoot**

msgBorderFlash used by a filter to flash the **subTreeRoot**

NOTE.H

This file contains the API for **clsNote.**

clsNote inherits from **clsFrame.**

Provides the UI for system- and app-modal messages to the user.

Debugging Flags

The **clsNote** debugging flag is 'K'. Defined values are:

flag15 (0x8000) general

```
#ifndef NOTE_INCLUDED
#define NOTE_INCLUDED

#include <clsmgr.h>

#include <win.h>

#include <frame.h>

#include <tktable.h>
```

```
#ifndef CLSMGR_INCLUDED

#endif
#ifndef WIN_INCLUDED

#endif
#ifndef FRAME_INCLUDED

#endif
#ifndef TKTABLE_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef WIN     NOTE, *P_NOTE;
// Tags of component windows within a note.
#define tagNoteTitle        MakeTag(clsNote, 1)
#define tagNoteTkTable      MakeTag(clsNote, 2)
#define tagNoteCmdBar       MakeTag(clsNote, 3)
// Note flags
#define nfSystemModal       flag0
#define nfAutoDestroy       flag1
#define nfSystemTitle       flag2  // use system title; ignore pTitle
#define nfAppTitle          flag3  // use app title; ignore pTitle
#define nfUnformattedTitle flag9  // use pTitle as is (not "Note from <pTitle>")
#define nfTimeout           flag4  // dismiss on timeout or input
#define nfNoWordWrap        flag5  // don't word wrap content labels
#define nfResContent        flag6  // pContentEntries is P_NOTE_RES_ID
#define nfNoBeep            flag7  // disable prefs-controlled beeping
#define nfExplicitCancel    flag8  // note will ignore cmdBar buttons
#define nfDefaultSysFlags   \
                    (nfSystemModal | nfAutoDestroy | nfSystemTitle | nfNoBeep)
#define nfDefaultAppFlags   (nfAppTitle | nfNoBeep)
#define nfDefaultFlags      nfDefaultSysFlags
typedef struct NOTE_METRICS {
    U16             flags;          // looks and filter flags
    MESSAGE         autoDismissMsg; // returned iff win dismissed
    OBJECT          modalFilter;    // filter or objNull for default
    OS_MILLISECONDS timeout;        // timeout or 0 for user pref
    OBJECT          client;         // client for msgNoteDone
    U32             spare;          // reserved
} NOTE_METRICS, *P_NOTE_METRICS;
```

msgNew

Creates a note.

Takes P_NOTE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct {
    NOTE_METRICS        metrics;
    P_CHAR              pTitle;
    P_UNKNOWN           pContentEntries;    // used to create the content
    P_TK_TABLE_ENTRY    pCmdBarEntries;     // used to create the command bar
    U32                 spare;              // reserved
} NOTE_NEW_ONLY, *P_NOTE_NEW_ONLY;
```

If **nfSystemModal** is on, then the client is ignored. If **nfSystemModal** is off, then **msgNoteShow** returns immediately, and the client will be sent **msgNoteDone** when the note is dismissed.

If **pTitle** will be used (**nfSystemTitle** and **nfAppTitle** are off), the title will appear as follows:

"Note from <pTitle>..." if **nfUnformattedTitle** is off

"<pTitle>" if **nfUnformattedTitle** is on

```
#define noteNewFields   \
    frameNewFields      \
    NOTE_NEW_ONLY       note;
typedef struct NOTE_NEW {
    noteNewFields
} NOTE_NEW, *P_NOTE_NEW;
typedef struct {
    RES_ID  resId;      // resId for a string table resource
    U32     index;      // index within that table of a string
    U32     spare;      // reserved (unused)
} NOTE_RES_ID, *P_NOTE_RES_ID;
```

clsNote will use **msgResReadData** to read the string from either OSThisApp()'s APP_METRICS.**resList**, or **theSystemResFile** if OSThisApp() returns **objNull**.

Since **clsNote** will make a label from the string and **clsLabel** will break word-wrapped labels at newlines ('\n'), you may embed newlines in the string to force line breaks.

Comments

The fields you commonly set are:

pArgs->note.flags appropriate flags

pArgs->note.**autoDismissMsg** arg for **msgNoteCancel**

pArgs->note.timeout timeout if desired

pArgs->note.client client if app-modal

clsNote will create all the appropriate interior windows, then self-send **msgWinLayout** to size and place all the windows. After that, if either the x or y of the note's origin is 0, **clsNote** will delta the new instance so that when it is inserted as a child of **theRootWindow** the note will appear in a reasonable location.

To display and activate the note, use **msgNoteShow**.

msgNewDefaults

Initializes the NOTE_NEW structure to default values.

Takes P_NOTE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct NOTE_NEW {
    noteNewFields
} NOTE_NEW, *P_NOTE_NEW;
```

Comments

Zeroes out **pArgs**->note and sets:

```
pArgs->win.flags.style
    |= wsSaveUnder | wsShrinkWrapWidth | wsShrinkWrapHeight;
pArgs->border.style.resize = false;
pArgs->border.style.drag = bsDragNone;
pArgs->customLayout.style.limitToRootWin = true;
pArgs->frame.style.closeBox = false;
pArgs->frame.style.zoomable = false;
pArgs->note.metrics.flags = nfDefaultFlags;
```

msgNoteGetMetrics

Get the metrics of a note.

Takes P_NOTE_METRICS, returns STATUS.

```
#define msgNoteGetMetrics   MakeMsg(clsNote, 1)
```

Message Arguments

```
typedef struct NOTE_METRICS {
    U16             flags;          // looks and filter flags
    MESSAGE         autoDismissMsg; // returned iff win dismissed
    OBJECT          modalFilter;    // filter or objNull for default
    OS_MILLISECONDS timeout;        // timeout or 0 for user pref
    OBJECT          client;         // client for msgNoteDone
    U32             spare;          // reserved
} NOTE_METRICS, *P_NOTE_METRICS;
```

msgNoteSetMetrics

Set the metrics of a note.

Takes P_NOTE_METRICS, returns STATUS.

```
#define msgNoteSetMetrics   MakeMsg(clsNote, 2)
```

Message Arguments

```
typedef struct NOTE_METRICS {
    U16             flags;          // looks and filter flags
    MESSAGE         autoDismissMsg; // returned iff win dismissed
    OBJECT          modalFilter;    // filter or objNull for default
    OS_MILLISECONDS timeout;        // timeout or 0 for user pref
    OBJECT          client;         // client for msgNoteDone
    U32             spare;          // reserved
} NOTE_METRICS, *P_NOTE_METRICS;
```

Comments

clsNote will destroy any previous filter object if the filter is changed.

msgNoteShow

Displays a note.

Takes P_MESSAGE, returns STATUS.

```
#define msgNoteShow         MakeMsg(clsNote, 3)
```

Comments

If **nfSystemModal** is on, then the send of this message will block until the note is dismissed. At that time, **msgNoteShow** will set *pArgs to the message sent by the button that was hit (or **autoDismissMsg** if the win was dismissed by its modal filter). Be aware that the entire input system (and therefore the window system) will be blocked while **msgNoteShow** is waiting for completion.

If **nfSystemModal** is off, then **msgNoteShow** returns immediately. It is the app's responsibility to implement whatever notion of "modality" is appropriate. Usually this means remembering that the app should be "modal" and waiting for **msgNoteDone** to be sent to the note's client (which should usually be the app object). Although the note will filter all the input to the app and discard that input not directed at the note, the app must still respond to messages from the app framework. When **nfSystemModal** is off, the *pArgs to **msgNoteShow** is not set.

---

msgNoteDone

This is the message sent to clients when a note is dismissed.

Takes MESSAGE, returns STATUS.

```
#define msgNoteDone          MakeMsg(clsNote, 4)
```

Comments

msgNoteDone is only sent if **nfSystemModal** is off.

The parameter message is the message sent by the button that was hit (or **autoDismissMsg** if the win was dismissed by its modal filter).

---

msgNoteCancel

Informs a note that it should take itself down.

Takes P_MESSAGE, returns STATUS.

```
#define msgNoteCancel        MakeMsg(clsNote, 5)
```

Comments

This will be posted to a note when:

- it receives **msgButtonNotify** from its command bar, or
- it receives **msgModalFilterDismissWin** from its filter.

The method code will do all the final cleanup, including extracting the note window (and destroying it if **nfAutoDestroy** was on). The *pArgs message will either be returned to the original code that called **msgNoteShow** (if **nfSystemModal** is on), or passed to **msgNoteDone** (if **nfSystemModal** is off).

This message is only interesting to subclasses of **clsNote**. It should not be used by normal clients.

Messages from Other Classes

---

msgFree

Sent as the last of three msgs to destroy an object.

Takes OBJ_KEY, returns STATUS.

Comments

clsNote will use InputFilterRemove() to take its filter out of the input system's list of filters if the filter is active. **clsNote** will then send **msgDestroy** to its filter if the note had created it (as opposed to the client passing in a filter).

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments **clsNote** will restore its flags, **autoDismissMsg**, and timeout.

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments **clsNote** will file its flags, **autoDismissMsg**, and timeout. It will not file its **modalFilter** or client.

msgWinSend

Sends a message up a window ancestry chain.

Takes P_WIN_SEND, returns STATUS.

Comments The note may respond by posting itself **msgNoteCancel** (passing a pointer to its **autoDismissMsg**), depending on the **pArgs**->msg and the **nfExplicitCancel** flag.

msgWinLayoutSelf

Tells a window to layout its children (sent during layout).

Takes P_WIN_METRICS, returns STATUS.

Comments If **wsLayoutResize** is on and **nfNoWordWrap** is off and the note is shrinkwrapping in width, the note might further adjust the results of the default layout (obtained by just calling ancestor). The note's width will be forced wider if the height of the initial layout is taller than dictated by the 'golden section' ratio of h/w = 0.618.

msgGWinGesture

Self-sent to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments **clsNote** will just return the result of calling its ancestor if the note has buttons (i.e., NOTE_NEW_ONLY had a non-null **pCmdBarEntries**).

Otherwise, the note will post itself **msgNoteCancel**, passing a pointer to its **autoDismissMsg**. Although **clsNote** should check the **nfExplicitCancel** flag, it does not yet do so for **msgGWinGesture** (although this may change in the future).

See Also **msgNoteCancel** tells a note to take itself down.

msgModalFilterDismissWin

Sent to the **subTreeRoot** if the win should be dismissed.

Takes nothing, returns STATUS. Category: third-party notification.

Comments The note will respond by posting itself **msgNoteCancel**, passing a pointer to its **autoDismissMsg**.

msgTimerNotify

Notifies the client that the timer request has elapsed.

Takes P_TIMER_NOTIFY, returns nothing. Category: advisory message.

Comments

A note may receive this when a non-zero NOTE_METRICS.timeout was specified and the note was displayed via **msgNoteShow**. If this **msgTimerNotify** does indeed signify that the note should take itself down, the note will do so by posting itself **msgNoteCancel** (passing a pointer to its **autoDismissMsg**).

OPTION.H

This file contains the API for **clsOption**.

clsOption inherits from **clsFrame.**

Provides the standard looks, behavior, and protocol of option sheets.

An option sheet is a special kind of frame that you can use to display the properties of a selected object. If the selected object has several different sets of properties, then the option sheet will have several windows stacked in it like a deck of cards. Each of these windows is called an option card. For more information on option cards, please see **clsOptionTable** (in opttable.h).

The user navigates between the option cards with a popup choice, which is available on the title line of the option sheet. The popup choice contains a **clsTabButton** for each option card. The typical PenPoint developer does not need to know about how option sheets use **clsTabButton**, but feel free to take a look at it (in tbutton.h).

Although **clsOption** provides a rich API, most PenPoint developers need to understand only the following:

Messages sent by a client to an option sheet:

msgOptionAddCard

msgOptionAddLastCard

Messages sent to a sheet's client by an option sheet:

msgOptionClosed

msgOptionProvideTopCard

Messages sent to a card's client by an option sheet:

msgOptionProvideCardWin

msgOptionApplyCard

msgOptionRefreshCard

msgOptionApplicableCard

Messages self-sent by a client to create an option sheet:

msgOptionCreateSheet

msgOptionAddCards

Debugging Flags

The **clsOption** debugging flag is '%'. Defined values are:

flag8 (0x0100) general

```
#ifndef OPTION_INCLUDED
#define OPTION_INCLUDED

#include <frame.h>

#include <tktable.h>
```

```
#ifndef FRAME_INCLUDED

#endif
#ifndef TKTABLE_INCLUDED

#endif
```

Common #defines and typedefs

```
#define tagOptionApplyButton                MakeTag(clsOption, 1)
#define tagOptionApplyAndCloseButton        MakeTag(clsOption, 2)
#define tagOptionCloseButton                MakeTag(clsOption, 3)

#define hlpOptionApplyButton                tagOptionApplyButton
#define hlpOptionApplyAndCloseButton        tagOptionApplyAndCloseButton
#define hlpOptionCloseButton                tagOptionCloseButton

typedef OBJECT  OPTION;
```

Sheet Modality Style

The sheet modality style specifies whether the card is modal, and if so, whether system-modal or application-modal.

```
#define osModalNone     0
#define osModalApp      1
#define osModalSystem   2
```

Card Navigation Style

The card navigation style specifies how the user can move between option cards. GO recommends that you use a popup choice.

```
#define osNavPopup      0       // popup choice in the title bar
#define osNavTabBar     1       // tab buttons in the tab bar
//                      2       // unused (reserved)
//                      3       // unused (reserved)
typedef struct OPTION_STYLE {
    U16 senseSelection  : 1,    // observe theSelectionManager
        modality        : 2,    // whether modal, and what type
        cardNav         : 2,    // card navigation style
        getCards        : 1,    // true => enable msgOptionAddCards protocol
        needCards       : 1,    // true => current list of cards is invalid
        needTopCard     : 1,    // true => current top card is invalid
        hideNav         : 1,    // true => hide card navigation
        spare1          : 7;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} OPTION_STYLE, *P_OPTION_STYLE;
```

Default OPTION_STYLE:

```
senseSelection = true
modality       = osModalNone
cardNav        = osNavPopup
getCards       = false
needCards      = true
needTopCard    = true
hideNav        = false
```

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
typedef struct OPTION_TAG {
    OPTION  option;
    TAG     tag;
} OPTION_TAG, *P_OPTION_TAG;
```


Messages

msgNew

Creates an option sheet.

Takes P_OPTION_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct OPTION_NEW_ONLY {
    OPTION_STYLE        style;              // overall style
    P_TK_TABLE_ENTRY    pCmdBarEntries;     // optional override
    U32                 spare1;             // unused (reserved)
    U32                 spare2;             // unused (reserved)
} OPTION_NEW_ONLY, *P_OPTION_NEW_ONLY;
```

If **pCmdBarEntries** is not null, then it should be the address of a null-terminated array of entries. It is used to create a custom command bar rather than the usual Apply and Apply&Close buttons. The client of this custom command bar is set to the frame's client.

```
#define optionNewFields \
    frameNewFields      \
    OPTION_NEW_ONLY     option;
typedef struct OPTION_NEW {
    optionNewFields
} OPTION_NEW, *P_OPTION_NEW;
```

Comments

If **pArgs**->option.style.**cardNav** is **osNavPopup**, **clsOption** will create an instance of **clsTkTable** with a label and a **popupChoice** in it as the frame's title bar. The label string will be set to the frame's title string. The popup choice will contain a choice for each card in the option sheet.

msgNewDefaults

Initializes the OPTION_NEW structure to default values.

Takes P_OPTION_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct OPTION_NEW {
    optionNewFields
} OPTION_NEW, *P_OPTION_NEW;
```

Zeroes out **pArgs**->option and sets

```
pArgs->win.flags.style |= wsSendGeometry | wsSaveUnder;
```

pArgs->embeddedWin.style.selection = **ewSelectPreserve**;

pArgs->border.style.shadow = **bsShadowThickGray;>**border.style.resize = **bsResizeBottom;>**border.style.drag = **bsDragDown;>**border.style.**backgroundInk** = **bsInkGray33;>**border.style.edge = **bsEdgeAll;>**border.style.**leftMargin** = **bsMarginMedium;>**border.style.**rightMargin** = **bsMarginMedium;>**border.style.**bottomMargin** = **bsMarginMedium;>**border.style.**topMargin** = **bsMarginLarge;**

pArgs->frame.style.**clipBoard** = true;>frame.style.**closeBox** = false;>frame.style.zoomable = false;>frame.style.**cmdBar** = true;

pArgs->option.style.**senseSelection** = true;>option.style.**needCards** = true;>option.style.**needTopCard** = true;>option.style.**cardNav** = **osNavPopup;**

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

The option sheet saves its style and the tag of the current top card. This tag is used as the default value for the top card when **msgOptionProvideTopCard** is next sent (e.g., after the option sheet is restored and inserted in the window tree).

Saving an option sheet causes **msgSave** to be sent to each of the option card's tab buttons. If a card's client is OSThisApp(), its tab button records and saves this fact. Otherwise, the client is not saved.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

The option sheet restores its instance data and sets the following:

style.**needTopCard** = true;.**needCards** = true;

If the restored frame has a command bar, **msgTkTableSetClient** is sent to it to force its client to be the option sheet.

If style.**getCards** and style.**senseSelection** are true, the option sheet is set up to observe **theSelectionManager**.

Restoring an option sheet causes **msgRestore** to be sent to each of the option card's tab buttons. If a card's client was OSThisApp(), its tab button sets the client to the new value for OSThisApp(). Other cards have their client set to **objNull**.

msgOptionGetStyle

Passes back the style of the option sheet.

Takes P_OPTION_STYLE, returns STATUS.

```
#define msgOptionGetStyle       MakeMsg(clsOption, 1)
```

Message Arguments

```
typedef struct OPTION_STYLE {
    U16 senseSelection  : 1,    // observe theSelectionManager
        modality        : 2,    // whether modal, and what type
        cardNav         : 2,    // card navigation style
        getCards        : 1,    // true => enable msgOptionAddCards protocol
        needCards       : 1,    // true => current list of cards is invalid
        needTopCard     : 1,    // true => current top card is invalid
        hideNav         : 1,    // true => hide card navigation
        spare1          : 7;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} OPTION_STYLE, *P_OPTION_STYLE;
```

Comments Most clients do not need to deal with this message.

msgOptionSetStyle

Sets the style of the option sheet.

Takes P_OPTION_STYLE, returns STATUS.

```
#define msgOptionSetStyle       MakeMsg(clsOption, 2)
```

Message Arguments

```
typedef struct OPTION_STYLE {
    U16 senseSelection  : 1,    // observe theSelectionManager
        modality        : 2,    // whether modal, and what type
        cardNav         : 2,    // card navigation style
        getCards        : 1,    // true => enable msgOptionAddCards protocol
        needCards       : 1,    // true => current list of cards is invalid
        needTopCard     : 1,    // true => current top card is invalid
        hideNav         : 1,    // true => hide card navigation
        spare1          : 7;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} OPTION_STYLE, *P_OPTION_STYLE;
```

Comments Note that changing style.**cardNav** is not supported.

Most clients do not need to deal with this message.

msgOptionGetNeedCards

Passes back the value of style.**needCards**.

Takes P_BOOLEAN, returns STATUS.

```
#define msgOptionGetNeedCards   MakeMsg(clsOption, 34)
```

Comments Most clients do not need to deal with this message.

msgOptionSetNeedCards

Sets style.**needCards**.

Takes BOOLEAN, returns STATUS.

```
#define msgOptionSetNeedCards   MakeMsg(clsOption, 35)
```

Comments If style.**needCards** and style.**getCards** are true, the option sheet self-sends **msgOptionGetCards** when the current cards are needed.

Most clients do not need to deal with this message.

msgOptionGetCard

Passes back some information about a card in the option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionGetCard        MakeMsg(clsOption, 3)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

In parameters:

tag tag of the card to get.

Out parameters:

win uid of the card.

client client of the card.

Will return **stsBadParam** if a card matching the passed tag was not found in the option sheet.

Most clients do not need to deal with this message.

msgOptionGetTopCard

Passes back some information about the top card in the option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionGetTopCard     MakeMsg(clsOption, 25)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

Out parameters:

tag tag of the top card.

win uid of the card.

client client of the card.

If there is no top card, the option sheet sets all of the out parameters to null.

Most clients do not need to deal with this message.

msgOptionGetCardAndName

Passes back some information about a card in the option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionGetCardAndName     MakeMsg(clsOption, 20)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

In parameters:

tag tag of the card to get.

pName pointer to a buffer in which to put the card's name.

nameLen size of **pName** buffer in bytes (if 0, **pName** is ignored).

Out parameters:

win uid of the card.

client client of the card.

pName buffer is filled in with the first **nameLen** bytes of the name of the card (if 0 was not passed for **nameLen**).

Will return **stsBadParam** if a card matching the passed tag was not found in the option sheet.

Most clients do not need to deal with this message.

msgOptionEnumCards

Enumerates the tags of the cards in the option sheet.

Takes P_OPTION_ENUM, returns STATUS.

```
#define msgOptionEnumCards      MakeMsg(clsOption, 33)
```

Arguments

```
typedef struct OPTION_ENUM {
    U16     max,    // in = size of pTags[] array
            count;  // in = # to return in array
                    // if count > max then memory may be allocated
                    // out = # of valid entries in array
    P_TAG   pTag;   // in = ptr to array of card tags
                    // out = if memory was allocated
                    // client should free the memory using OSHeapBlockFree()
    U16     next;   // in  = 0 to start at beginning
                    //       OR previous out value to pick up
                    //       where we left off
                    // out = where we left off
    U32     flags;  // in  = various flags (must be 0 for now)
    U32     spare;  // unused (reserved)
} OPTION_ENUM, *P_OPTION_ENUM;
```

Comments

This message is sent to enumerate all of the cards that have been added to the option sheet. Typical usage is shown below.

```
TAG         cards[10];
OPTION_ENUM oe;
oe.max      = 10;       // we have space for 10 card tags
oe.count    = maxU16;   // we want all the card tags
oe.pTag     = cards;    // our tag buffer
oe.next     = 0;        // first call to msgOptionEnumCards
oe.flags    = 0;        // unused for now
ObjCallRet(msgOptionEnumCards, sheet, &oe, s);
// oe.pTag[0 .. oe.count] is the array of card tags
// ...
// free any allocated memory when finished with the tags
if (oe.pTag != cards)
    StsWarn(OSHeapBlockFree(oe.pTag));
```

Most clients do not need to deal with this message.

msgOptionSetCard

Changes some of the information of a card in the option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionSetCard        MakeMsg(clsOption, 4)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

In parameters:

tag tag of the card to set.

client client for the card.

win window for the card.

pName pointer to a buffer holding a new name, or **pNull** to keep the old name.

The option sheet changes the various parameters of the specified card. To avoid changing the name of the card, set **pArgs**->pName to **pNull**.

Most clients do not need to deal with this message.

msgOptionAddCard

Adds a card to the option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionAddCard        MakeMsg(clsOption, 5)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

In parameters:

tag tag of the card to set.

pName pointer to a buffer holding the card's name.

win window for the card.

client client for the card.

clientData any client data you want stored with the card.

If the card specified by **pArgs**->tag has already been added to the option sheet, the following is done:

- if **pArgs**->win is **objNull**, the window for the card is unchanged.
- otherwise, the current window for the card is destroyed and replacedby **pArgs**->win.
- if **pArgs**->pName is not **pNull**, the new name is used.
- the card client is replaced by **pArgs**->client.

Note that the card's tag is also used as the **helpId** of the tab button representing the card (in the popup choice card navigation menu or the tab bar). The caller should insure that quick help exists for the card with the card's tag as the **helpId**.

Most clients send this message to add a card to an option sheet (if there is more than one card).

See Also **msgOptionAddLastCard**

msgOptionAddLastCard

Adds the last card of a group to the option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionAddLastCard        MakeMsg(clsOption, 29)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments This is the same as **msgOptionAddCard**, except that the menu button for this card has a line break after it.

Most clients send this message to add the last card to an option sheet.

See Also **msgOptionAddCard**

msgOptionAddFirstCard

Adds the first card of a group to the option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionAddFirstCard       MakeMsg(clsOption, 42)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This is the same as **msgOptionAddCard**, except that the menu button for this card has a line break before it.

Most clients don't need to send this message.

See Also

msgOptionAddCard

msgOptionAddAndInsertCard

Adds a card to the option sheet and inserts it into the sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionAddAndInsertCard   MakeMsg(clsOption, 17)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This message is handled exactly as in **msgOptionAddCard**, including the case in which **pArgs**->tag has already been added to the sheet.

Normally, **msgOptionAddCard** does not actually insert the card's window into the option sheet's window tree. **msgOptionAddAndInsertCard** does insert the window.

Most clients do not need to deal with this message.

See Also

msgOptionAddCard

msgOptionRemoveCard

Removes a card from an option sheet and destroys that card.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionRemoveCard     MakeMsg(clsOption, 6)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

The option sheet removes and destroys the specified card. It also removes the window for the card, but does not destroy the window.

In parameters:

tag tag of card to remove.

Will return **stsBadParam** if a card matching the passed tag was not found in the option sheet.

Most clients do not need to deal with this message.

See Also msgOptionExtractCard

msgOptionExtractCard

Extracts a card's window from an option sheet.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionExtractCard        MakeMsg(clsOption, 19)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments The option sheet extracts the card's window, but does not destroy it. Note that the tab button for the card remains, with its win set to **objNull**.

In parameters:

tag tag of card to extract.

Out parameters:

win win of extracted card.

Will return **stsBadParam** if a card matching the passed tag was not found in the option sheet.

Most clients do not need to deal with this message.

See Also msgOptionRemoveCard

msgOptionShowCard

Causes the specified card to be displayed as the current card.

Takes P_OPTION_CARD, returns STATUS.

```
#define msgOptionShowCard        MakeMsg(clsOption, 14)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments The option sheet sends **msgOptionRefreshCard** to the card.

In parameters:

tag tag of card to show.

Out parameters:

win uid of card.

client client of card.

Will return **stsBadParam** if a card matching the passed tag was not found in the option sheet.

Most clients do not need to deal with this message.

msgOptionShowCardAndSheet

Causes the specified card to be displayed as the current card.

Takes TAG, returns STATUS.

```
#define msgOptionShowCardAndSheet       MakeMsg(clsOption, 44)
```

Comments

The sheet is shown if it is not currently shown.

The option sheet self-sends **msgOptionShowCard**(OPTION_CARD.tag = **pArgs**), followed by **msgOptionShowSheet**.

Most clients do not need to deal with this message.

See Also

msgOptionShowCard

msgOptionShowTopCard

Shows the client-defined top card.

Takes nothing, returns STATUS.

```
#define msgOptionShowTopCard        MakeMsg(clsOption, 30)
```

Comments

The option sheet sends **msgOptionProvideTopCard** to its client with the following OPTION_CARD parameters:

option = uid of the option sheet = tag of the current top card = win of the current top card = **pNull** = 0 = client of the current top card

The option sheet then shows the new top card specified by OPTION_CARD.tag by self-sending **msgOptionShowCard**.

Most clients do not need to deal with this message.

msgOptionGetCards

Gets the cards from the option sheet's client

Takes nothing, returns STATUS.

```
#define msgOptionGetCards       MakeMsg(clsOption, 32)
```

Comments

If style.**getCards** is false, this message is ignored. Otherwise, the option sheet sends **msgOptionAddCards** to its client with the following OPTION_TAG parameters:

option = uid of the option sheet = tag of the option sheet

Most clients do not need to deal with this message.

msgOptionApply

Tell the option sheet to initiate the Apply protocol.

Takes nothing, returns STATUS.

```
#define msgOptionApply          MakeMsg(clsOption, 8)
```

Comments

This message is sent by the sheet's Apply button. The option sheet sends **msgOptionApplyCard** to the top card.

Most clients do not need to deal with this message.

msgOptionApplyAndClose

Tell an option sheet to run the Apply protocol and then close itself.

Takes nothing, returns STATUS.

```
#define msgOptionApplyAndClose  MakeMsg(clsOption, 9)
```

Comments

This message is sent by the sheet's Apply&Close button. The option sheet:

sends **msgOptionApplyCard** to the top card in the sheet, and

sends **msgOptionClosed** to the sheet's client.

Most clients do not need to deal with this message.

msgOptionRefresh

Tells an option sheet to refresh its card settings.

Takes nothing, returns STATUS.

```
#define msgOptionRefresh        MakeMsg(clsOption, 21)
```

Comments

This is sent to an option sheet by the default application code when it receives a forwarded "check" gesture.

If the apply buttons in the command bar are grayed out (i.e., the top card is not applicable), nothing is done, and **stsOK** is returned.

Otherwise, the option sheet sends **msgOptionRefreshCard** to its top card. It then marks the other cards as needing to be refreshed when shown.

Most clients do not need to deal with this message.

msgOptionApplicable

Tells an option sheet to ask the top card if it is applicable.

Takes P_BOOLEAN, returns STATUS.

```
#define msgOptionApplicable     MakeMsg(clsOption, 37)
```

Comments

The option sheet sends **msgOptionApplicableCard** to its top card. It then marks the other cards as needing to be sent **msgOptionApplicableCard** when shown.

If the top card is not applicable, the command bar buttons are grayed out.

If **pArgs** is not **pNull**, true is passed back if the top card is applicable; otherwise false is passed back.

Most clients do not need to deal with this message.

msgOptionDirty

Tells an option sheet to ask the top card to dirty its controls.

Takes nothing, returns STATUS.

```
#define msgOptionDirty          MakeMsg(clsOption, 38)
```

Comments

The option sheet sends **msgOptionDirtyCard** to its top card. It then marks the other cards as needing to be sent **msgOptionDirtyCard** when shown.

Most clients do not need to deal with this message.

msgOptionClean

Tells an option sheet to ask the top card to clean its controls.

Takes nothing, returns STATUS.

```
#define msgOptionClean      MakeMsg(clsOption, 39)
```

Comments

The option sheet sends **msgOptionCleanCard** to its top card. The other cards are NOT cleaned.

Most clients do not need to deal with this message.

msgOptionToggleDirty

Tells an option sheet to toggle the dirty/clean state of the cards.

Takes nothing, returns STATUS.

```
#define msgOptionToggleDirty            MakeMsg(clsOption, 40)
```

Comments

The option sheet sends **msgOptionProvideCardDirty** to the top card's client to determine the dirty/clean state of the top card. If the client responds with **stsNotUnderstood**, the option sheet sends **msgBorderGetDirty** to the top card's window to determine the dirty/clean state.

If the top card is clean, **msgOptionDirty** is then self-sent; otherwise **msgOptionClean** is self-sent.

Most clients do not need to deal with this message.

msgOptionClose

Tells an option sheet to close itself.

Takes nothing, returns STATUS.

```
#define msgOptionClose          MakeMsg(clsOption, 10)
```

Comments

When a sheet receives **msgOptionClose**, it sends **msgOptionClosed** to the sheet's client.

A sheet self-sends **msgOptionClose** when it receives **msgFrameClose**.

Most clients do not need to deal with this message.

msgOptionGetCardMenu

Passes back the card navigation menu.

Takes P_MENU, returns STATUS.

```
#define msgOptionGetCardMenu        MakeMsg(clsOption, 26)
```

Comments

A copy of the popup card navigation menu is passed back. The option sheet returns **objNull** if style.**cardNav** is not **osNavPopup**.

Menu buttons in the navigation menu have option sheet as their client, **msgOptionShowCardAndSheet** as their message, and the appropriate card tag as their data. This causes the sheet being displayed and the appropriate card being turned to when the user taps on a menu button.

The caller must send **msgOptionCardMenuDone** when finished with the menu.

Most clients do not need to deal with this message.

See Also **msgOptionShowCardAndSheet**

msgOptionCardMenuDone

Indicates the caller is finished with the card menu.

Takes MENU, returns STATUS.

```
#define msgOptionCardMenuDone        MakeMsg(clsOption, 27)
```

Comments This message should be sent to an option sheet when the card menu retrieved via **msgOptionGetCardMenu** is no longer needed.

Most clients do not need to deal with this message.

Messages Option Sheets send to each card's client

msgOptionShowSheet

Asks the client of the option sheet to show the option sheet.

Takes P_OPTION_TAG, returns STATUS. Category: client responsibility.

```
#define msgOptionShowSheet      MakeMsg(clsOption, 28)
```

Message Arguments

```
typedef struct OPTION_TAG {
    OPTION  option;
    TAG     tag;
} OPTION_TAG, *P_OPTION_TAG;
```

Comments This message is sent by the option sheet when the user taps on a menu button in the card menu and the option sheet is not inserted in the window tree.

The client should respond by inserting the option sheet into the window tree.

msgOptionProvideCardWin

Asks the client of the card to provide the window for the card.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionProvideCardWin     MakeMsg(clsOption, 18)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This message is sent by the option sheet when a card is about to be shown, and the window for the card is **objNull**.

The card client should set **pArgs->**win to the desired card window.

Most clients need to override and handle this message.

msgOptionProvideTopCard

Asks the client of the option sheet to provide the tag for the top card.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionProvideTopCard     MakeMsg(clsOption, 31)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This message is sent by the option sheet when the top card must be shown. This can be in response to **msgOptionShowTopCard** or when the option sheet is first inserted.

The option sheet sends **msgOptionProvideTopCard** to its client with the following OPTION_CARD parameters:

option = uid of the option sheet = tag of the current top card = win of the current top card = **pNull** = 0 = client of the current top card

The option sheet's client should set **pArgs->**tag to the tag for the desired top card.

Note that only **pArgs->**tag is used as an out parameter; other changes to **pArgs** are ignored.

See Also

msgOptionShowTopCard

msgOptionProvideCardDirty

Asks the client of the card to provide the dirtiness of the card window.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionProvideCardDirty       MakeMsg(clsOption, 41)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This message is sent by the option sheet in response to **msgOptionToggleDirty**.

The card's client should return **stsOK** if the card is dirty, **stsRequestDenied** if clean.

Most clients do not need to deal with this message.

msgOptionApplyCard

This is sent to a card's client when the card should apply its settings.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionApplyCard      MakeMsg(clsOption, 12)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

With this message, an option option sheet tells a card to apply its settings to the selection. This is sent whenever the user chooses Apply or Apply&Close on the option sheet.

Most clients need to override and handle this message.

Here is the typical sequence of steps a card client should take in response:

Run through every control in the card and for each one 1) check to see if it's dirty, and if it is 2) validate it if necessary. If any control has an invalid value, return **stsFailed** from the handler for **msgOptionApplyCard**. (This step can be omitted if there's no way any control could have an invalid value.)

Again make a pass through every control in the card. If a control is dirty, apply its value.

Finally, clean all the controls in the card. This can usually be done by sending **msgControlSetDirty**(false) to the card window. Note that most "command sheets" should have their control's CONTROL_STYLE.**showDirty** set false, and so this final step should be omitted.

msgOptionRefreshCard

Tells a card's client to refresh its settings from the current selection.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionRefreshCard    MsgNoError(MakeMsg(clsOption, 11))
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This is sent to a card's client when the option sheet has received **msgOptionRefresh**. The client should refresh the card's settings from the current selection.

Most clients need to override and handle this message.

msgOptionApplicableCard

Finds out if a card is applicable to the current selection.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionApplicableCard     MakeMsg(clsOption, 22)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

The card's client should respond by returning **stsOK** if the card can be applied to the current selection, **stsFailed** if not.

Most clients need to override and handle this message.

msgOptionDirtyCard

Sent to a card's client when the card should dirty all its controls.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionDirtyCard          MakeMsg(clsOption, 23)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This is sent when the user changes the selection while an option sheet is up. It is needed so that if the card is applied to the new selection, every property on the card is applied, not just those changed by the user since the last apply.

The usual scenario is for the card window to inherit from **clsBorder**, whose instances respond to **msgBorderSetDirty** by forwarding that message on to their immediate children. Card clients may elect NOT to respond to **msgOptionDirtyCard**--if the option sheet code gets back **stsNotUnderstood**, then it will send **msgBorderSetDirty**(true) to the card window.

Most clients do not need to deal with this message.

msgOptionCleanCard

Sent to a card's client when the card should clean all its controls.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionCleanCard          MakeMsg(clsOption, 36)
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

This is sent after **msgOptionApplyCard** is sent.

The usual scenario is for the card window to inherit from **clsBorder**, whose instances respond to **msgBorderSetDirty** by forwarding that message on to their immediate children. Card clients may elect to NOT respond to **msgOptionCleanCard**--if the option sheet code gets back **stsNotUnderstood**, then it will send **msgBorderSetDirty**(false) to the card window.

Most clients do not need to deal with this message.

msgOptionUpdateCard

Sent to a card's client every time the card is about to be shown.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionUpdateCard         MsgNoError(MakeMsg(clsOption, 24))
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

Most clients do not need to respond to this message. It is intended for those circumstances where one card has dependencies on the state of another, and would need to look at that other card before being (re)displayed to the user.

See Also

msgOptionRetireCard

msgOptionRetireCard

Sent to a card's client every time the current shown card is hidden.

Takes P_OPTION_CARD, returns STATUS. Category: client responsibility.

```
#define msgOptionRetireCard         MsgNoError(MakeMsg(clsOption, 43))
```

Message Arguments

```
typedef struct OPTION_CARD {
    OPTION  option;         // out: option sheet sending the msg.
    U32     tag;            // in: tag for tab
    WIN     win;            // in: card window or objNull
    P_CHAR  pName;          // in: card name
    U16     nameLen;        // in: max. len for pName (for msgOptionGetCardAndName)
    OBJECT  client;         // in: for msgOptionRefreshCard, etc.
    U32     clientData[2];  // in: arbitrary client data
    U32     spare1;         // unused (reserved)
    U32     spare2;         // unused (reserved)
} OPTION_CARD, *P_OPTION_CARD;
```

Comments

Most clients do not need to respond to this message. It is intended for those circumstances where one card builds a context (e.g., allocates resources) when shown, and needs to destroy the context when the card is no longer shown. This can happen when another card is turned to or when the option sheet is extracted or destroyed.

See Also

msgOptionUpdateCard

Messages Option Sheets send to their frame's client

msgOptionClosed

This is sent to an option sheet's client when the sheet is closed.

Takes OPTION, returns STATUS. Category: client responsibility.

```
#define msgOptionClosed          MakeMsg(clsOption, 13)
```

Comments

The client should respond by using **msgAppRemoveFloatingWin** to take down the option sheet, then optionally destroying the sheet with **msgDestroy**.

Messages sheet clients should self-send

msgOptionCreateSheet

A message sent by convention by clients creating option sheets.

Takes P_OPTION_TAG, returns STATUS. Category: descendant responsibility.

```
#define msgOptionCreateSheet     MakeMsg(clsOption, 16)
```

Message Arguments

```
typedef struct OPTION_TAG {
    OPTION  option;
    TAG     tag;
} OPTION_TAG, *P_OPTION_TAG;
```

Comments

When you need to create an option sheet, you should self-send this this message, rather than directly creating a sheet. By following this convention, subclasses can modify the sheet or supply a different one (which would have to behave the same as the original).

When self-sending this message, the client should fill in the 'tag' of the option sheet desired (if applicable) or some other identifying value (some clients may create different kinds of option sheets). The client should also zero out the 'option' field of the OPTION_TAG struct.

In **msgOptionCreateSheet**, a client creates an EMPTY option sheet and fills in the 'option' field with the uid of the sheet. Subclasses handle this message by calling the ancestor's handler and then either modifying the sheet or supplying a new one (and destroying any non- null sheet already in the 'option' field).

msgOptionAddCards

A message to be sent by convention by clients creating option sheets.

Takes P_OPTION_TAG, returns STATUS. Category: descendant responsibility.

```
#define msgOptionAddCards        MakeMsg(clsOption, 15)
```

Message Arguments

```
typedef struct OPTION_TAG {
    OPTION  option;
    TAG     tag;
} OPTION_TAG, *P_OPTION_TAG;
```

Comments

This message embodies the second step of creating an option sheet. Just like **msgOptionCreateSheet**, **msgOptionAddCards** is self-sent by a client to fill in a sheet with some cards, and to allow subclasses of the client to modify cards or add different ones.

if style.**getCards** is true, the option sheet sends this message to the frame's client as follows:

- when the sheet is first inserted into the window tree

- if style.**cardNav** is **osNavPopup**, when the card navigation menu is neededafter the selection has changed.

Messages from other classes

msgContentsButtonGoto

Default message sent when the user taps on a menu button.

Takes TAG, returns STATUS. Category: client notification.

Comments

This is also sent to the client when the managed button is hit.

The option sheet responds by self-sending **msgOptionShowCard** with the following OPTION_CARD parameter:

tag = **pArgs**;

msgOptionBookProvideContents

Receiver passes back a window representing its contents.

Takes P_WIN, returns STATUS.

Comments

The option sheet responds by creating an instance of **clsContentsTable** with one **clsContentsButton** child for each card in the option sheet. Cards which themselves respond to **msgOptionBookProvideContents** are represented by **cbSection** style contents buttons.

OPTTABLE.H

This file contains the API definition for **clsOptionTable.**

clsOptionTable inherits from **clsTkTable.**

Option tables implement no new behavior; they only change ancestor defaults to lay out their child windows in the standard two-column table format used by option sheets.

```
#ifndef OPTTABLE_INCLUDED
#define OPTTABLE_INCLUDED

#include <tktable.h>
```

```
#ifndef TKTABLE_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT OPTION_TABLE;
typedef struct OPTION_TABLE_STYLE {
    U16 spare       : 16;   // unused (reserved)
} OPTION_TABLE_STYLE, *P_OPTION_TABLE_STYLE;
```

Messages

msgNew

Creates an option table window.

Takes P_OPTION_TABLE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct OPTION_TABLE_NEW_ONLY {
    U32                 spare1;         // unused (reserved)
    U32                 spare2;         // unused (reserved)
} OPTION_TABLE_NEW_ONLY, *P_OPTION_TABLE_NEW_ONLY;
#define optionTableNewFields    \
    tkTableNewFields            \
    OPTION_TABLE_NEW_ONLY       optionTable;
typedef struct OPTION_TABLE_NEW {
    optionTableNewFields
} OPTION_TABLE_NEW, *P_OPTION_TABLE_NEW;
```

msgNewDefaults

Initializes the OPTION_TABLE_NEW structure to default values.

Takes P_OPTION_TABLE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct OPTION_TABLE_NEW {
    optionTableNewFields
} OPTION_TABLE_NEW, *P_OPTION_TABLE_NEW;
```

Comments

Sets

```
pArgs->win.flags.style &= ~(wsClipChildren | wsFileInline);
pArgs->border.style.leftMargin = bsMarginLarge;
pArgs->border.style.rightMargin = bsMarginLarge;
pArgs->border.style.bottomMargin = bsMarginLarge;
pArgs->border.style.topMargin = bsMarginLarge;
pArgs->gWin.style.grabDown = false;
pArgs->tableLayout.style.childXAlignment = tlAlignBaseline;
pArgs->tableLayout.style.childYAlignment = tlAlignBaseline;
pArgs->tableLayout.style.growChildWidth = false;
pArgs->tableLayout.style.growChildHeight = false;
pArgs->tableLayout.numRows.constraint = tlInfinite;
pArgs->tableLayout.numRows.value = 0;
pArgs->tableLayout.numCols.constraint = tlAbsolute;
pArgs->tableLayout.numCols.value = 2;
pArgs->tableLayout.colWidth.constraint = tlGroupMax | tlBaselineBox;
pArgs->tableLayout.rowHeight.constraint = tlGroupMax | tlBaselineBox;
pArgs->tableLayout.rowHeight.gap = defaultRowGap;
pArgs->tableLayout.colWidth.gap = defaultColGap;
```

Sends **msgNewDefaults** to **clsLabel** to initialize **pNew**->tkTable.**pButtonNew**, then sets:

```
pArgs->tkTable.pButtonNew->win.flags.style |= wsParentClip;
pArgs->tkTable.pButtonNew->win.flags.style &= ~(wsClipSiblings | wsClipChildren);
pArgs->tkTable.pButtonNew->border.style.backgroundInk = bsInkTransparent;
pArgs->tkTable.pButtonNew->label.style.fontType = lsFontCustom;
pArgs->tkTable.pButtonNew->label.font.attr.weight = sysDcWeightBold;
```

PAGENUM.H

This file contains the API definition for **clsPageNum**.

clsPageNum inherits from **clsLabel**.

Page numbers are the standard notebook frame decorations which display the current page number.

```
#ifndef PAGENUM_INCLUDED
#define PAGENUM_INCLUDED

#include <label.h>
```

```
#ifndef LABEL_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT PAGE_NUM;
typedef struct PAGE_NUM_STYLE {
    U16 spare       : 16;   // unused (reserved)
} PAGE_NUM_STYLE, *P_PAGE_NUM_STYLE;
```

Messages

msgNew

Creates a pagenum window.

Takes P_PAGE_NUM_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct PAGE_NUM_NEW_ONLY {
    PAGE_NUM_STYLE  style;
    U32             pageNumber; // initial page number
    U32             spare;      // unused (reserved)
} PAGE_NUM_NEW_ONLY, *P_PAGE_NUM_NEW_ONLY;
#define pageNumNewFields    \
    labelNewFields          \
    PAGE_NUM_NEW_ONLY       pageNum;
typedef struct PAGE_NUM_NEW {
    pageNumNewFields
} PAGE_NUM_NEW, *P_PAGE_NUM_NEW;
```

msgNewDefaults

Initializes the PAGE_NUM_NEW structure to default values.

Takes P_PAGE_NUM_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct PAGE_NUM_NEW {
    pageNumNewFields
} PAGE_NUM_NEW, *P_PAGE_NUM_NEW;
```

Comments

Zeroes out **pArgs**->pageNum and sets

```
    pArgs->border.style.leftMargin = bsMarginMedium;
    pArgs->border.style.rightMargin = bsMarginMedium;
    pArgs->border.style.bottomMargin = bsMarginSmall;
    pArgs->border.style.topMargin = bsMarginMedium;
```

```
pArgs->label.style.xAlignment = lsAlignRight;
pArgs->label.style.yAlignment = lsAlignCenter;
```

msgPageNumGetStyle

Passes back the current style values.

Takes P_PAGE_NUM_STYLE, returns STATUS.

```
#define msgPageNumGetStyle      MakeMsg(clsPageNum, 1)
```

Message Arguments

```
typedef struct PAGE_NUM_STYLE {
    U16 spare       : 16;   // unused (reserved)
} PAGE_NUM_STYLE, *P_PAGE_NUM_STYLE;
```

msgPageNumSetStyle

Sets the style values.

Takes P_PAGE_NUM_STYLE, returns STATUS.

```
#define msgPageNumSetStyle      MakeMsg(clsPageNum, 2)
```

Message Arguments

```
typedef struct PAGE_NUM_STYLE {
    U16 spare       : 16;   // unused (reserved)
} PAGE_NUM_STYLE, *P_PAGE_NUM_STYLE;
```

msgPageNumGet

Passes back the current page number.

Takes P_U32, returns STATUS.

```
#define msgPageNumGet           MakeMsg(clsPageNum, 3)
```

msgPageNumSet

Sets the current page number.

Takes U32, returns STATUS.

```
#define msgPageNumSet           MakeMsg(clsPageNum, 4)
```

msgPageNumIncr

Increments the current page number.

Takes S32, returns STATUS.

```
#define msgPageNumIncr          MakeMsg(clsPageNum, 5)
```

POPUPCH.H

This file contains the API for **clsPopupChoice.**

clsPopupChoice inherits from **clsMenuButton.**

Popup choices are buttons that pop up a menu of choices when tapped.

A popup choice assumes that the first (bottom) child of its menu inherits from **clsChoice.** When this choice changes value, the popup choice button will copy the string of the new 'on' button in the choice as the popup choice's own string. Popup choices also respond to flick gestures by cycling their value among the set of possible values in the choice.

Debugging Flags

The **clsPopupChoice** debugging flag is 'K'. Defined values are:

flag13 (0x2000) general

```
#ifndef POPUPCH_INCLUDED
#define POPUPCH_INCLUDED

#include <choice.h>

#include <mbutton.h>
```

```
#ifndef CHOICE_INCLUDED

#endif
#ifndef MBUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef struct POPUP_CHOICE_STYLE {
    U16 spare;
} POPUP_CHOICE_STYLE, *P_POPUP_CHOICE_STYLE;
typedef OBJECT POPUP_CHOICE, *P_POPUP_CHOICE;
```

---

msgNew

Creates a popup choice button.

Takes P_POPUP_CHOICE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct POPUP_CHOICE_NEW_ONLY {
    POPUP_CHOICE_STYLE  style;
    U32                 spare;      // unused (reserved)
} POPUP_CHOICE_NEW_ONLY, *P_POPUP_CHOICE_NEW_ONLY;
#define popupChoiceNewFields    \
    menuButtonNewFields         \
    POPUP_CHOICE_NEW_ONLY       popupChoice;
typedef struct POPUP_CHOICE_NEW {
    popupChoiceNewFields
} POPUP_CHOICE_NEW, *P_POPUP_CHOICE_NEW;
```

Comments

The popup choice will set its **pString** from the 'on' button within the popup's choice, if any button there is 'on'.

The fields you commonly set are:

pArgs->menuButton.menu uid of a menu whose first child is a choice

msgNewDefaults

Initializes the POPUP_CHOICE_NEW structure to default values.

Takes P_POPUP_CHOICE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct POPUP_CHOICE_NEW {
    popupChoiceNewFields
} POPUP_CHOICE_NEW, *P_POPUP_CHOICE_NEW;
```

Comments

Zeroes out **pArgs->**popupChoice and sets:

```
pArgs->gWin.style.gestureEnable = true;
pArgs->control.style.showDirty = true;
pArgs->label.style.decoration = lsDecorationPopup;
pArgs->button.style.feedback = bsFeedbackNone;
pArgs->menuButton.style.subMenuType = mbMenuPopup;
pArgs->menuButton.style.getWidth = true;
```

msgPopupChoiceGetStyle

Passes back the receiver's style. NOT IMPLEMENTED.

Takes P_POPUP_CHOICE_STYLE, returns STATUS.

```
#define msgPopupChoiceGetStyle      MakeMsg(clsPopupChoice, 1)
```

Message Arguments

```
typedef struct POPUP_CHOICE_STYLE {
    U16 spare;
} POPUP_CHOICE_STYLE, *P_POPUP_CHOICE_STYLE;
```

msgPopupChoiceSetStyle

Sets the receiver's style. NOT IMPLEMENTED.

Takes P_POPUP_CHOICE_STYLE, returns STATUS.

```
#define msgPopupChoiceSetStyle      MakeMsg(clsPopupChoice, 2)
```

Message Arguments

```
typedef struct POPUP_CHOICE_STYLE {
    U16 spare;
} POPUP_CHOICE_STYLE, *P_POPUP_CHOICE_STYLE;
```

msgPopupChoiceGetChoice

Passes back the choice associated with this popup.

Takes P_CHOICE, returns STATUS.

```
#define msgPopupChoiceGetChoice     MakeMsg(clsPopupChoice, 3)
```

Comments

The popup choice will self-send **msgMenuButtonGetMenu** to get the menu. If the menu is null, the popup choice will set *pArgs null and return **stsOK**. Otherwise, *pArgs will be set to the first child of the menu.

Messages from Other Classes

msgWinSend

Sends a message up a window ancestry chain.

Takes P_WIN_SEND, returns STATUS.

Comments

If **pArgs**->msg is not **msgMenuDone**, **clsPopupChoice** just calls its ancestor.

Otherwise, **clsPopupChoice** calls its ancestor (to allow **clsMenuButton** to take down the menu), then resets its visuals to reflect the new 'on' button within the choice.

For popup choices that display a string, this just means obtaining the string from the 'on' button (or, if the button has LABEL_STYLE.**infoType** of **lsInfoWindow**, from the first **lsInfoString** label found within using depth enumeration) and using **msgLabelSetString** on self.

For popup choices that display an icon, the visuals are changed by getting the icon within self (**msgLabelGetWin**), sending it **msgIconFreeCache**, setting its window tag to the tag of the 'on' icon, and finally using **msgWinDirtyRect**(**pNull**) to get the icon to repaint. Note that because of this strategy, the icon within self cannot change size when its picture changes. The picture size is not copied from the 'on' icon to the icon within self.

msgGWinGesture

Self-sent to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

If the popup's CONTROL_STYLE.enable is false, the popup choice just returns **stsOK**.

If the class of **pArgs**->msg is not **clsXGesture**, the popup choice returns **stsMessageIgnored**.

If **pArgs**->msg is not one of **xgsFlick*** or **xgsDblFlick***, then the popup choice returns the result of calling its ancestor.

Otherwise, the popup choice obtains the 'on' button within its choice, and searches through the choice's list of children for the next, previous, first, or last child based on what type of flick gesture was received. The popup choice sets its value to be this new button and returns **stsOK**. Buttons that are not enabled (**msgControlGetEnable**) are skipped over.

Return Value

stsMessageIgnored pArgs->msg is not of **clsXGesture**.

msgControlGetValue

Passes back the receiver's value (tag of button that is on).

Takes P_TAG, returns STATUS.

Comments

clsPopupChoice overrides **clsButton**'s response (of passing back BUTTON_STYLE.on) by instead forwarding **msgControlGetValue** on to its choice. This means popup choices behave like choices with respect to **msgControlGetValue**.

msgControlSetValue

Sets the receiver's value.

Takes TAG, returns STATUS.

Comments **clsPopupChoice** overrides **clsButton**'s response (of setting BUTTON_STYLE.on) by instead forwarding **msgControlSetValue** on to its choice. Changing the choice's value then results in an update of the popup's label string. This means popup choices behave like choices with respect to **msgControlSetValue**.

msgControlGetClient

Passes back the receiver's client.

Takes P_UID, returns STATUS.

Comments **clsPopupChoice** intercepts this message and forwards it on to the popup's choice.

msgControlSetClient

clsPopupChoice forwards this message on to the popup's choice.

Takes UID, returns STATUS.

msgControlBeginPreview

clsPopupChoice responds by noting internally that its menu is now up, then calling ancestor.

Takes P_INPUT_EVENT, returns STATUS.

msgControlSetMetrics

Sets the metrics.

Takes P_CONTROL_METRICS, returns STATUS.

Comments If the popup choice's menu is up, it prohibits the CONTROL_STYLE.dirty bit from changing.

msgControlSetStyle

Sets the style values.

Takes P_CONTROL_STYLE, returns STATUS.

Comments If the popup choice's menu is up, it prohibits the CONTROL_STYLE.dirty bit from changing.

msgControlSetDirty

Sets style.dirty.

Takes BOOLEAN, returns STATUS.

Comments If the popup choice's menu is up, it prohibits the CONTROL_STYLE.dirty bit from changing.

msgMenuButtonProvideWidth

Self-sent when MENU_BUTTON_STYLE.**getWidth** is true.

Takes P_S32, returns STATUS. Category: self-sent.

Comments **clsPopupChoice** responds by computing a width based on its menu.

If the **wsLayoutDirty** bit of its menu is true, the popup choice will lay out its menu. **clsPopupChoice** then enumerates all the children of its choice and computes the maximum width of all the children that inherit from **clsLabel** and whose LABEL_STYLE.**infoType** is not **lsInfoWindow** (if an **lsInfoWindow** label child is encountered, **clsPopupChoice** will find the first string-type label within it and use the width of that).

msgMenuButtonPlaceMenu

Self-sent whenever a menu button needs to position its associated menu.

Takes P_WIN_METRICS, returns STATUS. Category: self-sent.

Comments

clsPopupChoice first gets the 'on' button from its choice. If there is a button on, **clsPopupChoice** will position its menu so that the 'on' button is adjacent to the popup. If there is no button on in the choice, **clsPopupChoice** just calls its ancestor.

PROGRESS.H

This file contains the API for **clsProgressBar.**

clsProgressBar inherits from **clsControl.**

Implements a read-only or read/write progress indicator.

Debugging Flags

The **clsProgressBar** debugging flag is 'K'. Defined values are:

flag14 (0x4000) general

```
#ifndef PROGRESS_INCLUDED
#define PROGRESS_INCLUDED

#include <control.h>


#include <sysgraf.h>
```

```
#ifndef CONTROL_INCLUDED

#endif
#ifndef SYSGRAF_INCLUDED

#endif
```

Common #defines and typedefs

```
// Labels style
#define psLabelsNumeric         0
#define psLabelsNone            1
#define psLabelsCustom          2

// Ticks style
#define psTicksSmall            0
#define psTicksFull             1
#define psTicksNone             2

// Direction style
#define psDirectionHorizontal   0   // horizontal indicator
#define psDirectionVertical     1   // vertical indicator

// Thickness style
#define psThicknessRelFont      0   // thickness varies with system font size
#define psThicknessFixed        1   // thickness is fixed

// Edge Styles
#define psEdgeNone              0
#define psEdgeMinLat            flag0
#define psEdgeMaxLat            flag1
#define psEdgeMinLong           flag2
#define psEdgeMaxLong           flag3
#define psEdgeAll               (psEdgeMinLat | psEdgeMaxLat | \
                                psEdgeMinLong | psEdgeMaxLong)
```

"Lat" is latitude, and "Long" is longitude. For horizontal progress bars, latitude is the y dimension (or minor axis), and longitude is the x dimension (or major axis). For vertical bars, lat is x, and long is y.

```
typedef struct PROGRESS_STYLE {
    U16 labels          : 2,    // labels style
        ticks           : 2,    // style of ticks to paint
        direction       : 2,    // direction of major axis
        units           : 6,    // units for everything except labels
        thickness       : 2,    // thickness style for lines and ticks
        labelRotation   : 2;    // use lsRotate* from label.h
    U16 labelScaleUnits : 6,    // scale units for labels from border.h
        edge            : 4,    // bar edges to display
                                // (separate from clsBorder edges)
        labelFontType   : 2,    // use lsFont* from label.h
        spare           : 4;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} PROGRESS_STYLE, *P_PROGRESS_STYLE;
```

Default PROGRESS_STYLE:

```
    labels          = psLabelsNone
    ticks           = psTicksNone
    direction       = psDirectionHorizontal
    units           = bsUnitsPoints
    thickness       = psThicknessRelFont
    labelRotation   = lsRotateNone
    labelFontType   = lsFontSystem
    labelScaleUnits = bsUnitsLayout
    edge            = psEdgeMinLat | psEdgeMinLong
```

```
typedef struct PROGRESS_REGION {
    U32             rgb;
    SYSDC_PATTERN   pattern;
} PROGRESS_REGION, *P_PROGRESS_REGION;
```

```
typedef struct PROGRESS_METRICS {
    PROGRESS_STYLE  style;              // overall style
    S32             numIntervals;
    S32             ticksPerLabel;      // gives period of labels
    S32             minNumericLabel;    // when psLabelsNumeric
    S32             maxNumericLabel;    // when psLabelsNumeric
    U16             thicknessBase;      // thickness (units or multiplier)
    U16             latitude;           // dimension of minor axis (in units)
    U16             longitude;          // dimension of major axis (in units)
    S32             maxValue;           // values are in [0..maxValue]
    S32             value;              // current value
    SYSDC_FONT_SPEC font; // spec to open if style.labelFontType == lsFontCustom
    U8              labelScale; // scale for labels as in border.h
    U32             spare1;     // unused (reserved)
    U32             spare2;     // unused (reserved)
} PROGRESS_METRICS, *P_PROGRESS_METRICS;
```

metrics.latitude and .longitude are used only when the progress bar is shrink-wrapped in those dimensions. When not shrink-wrapped, the progress bar expands to fill the available space.

msgNew

Creates a progress indicator.

Takes P_PROGRESS_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct PROGRESS_NEW_ONLY {
    PROGRESS_METRICS    metrics;
    P_CHAR              fontName;   // font name from which to derive font.id
    U32                 spare1;     // unused (reserved)
    U32                 spare2;     // unused (reserved)
} PROGRESS_NEW_ONLY, *P_PROGRESS_NEW_ONLY;
```

```
#define progressNewFields   \
    controlNewFields        \
    PROGRESS_NEW_ONLY       progress;
typedef struct PROGRESS_NEW {
    progressNewFields
} PROGRESS_NEW, *P_PROGRESS_NEW;
```

Comments

The filled region looks are initialized with:

rgb = SysDcGrayRGB(128)

pattern = **sysDcPatForeground**

The unfilled region looks are initialized with:

rgb = **sysDcRGBTransparent**

pattern = **sysDcPatNil**

msgNewDefaults

Initializes the PROGRESS_NEW structure to default values.

Takes P_PROGRESS_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct PROGRESS_NEW {
    progressNewFields
} PROGRESS_NEW, *P_PROGRESS_NEW;
```

Comments

Zeroes out **pArgs**->progress and sets:

```
pArgs->win.flags.style |= wsShrinkWrapWidth | wsShrinkWrapHeight;

pArgs->border.style.previewAlter = bsAlterNone;
pArgs->border.style.selectedAlter = bsAlterNone;

pArgs->control.style.showDirty = false;

pArgs->progress.metrics.style.labels = psLabelsNone;
pArgs->progress.metrics.style.ticks = psTicksNone;
pArgs->progress.metrics.style.units = bsUnitsPoints;
pArgs->progress.metrics.style.labelScaleUnits = bsUnitsLayout;
pArgs->progress.metrics.style.edge = psEdgeAll;
pArgs->progress.metrics.numIntervals = 10;
pArgs->progress.metrics.ticksPerLabel = 2;
pArgs->progress.metrics.minNumericLabel = 0;
pArgs->progress.metrics.maxNumericLabel = 100;
pArgs->progress.metrics.thicknessBase = 1;
pArgs->progress.metrics.latitude = 18;
pArgs->progress.metrics.longitude = 144;
pArgs->progress.metrics.maxValue = 100;
pArgs->progress.metrics.value = 0;
pArgs->progress.metrics.labelScale = lsScaleMedium;
```

Also sets **pArgs**->progress.metrics.font to the default system font.

msgProgressGetStyle

Passes back the current style.

Takes P_PROGRESS_STYLE, returns STATUS.

```
#define msgProgressGetStyle     MakeMsg(clsProgressBar, 1)
```

Message Arguments

```
typedef struct PROGRESS_STYLE {
    U16 labels          : 2,    // labels style
        ticks           : 2,    // style of ticks to paint
        direction       : 2,    // direction of major axis
        units           : 6,    // units for everything except labels
        thickness       : 2,    // thickness style for lines and ticks
        labelRotation   : 2;    // use lsRotate* from label.h
    U16 labelScaleUnits : 6,    // scale units for labels from border.h
        edge            : 4,    // bar edges to display
                                // (separate from clsBorder edges)
        labelFontType   : 2,    // use lsFont* from label.h
        spare           : 4;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} PROGRESS_STYLE, *P_PROGRESS_STYLE;
```

msgProgressSetStyle

Sets the style.

Takes P_PROGRESS_STYLE, returns STATUS.

```
#define msgProgressSetStyle     MakeMsg(clsProgressBar, 2)
```

Message Arguments

```
typedef struct PROGRESS_STYLE {
    U16 labels          : 2,    // labels style
        ticks           : 2,    // style of ticks to paint
        direction       : 2,    // direction of major axis
        units           : 6,    // units for everything except labels
        thickness       : 2,    // thickness style for lines and ticks
        labelRotation   : 2;    // use lsRotate* from label.h
    U16 labelScaleUnits : 6,    // scale units for labels from border.h
        edge            : 4,    // bar edges to display
                                // (separate from clsBorder edges)
        labelFontType   : 2,    // use lsFont* from label.h
        spare           : 4;    // unused (reserved)
    U16 spare2          : 16;   // unused (reserved)
} PROGRESS_STYLE, *P_PROGRESS_STYLE;
```

Comments

The progress bar will set its layout bit dirty (as in **msgWinSetLayoutDirty**) as necessary. It will use **msgWinDirtyRect** in a similar fashion. It is the client's responsibility to send **msgWinLayout** to the progress bar whenever the style changes would affect the layout.

msgProgressGetMetrics

Passes back the current metrics.

Takes P_PROGRESS_METRICS, returns STATUS.

```
#define msgProgressGetMetrics   MakeMsg(clsProgressBar, 3)
```

Message Arguments

```
typedef struct PROGRESS_METRICS {
    PROGRESS_STYLE  style;              // overall style
    S32             numIntervals;
    S32             ticksPerLabel;      // gives period of labels
    S32             minNumericLabel;    // when psLabelsNumeric
    S32             maxNumericLabel;    // when psLabelsNumeric
    U16             thicknessBase;      // thickness (units or multiplier)
    U16             latitude;           // dimension of minor axis (in units)
    U16             longitude;          // dimension of major axis (in units)
    S32             maxValue;           // values are in [0..maxValue]
    S32             value;              // current value
    SYSDC_FONT_SPEC font; // spec to open if style.labelFontType == lsFontCustom
    U8              labelScale; // scale for labels as in border.h
    U32             spare1;     // unused (reserved)
    U32             spare2;     // unused (reserved)
} PROGRESS_METRICS, *P_PROGRESS_METRICS;
```

msgProgressSetMetrics

Sets the metrics.

Takes P_PROGRESS_METRICS, returns STATUS.

```
#define msgProgressSetMetrics   MakeMsg(clsProgressBar, 4)
```

Message Arguments

```
typedef struct PROGRESS_METRICS {
    PROGRESS_STYLE  style;              // overall style
    S32             numIntervals;
    S32             ticksPerLabel;      // gives period of labels
    S32             minNumericLabel;    // when psLabelsNumeric
    S32             maxNumericLabel;    // when psLabelsNumeric
    U16             thicknessBase;      // thickness (units or multiplier)
    U16             latitude;           // dimension of minor axis (in units)
    U16             longitude;          // dimension of major axis (in units)
    S32             maxValue;           // values are in [0..maxValue]
    S32             value;              // current value
    SYSDC_FONT_SPEC font; // spec to open if style.labelFontType == lsFontCustom
    U8              labelScale; // scale for labels as in border.h
    U32             spare1;     // unused (reserved)
    U32             spare2;     // unused (reserved)
} PROGRESS_METRICS, *P_PROGRESS_METRICS;
```

Comments

The progress bar will set its layout bit dirty (as in **msgWinSetLayoutDirty**) as necessary. It will use **msgWinDirtyRect** in a similar fashion. It is the client's responsibility to send **msgWinLayout** to the progress bar whenever the changes would affect the layout.

msgProgressGetFilled

Passes back the current filled region looks.

Takes P_PROGRESS_REGION, returns STATUS.

```
#define msgProgressGetFilled    MakeMsg(clsProgressBar, 5)
```

Message Arguments

```
typedef struct PROGRESS_REGION {
    U32             rgb;
    SYSDC_PATTERN   pattern;
} PROGRESS_REGION, *P_PROGRESS_REGION;
```

msgProgressSetFilled

Sets the current filled region looks.

Takes P_PROGRESS_REGION, returns STATUS.

```
#define msgProgressSetFilled    MakeMsg(clsProgressBar, 6)
```

Message Arguments

```
typedef struct PROGRESS_REGION {
    U32             rgb;
    SYSDC_PATTERN   pattern;
} PROGRESS_REGION, *P_PROGRESS_REGION;
```

Comments

The progress bar will self-send **msgWinDirtyRect** as necessary.

msgProgressGetUnfilled

Passes back the current unfilled region looks.

Takes P_PROGRESS_REGION, returns STATUS.

```
#define msgProgressGetUnfilled  MakeMsg(clsProgressBar, 7)
```

Message Arguments

```
typedef struct PROGRESS_REGION {
    U32             rgb;
    SYSDC_PATTERN   pattern;
} PROGRESS_REGION, *P_PROGRESS_REGION;
```

msgProgressSetUnfilled

Sets the current unfilled region looks.

Takes P_PROGRESS_REGION, returns STATUS.

```
#define msgProgressSetUnfilled  MakeMsg(clsProgressBar, 8)
```

Message Arguments

```
typedef struct PROGRESS_REGION {
    U32             rgb;
    SYSDC_PATTERN   pattern;
} PROGRESS_REGION, *P_PROGRESS_REGION;
```

Comments

The progress bar will self-send **msgWinDirtyRect** as necessary.

msgProgressProvideLabel

Sent to the client when style.labels == **psLabelsCustom**.

Takes P_PROGRESS_PROVIDE_LABEL, returns STATUS. Category: client responsibility.

```
#define msgProgressProvideLabel MakeMsg(clsProgressBar, 9)
```

Arguments

```
typedef struct PROGRESS_PROVIDE_LABEL {
    CONTROL     progressBar;    //  In: requestor
    U16         position;       //  In: position of label (0 at minimum)
    P_CHAR      pString;        // Out: a 256 byte buffer for the string
    U32         spare;          // unused (reserved)
} PROGRESS_PROVIDE_LABEL, *P_PROGRESS_PROVIDE_LABEL;
```

Comments

The client should copy a string for the indicated position into the provided buffer.

msgProgressGetVisInfo

Passes back information about the current state of the visuals.

Takes P_PROGRESS_VIS_INFO, returns STATUS.

```
#define msgProgressGetVisInfo   MakeMsg(clsProgressBar, 10)
```

Arguments

```
typedef struct PROGRESS_VIS_INFO {
    RECT32  filledRect,
            unfilledRect;
    U32     spare1;     // unused (reserved)
    U32     spare2;     // unused (reserved)
} PROGRESS_VIS_INFO, *P_PROGRESS_VIS_INFO;
```

Comments

All measurements are in LWC (device units).

Messages from Other Classes

msgControlGetValue

Passes back the receiver's value (metrics.value).

Takes P_S32, returns STATUS.

msgControlSetValue

Sets the receiver's value.

Takes S32, returns STATUS.

Comments — The progress bar will self-send **msgWinDirtyRect** as necessary.

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments — **clsProgressBar** responds by filing away all of its state.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments — **clsLabel** responds by restoring all of its state.

msgWinLayoutSelf

Tell a window to layout its children.

Takes P_WIN_METRICS, returns STATUS.

Comments — **clsProgressBar** responds by recomputing its layout parameters.

If the receiver is shrink-wrapping in a dimension, it will use the latitude or longitude value as appropriate to determine the interior dimension of the progress bar (which does not include the inked edges of the bar). When not shrink-wrapping in a dimension, the corresponding latitude or longitude value is ignored.

msgWinRepaint

Tells a window to repaint itself.

Takes nothing, returns STATUS. Category: descendant responsibility.

Comments — **clsProgressBar** responds by painting the edges, bar, ticks, and labels.

First, the **progressBar** self-sends **msgControlGetValue** to get its current value and then **msgBorderGetForegroundRGB** to get the color in which to paint the edges, ticks, and labels. It then paints the edges.

Next, the **progressBar** will paint the unfilled portion of the bar if the unfilled pattern isn't **sysDcPatNil**. The pattern will be painted with the specified foreground RGB and a background RGB obtained by self-sending **msgBorderGetBackgroundRGB**. See **msgProgressSetUnfilled**.

The **progressBar** will then paint the filled portion of the bar if the filled pattern isn't **sysDcPatNil**. The method is as described above. See **msgProgressSetFilled**.

While drawing the tick marks, the **progressBar** will self-send **msgBorderRGBToInk** and use a foreground color that is opposite so that the ticks will show up against the filled/unfilled regions.

Finally, the labels are painted using a foreground RGB obtained by self-sending **msgBorderGetForegroundRGB**.

msgWinGetBaseline

Gets the desired x,y alignment of a window.

Takes P_WIN_METRICS, returns STATUS.

Comments

clsProgressBar responds by setting **pArgs**->bounds.origin to the origin of the bar within self.

SBAR.H

This file contains the API definition for **clsScrollbar.**

clsScrollbar inherits from **clsControl.**

Scrollbars provide scrolling visuals and define a protocol for handling various kinds of scrolling actions.

Debugging Flags

The **clsScrollbar** debugging flag is 'K'. Defined values are:

flag2 (0x0004) protocol messages

flag6 (0x0040) painting

flag10 (0x0400) input

flag14 (0x4000) general debug info

```
#ifndef SBAR_INCLUDED
#define SBAR_INCLUDED

#include <control.h>
```

```
#ifndef CONTROL_INCLUDED

#endif
```

Common #defines and typedefs

```
#define hlpScrollbarVertical    MakeTag(clsScrollbar, 1)
#define hlpScrollbarHorizontal  MakeTag(clsScrollbar, 2)
#define hlpScrollbarGeneral     hlpScrollbarVertical
typedef OBJECT SCROLLBAR;
```

Direction

```
#define sbDirectionVertical     0   // vertical scrollbar
#define sbDirectionHorizontal   1   // horizontal scrollbar
typedef struct SCROLLBAR_STYLE {
    U16 direction   : 1,
        wide        : 1,    // no longer implemented
        spare       : 14;   // unused (reserved)
} SCROLLBAR_STYLE, *P_SCROLLBAR_STYLE;
```

Default SCROLLBAR_STYLE:

```
    direction   = sbDirectionVertical
```

```
Enum16(SCROLLBAR_ACTION) {
    // For vertical scrollbars:
    sbLineUp            = 0,
    sbLineDown          = 1,
    sbPageUp            = 2,
    sbPageDown          = 3,
    sbThumbUpDown       = 4,
    sbLineToTop         = 11,
    sbLineToBottom      = 12,
    sbToTop             = 15,
    sbToBottom          = 16,
```

```
    // For horizontal scrollbars:
    sbLineLeft          = 5,
    sbLineRight         = 6,
    sbPageLeft          = 7,
    sbPageRight         = 8,
    sbThumbLeftRight    = 9,
    sbColumnToLeft      = 13,
    sbColumnToRight     = 14,
    sbToLeft            = 17,
    sbToRight           = 18,
    // Terminating action:
    sbEndScroll         = 10
};
typedef struct SCROLLBAR_SCROLL {
    SCROLLBAR           sb;         // in: originating scrollbar
    SCROLLBAR_ACTION    action;     // in: current action
    S32                 offset;     // in/out: current or new offset
    S32                 lineCoord;  // in: coordinate of line in root win space
    U32                 spare1;     // unused (reserved)
    U32                 spare2;     // unused (reserved)
} SCROLLBAR_SCROLL, *P_SCROLLBAR_SCROLL;
typedef struct SCROLLBAR_PROVIDE {
    SCROLLBAR   sb;         // in: originating scrollbar
    S32         viewLength; // out: client-provided view width or height
    S32         docLength;  // out: client-provided document width or height
    S32         offset;     // out: client-provided current offset
    U32         spare;      // unused (reserved)
} SCROLLBAR_PROVIDE, *P_SCROLLBAR_PROVIDE;
```

Messages

msgNew

Creates a scrollbar window.

Takes P_SCROLLBAR_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct SCROLLBAR_NEW_ONLY {
    SCROLLBAR_STYLE style;
    U32             spare1; // unused (reserved)
    U32             spare2; // unused (reserved)
} SCROLLBAR_NEW_ONLY, *P_SCROLLBAR_NEW_ONLY;
#define scrollbarNewFields  \
    controlNewFields        \
    SCROLLBAR_NEW_ONLY      scrollbar;
typedef struct SCROLLBAR_NEW {
    scrollbarNewFields
} SCROLLBAR_NEW, *P_SCROLLBAR_NEW;
```

Comments

The fields you commonly set are:

pArgs->scrollbar.style.direction whether horizontal or vertical

msgNewDefaults

Initializes the SCROLLBAR_NEW structure to default values.

Takes P_SCROLLBAR_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct SCROLLBAR_NEW {
    scrollbarNewFields
} SCROLLBAR_NEW, *P_SCROLLBAR_NEW;
```

Comments

Zeroes out **pArgs->**scrollbar and sets

```
pArgs->win.flags.style |= wsShrinkWrapWidth | wsShrinkWrapHeight;
pArgs->win.flags.input = inputTip;
pArgs->gWin.helpId = hlpScrollbarVertical;
pArgs->control.style.previewGrab = true;
pArgs->control.style.previewRepeat = true;
pArgs->control.style.previewEnable = true;
pArgs->scrollbar.style.direction = sbDirectionVertical;
```

msgScrollbarGetStyle

Passes back the current style values.

Takes P_SCROLLBAR_STYLE, returns STATUS.

```
#define msgScrollbarGetStyle        MakeMsg(clsScrollbar, 1)
```

Message Arguments

```
typedef struct SCROLLBAR_STYLE {
    U16 direction   : 1,
        wide        : 1,    // no longer implemented
        spare       : 14;   // unused (reserved)
} SCROLLBAR_STYLE, *P_SCROLLBAR_STYLE;
```

msgScrollbarSetStyle

Sets the style values.

Takes P_SCROLLBAR_STYLE, returns STATUS.

```
#define msgScrollbarSetStyle        MakeMsg(clsScrollbar, 2)
```

Message Arguments

```
typedef struct SCROLLBAR_STYLE {
    U16 direction   : 1,
        wide        : 1,    // no longer implemented
        spare       : 14;   // unused (reserved)
} SCROLLBAR_STYLE, *P_SCROLLBAR_STYLE;
```

msgScrollbarUpdate

Forces the scrollbar to repaint with the latest info.

Takes nothing, returns STATUS.

```
#define msgScrollbarUpdate          MakeMsg(clsScrollbar, 14)
```

Comments

Causes **msgScrollbarProvideVert/HorizInfo** to be sent to client.

Self-Sent/Client Messages

msgScrollbarVertScroll

Client should perform vertical scroll.

Takes P_SCROLLBAR_SCROLL, returns STATUS. Category: client responsibility.

```
#define msgScrollbarVertScroll      MakeMsg(clsScrollbar, 5)
```

Message Arguments

```
typedef struct SCROLLBAR_SCROLL {
    SCROLLBAR           sb;         // in: originating scrollbar
    SCROLLBAR_ACTION    action;     // in: current action
    S32                 offset;     // in/out: current or new offset
    S32                 lineCoord;  // in: coordinate of line in root win space
    U32                 spare1;     // unused (reserved)
    U32                 spare2;     // unused (reserved)
} SCROLLBAR_SCROLL, *P_SCROLLBAR_SCROLL;
```

Comments

The passed offset is an estimate computed by the scrollbar based on the information obtained from **msgScrollbarProvideVertInfo**.

If the client is unwilling to scroll to this offset, the client may scroll to a different offset. Be sure to set pArgs->offset to the new offset if it's different from the passed value.

msgScrollbarHorizScroll

Client should perform horizontal scroll.

Takes P_SCROLLBAR_SCROLL, returns STATUS. Category: client responsibility.

```
#define msgScrollbarHorizScroll     MakeMsg(clsScrollbar, 6)
```

Message Arguments

```
typedef struct SCROLLBAR_SCROLL {
    SCROLLBAR           sb;         // in: originating scrollbar
    SCROLLBAR_ACTION    action;     // in: current action
    S32                 offset;     // in/out: current or new offset
    S32                 lineCoord;  // in: coordinate of line in root win space
    U32                 spare1;     // unused (reserved)
    U32                 spare2;     // unused (reserved)
} SCROLLBAR_SCROLL, *P_SCROLLBAR_SCROLL;
```

Comments

The passed offset is an estimate computed by the scrollbar based on the information obtained from **msgScrollbarProvideHorizInfo**.

If the client is unwilling to scroll to this offset, the client may scroll to a different offset. Be sure to set pArgs->offset to the new offset if it's different from the passed value.

msgScrollbarProvideVertInfo

Client should provide the document and view info.

Takes P_SCROLLBAR_PROVIDE, returns STATUS. Category: client responsibility.

```
#define msgScrollbarProvideVertInfo     MakeMsg(clsScrollbar, 9)
```

Message Arguments

```
typedef struct SCROLLBAR_PROVIDE {
    SCROLLBAR   sb;         // in: originating scrollbar
    S32         viewLength; // out: client-provided view width or height
    S32         docLength;  // out: client-provided document width or height
    S32         offset;     // out: client-provided current offset
    U32         spare;      // unused (reserved)
} SCROLLBAR_PROVIDE, *P_SCROLLBAR_PROVIDE;
```

msgScrollbarProvideHorizInfo

Client should provide the document and view info.

Takes P_SCROLLBAR_PROVIDE, returns STATUS. Category: client responsibility.

```
#define msgScrollbarProvideHorizInfo    MakeMsg(clsScrollbar, 10)
```

Message Arguments

```
typedef struct SCROLLBAR_PROVIDE {
    SCROLLBAR   sb;         // in: originating scrollbar
    S32         viewLength; // out: client-provided view width or height
    S32         docLength;  // out: client-provided document width or height
    S32         offset;     // out: client-provided current offset
    U32         spare;      // unused (reserved)
} SCROLLBAR_PROVIDE, *P_SCROLLBAR_PROVIDE;
```

Messages from Other Classes

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments **clsScrollbar** responds by filing away its instance data.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments **clsScrollbar** responds by restoring its instance data.

msgWinRepaint

Tells a window to repaint itself.

Takes nothing, returns STATUS. Category: descendant responsibility.

Comments **clsScrollbar** responds by painting itself appropriately.

msgWinLayoutSelf

Tell a window to layout its children.

Takes P_WIN_METRICS, returns STATUS.

Comments **clsScrollbar** does nothing if **pArgs**->options does not have **wsLayoutResize** turned on. Otherwise, it will set **pArgs**->bounds.size only for the dimensions for which shrinkwrapping is set. It will set **pArgs**->size.w and h to a value derived from **msgBorderInsetToInnerRect** and an internal constant (currently 13 points).

The visuals of the scrollbar are painted within the **innerRect**.

See Also **msgBorderInsetToInnerRect** insets arbitrary rect to border rect.

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments **clsScrollbar** responds to input events by maintaining the state necessary to behave in the appropriate fashion. The types of input state a scrollbar can be in are:

null

pen up over an arrow

pen down over an arrow

pen up over the thumb

pen down over the thumb

dragging the thumb

pen up over the shaft

gesturing over the shaft

In particular, the scrollbar allows the normal **msgControl*Preview** protocol to ensue only when the pen is interacting with the scroll arrows.

msgGWinGesture

Called to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

clsScrollbar responds by returning **stsMessageIgnored** if the gesture has no meaning (e.g. **xgsFlickUp** on a horizontal scrollbar).

Otherwise, the scrollbar will fill out a SCROLLBAR_SCROLL struct and send either **msgScrollbarVertScroll** or **msgScrollbarHorizScroll** to the CONTROL_METRICS.client. Actually, the client will receive the message twice--once for the appropriate action, and once for the **sbEndScroll** action (although the second message with **sbEndScroll** may be dropped in the future).

msgGWinComplete

Causes the gesture to be completed.

Takes void, returns STATUS.

Comments

clsScrollbar responds by clearing its internal state data left over from processing a gesture in the scrollbar shaft.

msgControlBeginPreview

Self-sent when **msgPenDown** is received.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

Comments

clsScrollbar responds by returning **stsControlCancelPreview** if the **penDown** occurred in the shaft.

Otherwise, the scrollbar self-sends **msgControlRepeatPreview** so that at least one arrow scroll is done.

Note that the scrollbar won't receive this message if the **penDown** occurred in the thumb, because in that case **clsScrollbar**'s response to **msgInputEvent** returned **stsInputTerminate** (after creating and starting an instance of **clsTrack**).

msgControlAcceptPreview

Self-sent when **msgPenUp** is received.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

Comments

clsScrollbar responds by notifying its CONTROL_METRICS.client with **msgScrollbar[Vert/Horiz]Scroll** and an action of **sbEndScroll.**

Although one might expect this message to be sent when the pen is lifted from a scroll arrow, under normal circumstances a scrollbar will never receive this message. This is because **clsScrollbar** sees the **msgInputEvent(msgPenUp)** and self-sends **msgGWinAbort** to cancel the gesture (because the user really wasn't gesturing over the repeating arrow). **clsControl** responds to **msgGWinAbort** by self-sending **msgControlCancelPreview**, which sends out the **sbEndScroll.**

msgControlCancelPreview

Self-sent when style.**previewGrab** is false and **msgPenExitDown** is received.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

Comments

clsScrollbar responds by notifying its CONTROL_METRICS.client with **msgScrollbar[Vert/Horiz]Scroll** and an action of **sbEndScroll**.

msgControlRepeatPreview

Self-sent if style.**repeatPreview** is true.

Takes P_INPUT_EVENT, returns STATUS. Category: self-sent.

Comments

clsScrollbar responds by notifying its CONTROL_METRICS.client with **msgScrollbar[Vert/Horiz]Scroll** and an action of **sbLine[Up/Down]** (if the scrollbar is vertical) or **sbLine[Left/Right]** (if horizontal).

If the client indicated that no scrolling took place (by not changing the SCROLLBAR_SCROLL.offset field), then the scrollbar will return **stsControlCancelRepeat**.

msgTrackDone

Sent by a tracker when it's done.

Takes P_TRACK_METRICS, returns STATUS. Category: client notification.

Comments

A **scrollBar** will receive this message when the user has lifted the pen after dragging the thumb.

If the **scrollBar**'s style.direction is **sbDirectionVertical**, the **scrollBar** will notify its CONTROL_METRICS.client with **msgScrollbarVertScroll** and one of these actions: **sbThumbUpDown**, **sbToTop**, or **sbToBottom**.

If the **scrollBar**'s style.direction is **sbDirectionHorizontal**, the **scrollBar** will notify its CONTROL_METRICS.client with **msgScrollbarHorizScroll** and one of these actions: **sbThumbLeftRight**, **sbToLeft**, or **sbToRight**.

SELCHMGR.H

This file contains the API for **clsSelChoiceMgr.**

clsSelChoiceMgr inherits from **clsManager.**

Provides a choice manager that defines a protocol for managing the selection. Although clients may subclass **clsSelChoiceMgr** and add to or modify its behavior, there should be little reason to do so. **clsSelChoiceMgr** itself implements all of the standard UI for selectable choices.

Notes:

The selection choice manager works in a similar manner to the regular choice manager except it causes selection feedback to be displayed on the controls it manages. It also tells a client when to acquire the selection by sending **msgSelChoiceMgrAcquireSel** to the client. This message is sent every time one of the controls it manages turns on. selchmgr also sends **msgSelChoiceMgrNullSel** when someone programmatically turns off the selected control or sends the selchmgr **msgChoiceMgrSetOnButton** with an argument of **objNull.** The client should set the selection to null when it recieves this message.

Note that **msgNewDefaults** to **clsChoice** results in a prototypical new struct whose values describe a button of contact style **bsContactLockOn.** This is correct for choices that always have one button on, but this is typically not what you'd want for selectable choices--the user should be able to deselect a selected button by tapping on it (so the choice then has no buttons on). To acheive this effect, do the equivalent of the following:

```
ObjCallWarn(msgNewDefaults, clsChoice, &choiceNew);
choiceNew.tkTable.pButtonNew->button.style.contact = bsContactToggle;
choiceNew.tkTable.manager = <uid of a selChoiceMgr>;
ObjCallRet(msgNew, clsChoice, &choiceNew, s);
```

See the documentation for **msgTkTableChildDefaults** in choice.h.

When a client receives **msgSelYield** from the selection manager it should send **msgSelChoiceMgrNullCurrent** to the selchmgr. This will cause it to turn off its currently chosen control and set its current choice to null. Here's how a client would typically respond to the relevant messages.

```
msgSelChoiceMgrAcquireSel:
    <remember what kind of selection self will own
        by writing pArgs->id into self's instance data>
    ObjCallRet(msgSelSelect, self, pNull, s);
    <don't call ancestor>
msgSelChoiceMgrNullSel:
    // The following will result in self receiving msgSelYield.
    ObjCallRet(msgSelSetOwner, theSelectionManager, objNull, s);
    <don't call ancestor>
msgSelYield:
    // Ignore if self isn't the primary selection owner.
    if ((BOOLEAN) (U32) pArgs == false)
        return ObjectCallAncestorCtx(ctx);
    <get the choice by referencing the id value in self's instance data>
    <get the manager of the choice via msgTkTableGetManager>
    ObjCallRet(msgSelChoiceMgrNullCurrent, <manager>, pNull, s);
    <clear the id field in self's instance data>
    <don't call ancestor>
```

```
    msgSelOptionTagOK:
        <determine whether the kind of option sheet indicated by pArgs
            (a TAG value) could be applied to the selection, and return
            stsOK if so, stsFailed if not>
        <don't call ancestor>
    msgSelOptions:
        <bring up an option sheet for the selection>
        <don't call ancestor>
```

See sel.h for additional selection messages and their documentation.

```
#ifndef SELCHMGR_INCLUDED
#define SELCHMGR_INCLUDED

#include <chmgr.h>

#include <xfer.h>

#include <win.h>
```

```
#ifndef CHMGR_INCLUDED

#endif
#ifndef XFER_INCLUDED

#endif
#ifndef WIN_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT  SEL_CHOICE_MGR;
```

msgNew

Creates a **selChoiceMgr** object.

Takes P_SEL_CHOICE_MGR_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct SEL_CHOICE_MGR_NEW_ONLY {
    OBJECT  client;     // Object to send acquire/null messages to
    U32     id;         // Id tag sent with acquire/null messages
    U32     spare;
} SEL_CHOICE_MGR_NEW_ONLY, *P_SEL_CHOICE_MGR_NEW_ONLY;
#define selChoiceMgrNewFields   \
    choiceMgrNewFields          \
    SEL_CHOICE_MGR_NEW_ONLY     selChoiceMgr;
typedef struct SEL_CHOICE_MGR_NEW {
    selChoiceMgrNewFields
} SEL_CHOICE_MGR_NEW, *P_SEL_CHOICE_MGR_NEW;
typedef struct SEL_CHOICE_MGR_INFO {
    SEL_CHOICE_MGR          selChoiceMgr;   // Sender
    U32                     id;             // Client-specified id tag
    WIN                     button;         // Current on button
} SEL_CHOICE_MGR_INFO, *P_SEL_CHOICE_MGR_INFO;
```

Comments

The fields you commonly set are:

pArgs->selChoiceMgr.client An object to manage the selection protocol. (Typically the app uid.)

pArgs->selChoiceMgr.id An id to distinguish among >1 selectable instances of **clsChoice** within the client's domain.

msgNewDefaults

Initializes the SEL_CHOICE_MGR_NEW structure to default values.

Takes P_SEL_CHOICE_MGR_NEW, returns STATUS. Category: class message.

Message Arguments
```
typedef struct SEL_CHOICE_MGR_NEW {
    selChoiceMgrNewFields
} SEL_CHOICE_MGR_NEW, *P_SEL_CHOICE_MGR_NEW;
```

Comments Zeroes out pArgs->selChoiceMgr.

msgSelChoiceMgrGetClient

Passes back the client uid held by the receiver.

Takes P_OBJECT, returns STATUS.

```
#define msgSelChoiceMgrGetClient    MakeMsg(clsSelChoiceMgr, 1)
```

msgSelChoiceMgrSetClient

Sets the client uid held by the receiver.

Takes OBJECT, returns STATUS.

```
#define msgSelChoiceMgrSetClient    MakeMsg(clsSelChoiceMgr, 2)
```

msgSelChoiceMgrGetId

Passes back the id held by the receiver.

Takes P_U32, returns STATUS.

```
#define msgSelChoiceMgrGetId        MakeMsg(clsSelChoiceMgr, 3)
```

msgSelChoiceMgrSetId

Sets the id held by the receiver.

Takes U32, returns STATUS.

```
#define msgSelChoiceMgrSetId        MakeMsg(clsSelChoiceMgr, 4)
```

msgSelChoiceMgrNullCurrent

Tells the receiver to clear the visuals and state of the choice.

Takes nothing, returns STATUS.

```
#define msgSelChoiceMgrNullCurrent  MakeMsg(clsSelChoiceMgr, 5)
```

Comments After receiving this message, the choice will have no current value. This message does not result in the sending of any side-effect messages such as **msgSelYield**.

clsChoiceMgr Messages to which selChoiceMgrs Respond

msgChoiceMgrGetOnButton

Gets the current on button. Passes back **objNull** if no button is on.

Takes P_UID, returns STATUS.

msgChoiceMgrSetOnButton

Sets the current on button.

Takes UID, returns STATUS.

Comments

Since the **choiceMgr** will use **msgControlSetValue** to turn the button on, that button's normal notification protocol will be invoked.

All buttons are turned off if message argument is **objNull**.

Client Messages

msgSelChoiceMgrAcquireSel

Sent to the client whenever a different button is selected.

Takes P_SEL_CHOICE_MGR_INFO, returns STATUS. Category: client responsibility.

```
#define msgSelChoiceMgrAcquireSel   MakeMsg(clsSelChoiceMgr, 6)
```

Message Arguments

```
typedef struct SEL_CHOICE_MGR_INFO {
    SEL_CHOICE_MGR          selChoiceMgr;   // Sender
    U32                     id;             // Client-specified id tag
    WIN                     button;         // Current on button
} SEL_CHOICE_MGR_INFO, *P_SEL_CHOICE_MGR_INFO;
```

Comments

The client would typically respond by doing the following:

<remember what kind of selection self will ownby writing **pArgs**->id into self's instance data>

ObjCallRet(**msgSelSelect**, self, **pNull**, s);

<don't call ancestor>

msgSelChoiceMgrNullSel

Sent to the client whenever a different button is selected.

Takes P_SEL_CHOICE_MGR_INFO, returns STATUS. Category: client responsibility.

```
#define msgSelChoiceMgrNullSel      MakeMsg(clsSelChoiceMgr, 7)
```

Message Arguments

```
typedef struct SEL_CHOICE_MGR_INFO {
    SEL_CHOICE_MGR          selChoiceMgr;   // Sender
    U32                     id;             // Client-specified id tag
    WIN                     button;         // Current on button
} SEL_CHOICE_MGR_INFO, *P_SEL_CHOICE_MGR_INFO;
```

Comments

The client would typically respond by doing the following:

ObjCallRet(**msgSelSetOwner**, **theSelectionManager**, **objNull**, s);

<don't call ancestor>

As a consequence of this, the client would then receive **msgSelYield**.

SHADOW.H

This file contains the API definition for **clsShadow.**

clsShadow inherits from **clsCustomLayout.**

Implements a true shadow as a separate window underneath the shadowed window.

```
#ifndef SHADOW_INCLUDED
#define SHADOW_INCLUDED

#include <clayout.h>
```

```
#ifndef _INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT  SHADOW;
typedef struct SHADOW_STYLE {
    U16 trueShadow      : 1,    // create a window for true-shadow effect
        spare           : 15;   // unused (reserved)
} SHADOW_STYLE, *P_SHADOW_STYLE;
```

Messages

msgNew

Creates in instance of **clsShadow.**

Takes P_SHADOW_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct SHADOW_NEW_ONLY {
    SHADOW_STYLE    style;
    WIN             borderWin;
    U32             spare;      // unused (reserved)
} SHADOW_NEW_ONLY, *P_SHADOW_NEW_ONLY;
#define shadowNewFields \
    customLayoutNewFields       \
    SHADOW_NEW_ONLY         shadow;
typedef struct SHADOW_NEW {
    shadowNewFields
} SHADOW_NEW, *P_SHADOW_NEW;
```

Comments

If **pArgs**->win.flags.style has **wsTransparent** on, **clsShadow** will do the following:

- set border.style.**getDeltaWin** for **pArgs**->shadow.**borderWin** to true. This will forward any drag/resize operations on the border window to the shadow window.
- if **pArgs**->shadow.style.**trueShadow** is true the following is done:

  if **pArgs**->shadow.**shadowWin** is **objNull**, an instance of **clsBorder** is created as the true shadow window.

  self's **pArgs**->border.style.shadow/resize are copied to **shadowWin**'s border style. Also, border.style.**getDeltaWin** for **shadowWin** is set to true.

shadowWin is inserted as a child of self, underneath the **borderWin**, if any.

If **pArgs**->borderWin is not **objNull**, the **wsShrinkWrapWidth/Height** window flags of the **borderWin** are changed to match self's and the **borderWin** is inserted as a child of self, above the **shadowWin**.

msgNewDefaults

Initializes the SHADOW_NEW structure to default values.

Takes P_SHADOW_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct SHADOW_NEW {
    shadowNewFields
} SHADOW_NEW, *P_SHADOW_NEW;
```

Comments

Zeroes out **pArgs**->shadow and sets

```
pArgs->win.flags.input |= inputDisable | inputTransparent;
pArgs->win.flags.style |= wsTransparent | wsGrowBottom | wsGrowRight;
pArgs->gWin.style.gestureEnable = false;
pArgs->border.style.edge = bsEdgeAll;
pArgs->border.style.shadow = bsShadowThickGray;
pArgs->border.style.shadowGap = bsGapWhite;
pArgs->border.style.borderInk = bsInkGray66;
pArgs->border.style.resize = bsResizeCorner;
pArgs->border.style.drag = bsDragHoldDown;
pArgs->border.style.top = bsTopUp;
pArgs->customLayout.style.limitToRootWin = true;
```

Default SHADOW_STYLE:

```
trueShadow  = false
```

msgShadowGetStyle

Passes back the current style values.

Takes P_SHADOW_STYLE, returns STATUS.

```
#define msgShadowGetStyle           MakeMsg(clsShadow, 1)
```

Message Arguments

```
typedef struct SHADOW_STYLE {
    U16 trueShadow      : 1,    // create a window for true-shadow effect
        spare           : 15;   // unused (reserved)
} SHADOW_STYLE, *P_SHADOW_STYLE;
```

msgShadowSetStyle

Sets the style values.

Takes P_SHADOW_STYLE, returns STATUS.

```
#define msgShadowSetStyle           MakeMsg(clsShadow, 2)
```

Message Arguments

```
typedef struct SHADOW_STYLE {
    U16 trueShadow      : 1,    // create a window for true-shadow effect
        spare           : 15;   // unused (reserved)
} SHADOW_STYLE, *P_SHADOW_STYLE;
```

Comments

Changes in self's border style are passed on to the **borderWin** and **shadowWin**.

msgShadowGetBorderWin

Passes back the border window.

Takes P_WIN, returns STATUS.

```
#define msgShadowGetBorderWin        MakeMsg(clsShadow, 3)
```

msgShadowSetBorderWin

Sets the border window.

Takes WIN, returns STATUS.

```
#define msgShadowSetBorderWin        MakeMsg(clsShadow, 4)
```

Comments — The new **borderWin** is altered as in **msgNew**.

msgShadowGetShadowWin

Passes back the shadow window.

Takes P_WIN, returns STATUS.

```
#define msgShadowGetShadowWin        MakeMsg(clsShadow, 5)
```

Messages from Other Classes

msgWinSetFlags

Sets the window flags.

Takes P_WIN_METRICS, returns STATUS.

Comments — **clsShadow** will alter the **borderWin**'s window flags to match the **wsShrinkWrapWidth/Height** flags of self.

msgCstmLayoutGetChildSpec

Passes back the current spec for the specified child.

Takes P_CSTM_LAYOUT_CHILD_SPEC, returns STATUS. Category: self-sent.

Comments — **clsShadow** responds by providing the custom layout constraints for **borderWin** and **shadowWin**.

The **shadowWin** is placed and sized to provide a gap area on the lower-left and upper-right.

The **borderWin** is placed above the bottom shadow of the **shadowWin** and sized width-wise to extend to the left of the right shadow of the **shadowWin**.

msgWinRepaint

Tells a window to repaint itself.

Takes nothing, returns STATUS. Category: descendant responsibility.

Comments — If self has **wsTransparent** on, **clsShadow** prevents any painting by not calling ancestor and painting nothing.

STDMSG.H

This file contains the API definition for the standard message package.

The functions described in this file are contained in SYSUTIL.LIB.

Introduction

The standard message package makes it easy to display error messages, modal dialog boxes, and progress notes. The package hides many of the details of finding resources and creating UI objects. The package uses **clsNote** to display messages. (See note.h.)

Message are stored as strings in string array resources. A 32 bit value identifies the proper resource. For error messages the value is a STATUS; for dialog boxes and progress notes the value is a TAG constructed using the MakeDialogTag macro.

Road Map

To display a dialog box, use:

- StdMsg

To display an error message when you know about the error, use:

- StdError

To display an error message when you don't know about the error, use:

- StdUnknownError

To display a progress note, use:

- StdProgressUp
- StdProgressDown

To display messages extracted from a specified resource file or path, use:

- StdMsgRes
- StdErrorRes

To construct a customized message, use:

- StdMsgCustom

PenPoint-internal use only:

- StdSystemError

A Typical Scenario

[This scenario illustrates some features of the package that haven't been described yet. See the sections "Button Definition" and "Text Substitution and Formatting" for more information.]

The first step in using the standard message package is to define a tag or status for each string:

```
// #define stsFooError1        MakeStatus(clsFoo, 0)
// #define stsFooError2        MakeStatus(clsFoo, 1)
// #define tagFooDialog1       MakeDialogTag(clsFoo, 0)
// #define tagFooDialog2       MakeDialogTag(clsFoo, 1)
```

The next thing to do is to construct resources which contain the text strings. Standard message strings live in string array resources (see resfile.h). Application string arrays should reside in the application's app.res file. (PenPoint's string arrays reside in penpoint.res.)

There is one string array for error strings and another separate array for dialog box and progress strings. A single string array resource holds all of the strings for a given class.

Typically the string arrays are defined in a .rc file which is compiled with the PenPoint SDK's resource compiler. The position of each string in the string array resource must match its tag or status index (starting from 0).

```
static P_STRING errorClsFoo[] = {
    "This is the first error message.",
    "[Retry] [Cancel] This is the second error message. count: ^1d"};
static P_STRING dialogClsFoo[] = {
    "This is the first dialog message.",
    "[Go] [Stop] This is the second dialog message. str: ^1s"};
static RC_INPUT errorTabClsFoo = {
    resForStdMsgError(clsFoo), errorClsFoo, 0, resStringArrayResAgent};
static RC_INPUT dialogTabClsFoo = {
    resForStdMsgDialog(clsFoo), dialogClsFoo, 0, resStringArrayResAgent};
P_RC_INPUT  resInput [] = {
    &errorTabClsFoo,        // String array for std msg error strings
    &dialogTabClsFoo,       // String array for other std msg strings
    pNull};
```

Finally create a note by simply calling one of the appropriate function. This example uses StdMsg(), StdError() and StdUnknownError().

```
buttonHit = StdMsg(tagFooDialog2, "String");
s = ObjectCall(...);
if (s < stsOK) {
    if (s == stsFooError1) {
        StdError(stsFooError1);
    } else {
        StdUnknownError(s);
    }
}
```

Button Definition

Message strings may contain button definitions. A button definition is a substring enclosed in square brackets at the beginning of the message string. Any number of buttons may be defined but all buttons must appear at the front of the string. If no buttons are defined then a single "OK" button is created.

StdMsg(), StdError(), StdMsgRes(), StdErrorRes() and StdSystemError() return the button number that the user hit to dismiss the note. Button numbers start with 0. For example, a note constructed with the following string:

```
"[Button0] [Button1] [Button2] Here's your message!"
```

returns the value 1 if the user hits Button1. These functions might also return a negative error status if a problem occurred inside the function.

See the section "A Typical Scenario" for an example.

Text Substitution and Formatting

Message strings may contain parameter substitutions, as defined in cmpstext.h. Text substitution also works inside the button substrings.

See the section "A Typical Scenario" for an example.

You can break your message up into paragraphs by putting 2 newlines at the paragraph breaks. For example:

```
"Here's the first paragraph.\n\nHere's the second one."
```


Progress Notes

Clients can put up a progress note to inform the user that a lengthy operation has begun, and take down the progress note to indicate that the operation has been completed.

Cancellation of the operation is not supported in PenPoint 1.0. Progress notes do not have buttons. Here's an example of progress indication usage:

```
SP_TOKEN    token;
StdProgressUp(tagFooProgress1, &token, param1, param2);
... Lengthy operation ...
StdProgressDown(&token);
```

Searching for Resources

Most of the functions in this package search for resources as follows:

- If the process is an application process (OSThisApp() returns non-null), then the application's resource list is searched. Otherwise **theSystemResFile** is searched.
- If the desired resource is not found in the above resource files or lists, then **theServiceResList** is searched.

The exceptions to this rule are:

- **StdSystemError**(), which only checks **theSystemResFile.**
- **StdMsgRes**(), which takes as one of its parameters the resource file or list to search.
- **StdErrorRes**(), which takes as one of its parameters the resource file or list to search.

Note Titles and Reference Field

Notes will be titled "Note from {App}..." if the string was found in the app resource file, or "Note from PenPoint..." if the string was found in the system resource file.

You can use StdMsgCustom() if you want to have some other title.

Error messages will also have an additional line at the bottom of the note of the form:

Reference: xxx-xxx

where xxx-xxx is the status code that generated the error.

Customization of Standard Message Package Notes

StdMsgCustom() allows clients to customize a standard message package note. It returns the note object, without displaying it. Developers can modify this object as they wish and then display it themselves.

```
#ifndef STDMSG_INCLUDED
#define STDMSG_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef OSTYPES_INCLUDED
#include <ostypes.h>
#endif
```

Common #defines

Constructing Standard Message Tags

Use MakeStatus() (defined in go.h) to construct string tags for errors.

Use MakeDialogTag() to construct string tags for dialog and progress strings.

```
#define MakeDialogTag(wkn, index)   MakeIndexedResId(wkn, 1, index)
```

Constructing Standard Message Resource Ids

In a .rc file, use **resForStdMsgDialog** to construct the resource id for a class's dialog string array. Use **resForStdMsgError** to construct the resource id for a class's error string array.

See the section "A Typical Scenario" for an example.

```
#define resForStdMsgDialog(wkn) MakeListResId(wkn, resGrpStdMsg, 1)
#define resForStdMsgError(wkn)  MakeListResId(wkn, resGrpStdMsg, 0)
```

Public Functions

StdUnknownError

Displays an error message when the client doesn't recognize the error.

Returns STATUS.

Function Prototype

```
STATUS CDECL StdUnknownError(
    STATUS  status);
```

Comments

Use this function to display an error message when the error status is one that you don't pay special attention to.

StdUnknownError searches for an error message that matches the status parameter. If the specified status isn't found then a note with just the error code is displayed.

StdUnknownError does not allow parameter substitution or multiple command buttons. Any parameter substitution specifications in the text are replaced with "???". A single "OK" command button is always displayed.

See the section "A Typical Scenario" for an example. See the section "Searching for Resources" for a description of which resource files are searched.

StdMsg

Displays a dialog box from a resource file.

Returns S32.

Function Prototype

```
S32 CDECL StdMsg(
    const TAG tag,
    ...);
```

Comments

Use this function to display a dialog box.

StdMsg searches for an dialog string that matches the tag parameter. A dialog box with the message and buttons defined in the message string is displayed.

See the section "A Typical Scenario" for an example. See the section "Searching for Resources" for a description of which resource files are searched.

Like printf, this function takes a variable number of parameters. There is no error checking on the number and type of the parameters.

Return Value

stsResResourceNotFound the specified tag is not found.

< **stsOK** some other error occurred.

>= **stsOK** number of button the user hit (0 based).

StdError

Displays an error message from a resource file.

Returns S32.

Function Prototype

```
S32 CDECL StdError(
    const STATUS status,
    ...);
```

Comments

Use this function to display an error message.

StdError searches for an error message string that matches the status parameter. A note with the message and buttons defined in the error message string is displayed. The note also contains an Error Code number line.

See the section "A Typical Scenario" for an example. See the section "Searching for Resources" for a description of which resource files are searched.

Like printf, this function takes a variable number of parameters. There is no error checking on the number and type of the parameters.

Return Value

stsResResourceNotFound the specified tag is not found.

< **stsOK** some other error occurred.

>= **stsOK** number of button the user hit (0 based).

StdSystemError

For PenPoint internal use only. Displays an error message for a standard PenPoint error.

Returns S32.

Function Prototype

```
S32 CDECL StdSystemError(
    const STATUS status,
    ...);
```

Comments StdSystemError searches **theSystemResFile** (penpoint.res) for an error message string that matches the status parameter. A note with the message and buttons defined in the string is displayed.

Like printf, this function takes a variable number of parameters. There is no error checking on the number and type of the parameters.

Return Value **stsResResourceNotFound** the specified tag is not found.

< stsOK some other error occurred.

>= stsOK number of button the user hit (0 based).

StdProgressUp

Displays a progress note from a resource file.

Returns STATUS.

Arguments

```
typedef struct SP_TOKEN {
    OBJECT              uid;
    OS_MILLISECONDS     startTime;
    U32                 spare[8];
} SP_TOKEN, *P_SP_TOKEN;
```

Function Prototype

```
STATUS CDECL StdProgressUp(
    const   TAG         tag,
            P_SP_TOKEN  pToken,
            ...);
```

Comments Use this function to inform the user that a lengthy operation has started.

StdProgressUp searches for an dialog message that matches the tag parameter. A dialog box with the message string is displayed. This dialog box stay ups until StdProgressDown is called.

The **pToken** parameter, as filled in by StdProgressUp, must be passed to StdProgressDown. The client shouldn't touch it!

Example:

```
SP_TOKEN    token;
StdProgressUp(tagFoo, &token, param1, param2);
...
StdProgressDown(&token);
```

Progress notes do not contain a command bar. Any button definitions are ignored.

Like printf, this function takes a variable number of parameters. There is no error checking on the number and type of the parameters.

See the section "Progress Notes" for more information. See the section "Searching for Resources" for a description of which resource files are searched.

Return Value **stsResResourceNotFound** The specified tag was not found

See Also StdProgressDown

StdProgressDown

Brings down a progress note that was put up with StdProgressUp().

Returns STATUS.

Function Prototype

```
STATUS CDECL StdProgressDown(
    P_SP_TOKEN  pToken);
```

Comments The **pToken** parameter must be the same as that passed to StdProgressUp().

See the section "Progress Notes" for more information.

See Also StdProgressUp

StdMsgRes

Just like StdMsg() except that the resource path is specified.

Returns S32.

Function Prototype

```
S32 CDECL StdMsgRes(
            OBJECT  resFile,
    const   TAG     tag,
            ...);
```

Comments Use StdMsgRes when you need the functionality of StdMsg, but need to look up the string in a specified resource file or resource list.

StdMsgRes searches the specified resource file or list for a dialog message string that matches the tag parameter. A dialog box with the message and buttons defined in the message string is displayed.

Like printf, this function takes a variable number of parameters. There is no error checking on the number and type of the parameters.

Return Value **stsResResourceNotFound** the specified tag is not found.

< **stsOK** some other error occurred.

>= **stsOK** number of button the user hit (0 based).

See Also StdMsg

StdErrorRes

Just like StdError() except that the resource path is specified.

Returns S32.

Function Prototype

```
S32 CDECL StdErrorRes(
            OBJECT  resFile,
    const   STATUS  status,
            ...);
```

Comments Use StdMsgError when you need the functionality of StdError, but need to look up the string in a specified resource file or resource list.

StdErrorRes searches the specified resource file or list for an error message string that matches the status parameter. A note with the message and buttons defined in the error message string is displayed.

Like printf, this function takes a variable number of parameters. There is no error checking on the number and type of the parameters.

Return Value **stsResResourceNotFound** the specified tag is not found.

< **stsOK** some other error occurred.

>= **stsOK** number of button the user hit (0 based).

See Also StdError

StdMsgCustom

Creates a note object in the manner of StdMsg().

Returns OBJECT.

Function Prototype

```
OBJECT CDECL StdMsgCustom(
            OBJECT  resFile,
    const   TAG     tag,
            ...);
```

Comments

Use StdMsgCustom when you want to create a note using the facilities of the standard message package but need to customize the note before displaying it.

The client is responsible for displaying the note object. The note has **autoDestroy** on, so it self-destructs when dismissed.

StdMsgCustom allows the specification of a resource file or list to search. If **resFile** is **objNull** then searching occurs as described in the section "Searching for Resources." The tag parameter can either be a dialog tag (created with MakeDialogTag()) or an error status (created with MakeStatus()).

Here's an example:

```
#define tagFooDialog1       MakeDialogTag(clsFoo, 0)

S32     buttonHit;
OBJECT  note;

note = StdMsgCustom(objNull, tagFooDialog1, arg1, arg2);
if (note == objNull) {
    ... // Handle error, probably resource not found.
    goto error;
}
... // Customize the note.
ObjCallRet(msgNoteShow, note, &buttonHit, s);
```

Like printf, this function takes a variable number of parameters. There is no error checking on the number and type of the parameters.

Return Value

objNull No match, or some other error occurred.

STRLBOX.H

This file contains the API for **clsStringListBox.**

clsStringListBox inherits from **clsListBox.**

Implements a listbox that behaves as a choice or a group of toggles.

As with **clsListBox**, the client supplies entry information on demand. With **clsStringListBox**, however, the client supplies strings, not windows. These strings are used to create instances of **clsButton**, and it is these buttons that are used as entry windows within the **listBox.**

A **stringListBox** may behave in one of three manners: as a list of individual toggles (as in **clsToggleTable**), as choice that has zero or one of its buttons 'on' at a time, or as a choice that always has exactly one of its buttons 'on' at once. When a **stringListBox** is behaving as a choice, its value is the 'data' field of the entry that is currently chosen.

```
#ifndef STRLBOX_INCLUDED
#define STRLBOX_INCLUDED

#include <listbox.h>
```

```
#ifndef LISTBOX_INCLUDED

#endif
```

Common #defines and typedefs

```
// String ListBox behavior styles (roles)
#define slbRoleToggles      0   // Act like a toggle table.
#define slbRoleChoice01     1   // Act like a choice ( <=1 entries chosen)
#define slbRoleChoice1      2   // Act like a choice (always 1 entry chosen)
// String ListBox entry looks
#define slbLookInvert       0   // Chosen entries have inverted appearance.
#define slbLookDecorate     1   // Chosen entries have decorated appearance.
typedef struct {
    U16     role    : 4,        // Overall behavior.
            look    : 2,        // Controls looks of entries.
            dirty   : 1,        // Dirty status (ref. control.h)
            spare   : 9;        // reserved
} STRLB_STYLE, *P_STRLB_STYLE;
```

Default STRLB_STYLE:

```
    role    = slbRoleToggles
    look    = slbLookInvert
    dirty   = false
```

---

msgNew

Creates a string listbox window.

Takes P_STRLB_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct {
    STRLB_STYLE     style;      // overall style
    U32             value;      // initial value (if slbRoleChoice01
                                // or slbRoleChoice1)
    U32             spare;      // reserved
} STRLB_NEW_ONLY, *P_STRLB_NEW_ONLY;
```

The value is the 'data' field of the entry that is currently chosen.

```
#define stringListBoxNewFields  \
    listBoxNewFields            \
    STRLB_NEW_ONLY              stringListBox;
typedef struct {
    stringListBoxNewFields
} STRLB_NEW, *P_STRLB_NEW;
#define stsStrListBoxNoValue                MakeStatus(clsStringListBox, 1)
```

Comments

The fields you commonly set are:

pArgs->stringListBox.style.role overall behavior

pArgs->stringListBox.style.look entry looks

pArgs->stringListBox.value initial value

msgNewDefaults

Initializes the STRLB_NEW structure to default values.

Takes P_STRLB_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct {
    stringListBoxNewFields
} STRLB_NEW, *P_STRLB_NEW;
```

msgStrListBoxGetStyle

Passes back the style of the receiver.

Takes P_STRLB_STYLE, returns STATUS.

```
#define msgStrListBoxGetStyle               MakeMsg(clsStringListBox, 1)
```

Message Arguments

```
typedef struct {
    U16     role    : 4,        // Overall behavior.
            look    : 2,        // Controls looks of entries.
            dirty   : 1,        // Dirty status (ref. control.h)
            spare   : 9;        // reserved
} STRLB_STYLE, *P_STRLB_STYLE;
```

msgStrListBoxGetDirty

Passes back true if the listbox has been altered since dirty was set false.

Takes P_BOOLEAN, returns STATUS.

```
#define msgStrListBoxGetDirty               MakeMsg(clsStringListBox, 2)
```

msgStrListBoxSetDirty

Sets the dirty bit of a string listbox.

Takes BOOLEAN, returns STATUS.

```
#define msgStrListBoxSetDirty               MakeMsg(clsStringListBox, 3)
```

Comments

The receiver will send **msgControlSetDirty**(**pArgs**) to every entry window.

msgStrListBoxGetValue

Passes back the value of a string listbox.

Takes P_U32, returns STATUS.

```
#define msgStrListBoxGetValue                MakeMsg(clsStringListBox, 4)
```

Comments

The value is the data field of the entry that is currently chosen. This message may be used on instances whose role is either **slbRoleChoice01** or **slbRoleChoice1**. For instances whose role is **slbRoleToggles**, use **msgListBoxEnum** with enum.flags set to **lbSelected**.

Return Value

stsFailed the role is set to **slbRoleToggles**.

stsStrListBoxNoValue there's no entry selected.

msgStrListBoxSetValue

Sets the value of a string listbox whose role is one of **slbRoleChoice***.

Takes U32, returns STATUS.

```
#define msgStrListBoxSetValue                MakeMsg(clsStringListBox, 5)
```

Comments

Will deselect any selected entry if the arg is **maxU32** and the role is set to **slbRoleChoice1**. For instances whose role is **slbRoleToggles**, send as many **msgListBoxSetEntry** messages as required.

Return Value

stsFailed the role is set to **slbRoleToggles**.

Client Messages

msgStrListBoxProvideString

This message requests the client (or subclass) to provide a string.

Takes P_STRLB_PROVIDE, returns STATUS. Category: self-sent/client responsibility.

```
#define msgStrListBoxProvideString           MakeMsg(clsStringListBox, 6)
```

Arguments

```
typedef struct {
    OBJECT    strListBox;  //  In: requestor
    U16       position;    //  In: position of requested entry
    P_CHAR    pString;     // Out: a 256 byte buffer for the string
    U32       data;        // Out: data for the entry
    U32       spare;       // reserved
} STRLB_PROVIDE, *P_STRLB_PROVIDE;
```

Comments

This message is sent when **clsStringListBox** receives **msgListBoxProvideEntry**.

The string listbox is constructing an entry to be put into the listbox, and it needs the string and some data for the entry. The client (or subclass) should copy the string bytes into the **pString** buffer, and set the data field as desired.

msgStrListBoxProvideString is sent first to the string listbox itself. If the message reaches the standard **clsStringListBox** message handler, this message is forwarded on to the client of the listbox.

A string listbox will send this message even when the position it's asking for is >= the number of entries specified for the **listBox** (same behavior as **msgListBoxProvideEntry**). In this case, the client is free to return a non-zero status value, indicating to the string listbox that no entry should be created for that position. Providing another string in this case allows A **listBox** will send this message even when the position it's asking for is >= the number of entries specified for the **listBox**. In this case, the client is free to return a non-zero status value, indicating to the **listBox** that no entry should be created for that

position. Providing another entry window in this case allows the user to create new entries by merely scrolling past the end of the list.

Subclasses of **clsStringListBox** may choose to respond to **msgStrListBoxProvideString**, or bypass this mechanism altogether and respond instead to **msgListBoxProvideEntry**.

msgStrListBoxNotify

This message is sent out whenever the value of a string listbox changes.

Takes U32, returns STATUS. Category: self-sent/client responsibility.

```
#define msgStrListBoxNotify                MakeMsg(clsStringListBox, 7)
```

Comments The **pArgs** will be undefined when role is set to **slbRoleToggles** (use **msgListBoxEnum** with enum.flags set to **lbSelected**).

clsStringListBox responds by forwarding the message to the client of the listbox.

Messages from Other Classes

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments **clsStringListBox** responds by filing away its style and value. Note that **clsListBox** will have filed its data first according to the value of LIST_BOX_STYLE.filing.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments **clsStringListBox** responds by restoring its style and value.

msgWinSend

Sends a message up a window ancestry chain.

Takes P_WIN_SEND, returns STATUS.

Comments **clsStringListBox** responds when **pArgs->msg** is **msgButtonBeginPreview**, **msgButtonCancelPreview**, or **msgButtonDone**. If **pArgs->msg** is anything else, **clsStringListBox** just returns the result of calling its ancestor.

For these three messages, **clsStringListBox** will make the set of entry windows act as a group (as does **clsChoiceMgr**) and return **stsManagerContinue**.

Return Value **stsManagerContinue** returned for one of the above three messages.

msgListBoxProvideEntry

Self-sent when a **listBox** needs a window for display.

Takes P_LIST_BOX_ENTRY, returns STATUS. Category: self-sent/client responsibility.

Comments **clsStringListBox** responds by self-sending **msgStrListBoxProvideString**, using the resulting information to create an instance of **clsButton**, and passing back the new button in **pArgs**->win.

msgListBoxAppendEntry

Appends an entry to the list box after the specified position.

Takes P_LIST_BOX_ENTRY, returns STATUS.

Comments **clsStringListBox** responds by keeping its state in synch--if the position that is currently on is greater than the new entry, it's incremented.

msgListBoxInsertEntry

Insert an entry to the list box before the specified position.

Takes P_LIST_BOX_ENTRY, returns STATUS.

Comments **clsStringListBox** responds by keeping its state in synch--if the position that is currently on is greater than the new entry, it's incremented.

msgListBoxRemoveEntry

Removes an entry from the list box.

Takes U16, returns STATUS.

Comments **clsStringListBox** responds by keeping its state in synch--if the position that is currently on is less than the new entry, it's decremented.

If the entry being removed is the current 'on' button, the receiver sets its current value to zero (if the role is **slbRoleChoice1**) or to **maxU32** (if the role is **slbRoleChoice1**). **msgStrListBoxNotify** will be sent.

msgListBoxSetEntry

Sets an entry's information.

Takes P_LIST_BOX_ENTRY, returns STATUS.

Comments **clsStringListBox** responds by setting the tag and data for any new replacement entry window.

SWIN.H

This file contains the API definition for **clsScrollWin**.

clsScrollWin inherits from **clsBorder**.

A **scrollWin** positions, sizes, and displays a client window (optionally part of a "deck" of other child windows) together with optional scrollbars, and can scroll the client window by repositioning it.

Debugging Flags

The **clsScrollWin** debugging flag is '%'. Defined values are:

flag6 (0x0040) layout

```
#ifndef SWIN_INCLUDED
#define SWIN_INCLUDED

#include <sbar.h>
```

```
#ifndef SBAR_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT SCROLL_WIN;
```

Client styles for scrollbar client

```
#define swClientScrollWin       0   // scrollWin is the scrollbar client
#define swClientWin             1   // clientWin is the scrollbar client
#define swClientOther           2   // scrollWin will not set the client
//                              3   // unused (reserved)
```

Alignment styles

```
#define swAlignLeft             0               // left-justified
#define swAlignCenter           1               // centered
#define swAlignRight            2               // right-justified
#define swAlignTop              swAlignLeft     // top-justified
#define swAlignBottom           swAlignRight    // bottom-justified
#define swAlignSelf             3               // clientWin will align itself
```

Forward styles

```
#define swForwardNone           0               // don't forward anything
#define swForwardGesture        1               // forward msgGWinGesture
#define swForwardXList          2               // forward msgGWinXList
typedef struct SCROLL_WIN_STYLE {
    U16 vertScrollbar       : 1,    // vertical scrollbar on/off
        horizScrollbar      : 1,    // horizontal scrollbar on/off
        autoVertScrollbar   : 1,    // vert scrollbar on/off based on clientWin
        autoHorizScrollbar  : 1,    // horiz scrollbar on/off based on clientWin
        maskScrollbars      : 1,    // mask out vertScrollbar and horizScrollbar
        expandChildWidth    : 1,    // expand the child's width to avail width
        expandChildHeight   : 1,    // expand the child's height to avail height
        contractChildWidth  : 1,    // contract the child's width to avail width
        contractChildHeight : 1,    // contract the child's height to avail height
```

```
        getDelta            : 1,    // send msgScrollWinProvideDelta to client
        getSize             : 1,    // send msgScrollWinProvideSize
        wideVertScrollbar   : 1,    // make the vertical scrollbar wide
        wideHorizScrollbar  : 1,    // make the horizontal scrollbar wide
        forward             : 2,    // what to forward from margins to clientWin
        maskAll             : 1;    // mask out maskScrollbars
    U16 xAlignment      : 2,    // x Alignment if innerWin wider than clientWin
        yAlignment          : 2,    // y Alignment if innerWin taller than clientWin
        vertClient          : 2,    // choice of vertical sb client
        horizClient         : 2,    // choice of horizontal sb client
      xAlignRigorous    : 1,    // use xAlignment continuously
      yAlignRigorous    : 1,    // use yAlignment continuously
      private1          : 1,  // private
        spare1              : 5;    // unused (reserved)
    U16 spare2              : 16;   // unused (reserved)
} SCROLL_WIN_STYLE, *P_SCROLL_WIN_STYLE;
```

Default SCROLL_WIN_STYLE:

```
    getDelta            = false
    vertScrollbar       = false
    horizScrollbar      = false
    autoVertScrollbar   = true
    autoHorizScrollbar  = true
    expandChildWidth    = false
    expandChildHeight   = false
    vertClient          = swClientScrollWin
    horizClient         = swClientScrollWin
    xAlignment          = swAlignLeft
    yAlignment          = swAlignTop
    getSize             = false
    contractChildWidth  = false
    contractChildHeight = false
    forward             = swForwardNone
    maskScrollbars      = false
    xAlignRigorous      = true
    yAlignRigorous      = true
```

The x- and **yAlignment** styles are used primarily when the **innerWin** is wider/taller than the **clientWin**. However, they are also used when a **clientWin** that is wider/taller than the **innerWin** is changing size. In this case, the **innerWin** alters the origin to compensate for the size change so that the appropriate edge of the **clientWin** is held fixed (either by doing the math itself or sending out **msgScrollWinAlign** if the alignment is set to **swAlignSelf**). An example: a top-aligned **clientWin** of height 100 in an **innerWin** of height 50 is growing by 20. The **innerWin** would subtract 20 from the **clientWin**'s new origin.y.

Clients can disable the adjustments that occur in the second case (**clientWin** is wider/taller than the **innerWin**) by setting the appropriate x- or **yAlignRigorous** flag to false.

```
typedef struct SCROLL_WIN_METRICS {
    SCROLL_WIN_STYLE    style;              // style bits
    OBJECT              client;             // for msgScrollWinProvideDelta
    WIN                 clientWin;          // current window to scroll
    U16                 colDelta, rowDelta; // metrics in device units
    U32                 spare1;             // unused (reserved)
    U32                 spare2;             // unused (reserved)
} SCROLL_WIN_METRICS, *P_SCROLL_WIN_METRICS;

typedef struct SCROLL_WIN_DELTA {
    SCROLL_WIN          scrollWin;  // in:  requesting scroll win
    SCROLLBAR_ACTION    action;     // in:  action to resolve
    S32                 offset;     // in:  current or new offset
    RECT32              viewRect;   // in/out:  viewable portion of clientWin
    S32                 lineCoord;  // in:  line coordinate, if any
    U32                 spare;      // unused (reserved)
} SCROLL_WIN_DELTA, *P_SCROLL_WIN_DELTA;
```

Messages

msgNew

Creates a **scrollWin**.

Takes P_SCROLL_WIN_NEW, returns STATUS. Category: class message.

```
typedef SCROLL_WIN_METRICS  SCROLL_WIN_NEW_ONLY, *P_SCROLL_WIN_NEW_ONLY;
#define scrollWinNewFields  \
    borderNewFields         \
    SCROLL_WIN_NEW_ONLY     scrollWin;
```

Arguments

```
typedef struct SCROLL_WIN_NEW {
    scrollWinNewFields
} SCROLL_WIN_NEW, *P_SCROLL_WIN_NEW;
```

Comments

The fields you commonly set are:

pArgs->scrollWin.style appropriate style values

pArgs->scrollWin.**clientWin** a window to scroll

msgNewDefaults

Initializes the SCROLL_WIN_NEW structure to default values.

Takes P_SCROLL_WIN_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct SCROLL_WIN_NEW {
    scrollWinNewFields
} SCROLL_WIN_NEW, *P_SCROLL_WIN_NEW;
```

Comments

Zeroes out **pArgs->**scrollWin and sets:

```
    pArgs->win.flags.style |= wsSendFile | wsClipChildren | wsClipSiblings;
    pArgs->win.flags.style &= ~wsParentClip;

    pArgs->scrollWin.style.autoVertScrollbar = true;
    pArgs->scrollWin.style.autoHorizScrollbar = true;
    pArgs->scrollWin.style.xAlignRigorous =
    pArgs->scrollWin.style.yAlignRigorous = true;
    pArgs->scrollWin.colDelta = 10;
    pArgs->scrollWin.rowDelta = 10;
```

msgScrollWinGetStyle

Passes back the current style values.

Takes P_SCROLL_WIN_STYLE, returns STATUS.

```
#define msgScrollWinGetStyle        MakeMsg(clsScrollWin, 13)
```

Message Arguments

```
typedef struct SCROLL_WIN_STYLE {
    U16 vertScrollbar       : 1,    // vertical scrollbar on/off
        horizScrollbar      : 1,    // horizontal scrollbar on/off
        autoVertScrollbar   : 1,    // vert scrollbar on/off based on clientWin
        autoHorizScrollbar  : 1,    // horiz scrollbar on/off based on clientWin
        maskScrollbars      : 1,    // mask out vertScrollbar and horizScrollbar
        expandChildWidth    : 1,    // expand the child's width to avail width
        expandChildHeight   : 1,    // expand the child's height to avail height
        contractChildWidth  : 1,    // contract the child's width to avail width
        contractChildHeight : 1,    // contract the child's height to avail height
        getDelta            : 1,    // send msgScrollWinProvideDelta to client
        getSize             : 1,    // send msgScrollWinProvideSize
```

```
        wideVertScrollbar   : 1,    // make the vertical scrollbar wide
        wideHorizScrollbar  : 1,    // make the horizontal scrollbar wide
        forward             : 2,    // what to forward from margins to clientWin
        maskAll             : 1;    // mask out maskScrollbars
    U16 xAlignment      : 2,    // x Alignment if innerWin wider than clientWin
        yAlignment          : 2,    // y Alignment if innerWin taller than clientWin
        vertClient          : 2,    // choice of vertical sb client
        horizClient         : 2,    // choice of horizontal sb client
      xAlignRigorous    : 1,    // use xAlignment continuously
      yAlignRigorous    : 1,    // use yAlignment continuously
      private1          : 1,  // private
        spare1              : 5;    // unused (reserved)
    U16 spare2              : 16;   // unused (reserved)
} SCROLL_WIN_STYLE, *P_SCROLL_WIN_STYLE;
```

msgScrollWinSetStyle

Sets the style values.

Takes P_SCROLL_WIN_STYLE, returns STATUS.

```
#define msgScrollWinSetStyle        MakeMsg(clsScrollWin, 14)
```

Message Arguments

```
typedef struct SCROLL_WIN_STYLE {
    U16 vertScrollbar       : 1,    // vertical scrollbar on/off
        horizScrollbar      : 1,    // horizontal scrollbar on/off
        autoVertScrollbar   : 1,    // vert scrollbar on/off based on clientWin
        autoHorizScrollbar  : 1,    // horiz scrollbar on/off based on clientWin
        maskScrollbars      : 1,    // mask out vertScrollbar and horizScrollbar
        expandChildWidth    : 1,    // expand the child's width to avail width
        expandChildHeight   : 1,    // expand the child's height to avail height
        contractChildWidth  : 1,    // contract the child's width to avail width
        contractChildHeight : 1,    // contract the child's height to avail height
        getDelta            : 1,    // send msgScrollWinProvideDelta to client
        getSize             : 1,    // send msgScrollWinProvideSize
        wideVertScrollbar   : 1,    // make the vertical scrollbar wide
        wideHorizScrollbar  : 1,    // make the horizontal scrollbar wide
        forward             : 2,    // what to forward from margins to clientWin
        maskAll             : 1;    // mask out maskScrollbars
    U16 xAlignment      : 2,    // x Alignment if innerWin wider than clientWin
        yAlignment          : 2,    // y Alignment if innerWin taller than clientWin
        vertClient          : 2,    // choice of vertical sb client
        horizClient         : 2,    // choice of horizontal sb client
      xAlignRigorous    : 1,    // use xAlignment continuously
      yAlignRigorous    : 1,    // use yAlignment continuously
      private1          : 1,  // private
        spare1              : 5;    // unused (reserved)
    U16 spare2              : 16;   // unused (reserved)
} SCROLL_WIN_STYLE, *P_SCROLL_WIN_STYLE;
```

Comments

The **scrollWin** self-sends **msgWinSetLayoutDirty**(true). It is the caller's responsibility to re-layout the **scrollWin**.

msgScrollWinGetMetrics

Passes back the metrics.

Takes P_SCROLL_WIN_METRICS, returns STATUS.

```
#define msgScrollWinGetMetrics      MakeMsg(clsScrollWin, 1)
```

Message Arguments

```
typedef struct SCROLL_WIN_METRICS {
    SCROLL_WIN_STYLE    style;              // style bits
    OBJECT              client;             // for msgScrollWinProvideDelta
    WIN                 clientWin;          // current window to scroll
    U16                 colDelta, rowDelta; // metrics in device units
    U32                 spare1;             // unused (reserved)
    U32                 spare2;             // unused (reserved)
} SCROLL_WIN_METRICS, *P_SCROLL_WIN_METRICS;
```

msgScrollWinSetMetrics

Sets the metrics.

Takes P_SCROLL_WIN_METRICS, returns STATUS.

```
#define msgScrollWinSetMetrics      MakeMsg(clsScrollWin, 2)
```

Message Arguments

```
typedef struct SCROLL_WIN_METRICS {
    SCROLL_WIN_STYLE    style;              // style bits
    OBJECT              client;             // for msgScrollWinProvideDelta
    WIN                 clientWin;          // current window to scroll
    U16                 colDelta, rowDelta; // metrics in device units
    U32                 spare1;             // unused (reserved)
    U32                 spare2;             // unused (reserved)
} SCROLL_WIN_METRICS, *P_SCROLL_WIN_METRICS;
```

msgScrollWinGetClientWin

Passes back the current **clientWin**.

Takes P_WIN, returns STATUS.

```
#define msgScrollWinGetClientWin    MakeMsg(clsScrollWin, 3)
```

Comments

The current **clientWin** is the last window to be shown using **msgScrollWinShowClientWin**.

msgScrollWinShowClientWin

Sets the current **clientWin**; the specified window is be made visible.

Takes WIN, returns STATUS.

```
#define msgScrollWinShowClientWin   MakeMsg(clsScrollWin, 4)
```

Comments

If P_ARGS is not a child of the **scrollWin**'s inner window, **msgScrollWinAddClientWin** is self-sent followed by **msgWinLayout**.

msgScrollWinAddClientWin

Adds another **clientWin**, inserting the specified window as a child of the **scrollWin**'s inner window.

Takes WIN, returns STATUS.

```
#define msgScrollWinAddClientWin    MakeMsg(clsScrollWin, 11)
```

Comments

The specified window is set to be invisible (window flag **wsVisible** off).

msgScrollWinRemoveClientWin

Extracts the specified child window from the **scrollWin**.

Takes WIN, returns STATUS.

```
#define msgScrollWinRemoveClientWin MakeMsg(clsScrollWin, 12)
```

msgScrollWinGetVertScrollbar

Passes back the vertical scrollbar.

Takes P_WIN, returns STATUS.

```
#define msgScrollWinGetVertScrollbar    MakeMsg(clsScrollWin, 6)
```

msgScrollWinGetHorizScrollbar

Passes back the horizontal scrollbar.

Takes P_WIN, returns STATUS.

```
#define msgScrollWinGetHorizScrollbar   MakeMsg(clsScrollWin, 7)
```

msgScrollWinGetInnerWin

Passes back the inner window of the **scrollWin**.

Takes P_WIN, returns STATUS.

```
#define msgScrollWinGetInnerWin         MakeMsg(clsScrollWin, 9)
```

msgScrollWinProvideDelta

Self-sent when style.**getDelta** is set to true so that descendant or client can normalize the scroll if desired.

Takes P_SCROLL_WIN_DELTA, returns STATUS. Category: descendant/client responsibility.

```
#define msgScrollWinProvideDelta        MakeMsg(clsScrollWin, 5)
```

Message Arguments

```
typedef struct SCROLL_WIN_DELTA {
    SCROLL_WIN          scrollWin;  // in:  requesting scroll win
    SCROLLBAR_ACTION    action;     // in:  action to resolve
    S32                 offset;     // in:  current or new offset
    RECT32              viewRect;   // in/out:  viewable portion of clientWin
    S32                 lineCoord;  // in:  line coordinate, if any
    U32                 spare;      // unused (reserved)
} SCROLL_WIN_DELTA, *P_SCROLL_WIN_DELTA;
```

Comments

clsScrollWin responds by forwarding this message to the current **clientWin**. If you receive this message, you can send **msgScrollWinGetDefaultDelta** to **pArgs**->scrollWin to fill out **pArgs** with the default **scrollWin** response.

msgScrollWinProvideSize

Self-sent to determine bubble location and size.

Takes P_SCROLL_WIN_SIZE, returns STATUS. Category: descendant/client responsibility.

```
#define msgScrollWinProvideSize         MakeMsg(clsScrollWin, 10)
```

Arguments

```
typedef struct SCROLL_WIN_SIZE {
    SCROLL_WIN          scrollWin;  // in:  requesting scroll win
    SIZE32              viewSize;   // out: desired view size (device units)
    SIZE32              docSize;    // out: logical doc size (device units)
    U32                 spare;      // unused (reserved)
} SCROLL_WIN_SIZE, *P_SCROLL_WIN_SIZE;
```

Comments

clsScrollWin responds by forwarding to the current **clientWin** (if style.**getSize** is true), or sending **msgWinGetDesiredSize** to the current **clientWin** (if style.**getSize** is false). In the latter case if there is no current **clientWin**, **clsScrollWin** uses 0 for **docSize**.

A **clientWin** responding to **msgScrollWinProvideSize** should fill out **pArgs**->viewSize and **pArgs**->docSize.

msgScrollWinCheckScrollbars

Determines whether the on/off state of either scrollbar needs to change and passes back the result.

Takes P_BOOLEAN, returns STATUS.

```
#define msgScrollWinCheckScrollbars     MakeMsg(clsScrollWin, 15)
```

Comments

Clients wishing to fix up the states should dirty the layout of the **scrollWin** and then send **msgWinLayout**.

msgScrollWinAlign

Sent to client when style.**xAlignment** or style.**yAlignment** is **swAlignSelf**.

Takes P_SCROLL_WIN_ALIGN, returns STATUS. Category: client responsibility.

```
#define msgScrollWinAlign       MakeMsg(clsScrollWin, 16)
```

Arguments

```
typedef struct SCROLL_WIN_ALIGN {
    SCROLL_WIN          scrollWin;  // in:  requesting scroll win
    BOOLEAN             alignX;     // in:  x dimension (false for y)
    RECT32              innerRect;  // in/out:  rect of innerWin, device units
    RECT32              clientRect; // in/out:  rect of clientWin, device units
    U32                 spare;      // unused (reserved)
} SCROLL_WIN_ALIGN, *P_SCROLL_WIN_ALIGN;
```

Comments

clsScrollWin sends this message to the **scrollWin**'s client or **clientWin** if the client is **objNull**. This message is sent when the child window changes size or the **scrollWin** inner window changes size. See the comment after "Default SCROLL_WIN_STYLE" for a further description of alignment.

msgScrollWinGetDefaultDelta

Compute the default response to **msgScrollWinProvideDelta**.

Takes P_SCROLL_WIN_DELTA, returns STATUS.

```
#define msgScrollWinGetDefaultDelta     MakeMsg(clsScrollWin, 17)
```

Message Arguments

```
typedef struct SCROLL_WIN_DELTA {
    SCROLL_WIN          scrollWin;  // in:  requesting scroll win
    SCROLLBAR_ACTION    action;     // in:  action to resolve
    S32                 offset;     // in:  current or new offset
    RECT32              viewRect;   // in/out:  viewable portion of clientWin
    S32                 lineCoord;  // in:  line coordinate, if any
    U32                 spare;      // unused (reserved)
} SCROLL_WIN_DELTA, *P_SCROLL_WIN_DELTA;
```

Comments

You can send this message to a **scrollWin** to compute the default scroll values for a given scrolling action.

See Also

msgScrollWinProvideDelta

msgScrollWinRefreshSize

Informs the receiver that **msgScrollWinProvideSize** would now return different size.

Takes P_SIZE32, returns STATUS.

```
#define msgScrollWinRefreshSize     MakeMsg(clsScrollWin, 18)
```

Comments

A client would send this to a **scrollWin** when the **scrollWin** has style.**getSize** set true and the client would now return different size in response to **msgScrollWinProvideSize**. The client passes the current size, and the **scrollWin** sends **msgScrollWinProvideSize** to the client (or the **clientWin** if that's null), then adjust the positions as if the **clientWin** had changed size.

clsScrollWin just returns **stsOK** if style.**getSize** is false.

Messages from other classes

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

clsScrollWin responds by filing away all its state, including any child windows that have **wsSendFile** turned on (**wsSendFile** is the default for **clsBorder** and its descendents).

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsScrollWin responds by restoring all of its state, including the child windows that were filed with the last **msgSave**.

msgWinLayoutSelf

Tell a window to layout its children.

Takes P_WIN_METRICS, returns STATUS.

Comments

The **scrollWin** first gets the dimensions of its current **clientWin** by using **msgWinGetDesiredSize**. If there is no current **clientWin**, the **scrollWin** uses a width and height of 0 in its computations.

If the **scrollWin** did not shrinkwrap around the current **clientWin**, then the **expandChild*** and **contractChild*** styles come into play. If the **clientWin**'s width is less than the width of the **scrollWin**'s inner window (a direct child of the **scrollWin** that serves as a clipping window) and **expandChildWidth** is true, then the **clientWin**'s width is expanded to fit. If the **clientWin**'s width is greater than the inner window's and **contractChildWidth** is true, then the **clientWin**'s width is reduced to fit. These rules hold for the height as well.

Finally, if the **clientWin**'s (possibly modified) width is still less than the inner window's, then the **xAlignment** style is used to place the **clientWin** within the inner window. This is also done in the vertical direction using **yAlignment**.

The **scrollWin** adds or remove a vertical **scrollBar** as necessary if style.**autoVertScrollbar** is on, and the same is done for the horizontal direction (when both style.**maskScrollbars** and style.**maskAll** are off).

msgWinSetFlags

Sets the window flags.

Takes P_WIN_METRICS, returns STATUS.

Comments

clsScrollWin responds by first propagating the shrinkwrap values to the inner window, then calling its ancestor.

msgWinSend

Sends a message up a window ancestry chain.

Takes WIN_SEND, returns STATUS.

Comments

clsScrollWin responds by checking to see if **pArgs**->msg is **msgScrollbarUpdate**. If so, the **scrollWin** sends **msgScrollbarUpdate** to both of its scrollbars and then return **stsOK**. If not, then the **scrollWin** just calls its ancestor.

msgGWinGesture

Self-sent to process the gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

If there is a current **clientWin** and style.forward is **swForwardGesture**, then the **pArgs** are transformed to the **clientWin**, and the **clientWin** is sent **msgGWinGesture**. The **scrollWin** returns the resulting status to the caller.

Otherwise, the **scrollWin** compares the **pArgs**->msg with the state of the corresponding scrollbar. If the message is not a scrolling gesture, then the **scrollWin** returns **stsMessageIgnored**. If it is a vertical scrolling gesture and the vertical scrollbar is not active, then the **scrollWin** returns **stsOK**. Finally, if the message is a vertical scrolling gesture and the vertical scrollbar is active, the **scrollWin** transforms the **pArgs** to the scrollbar's space and return the result of sending **msgGWinGesture** to the scrollbar (unless the **msgGWinGesture** originated with the scrollbar, i.e. **pArgs**->uid == the scrollbar -- in this case the **scrollWin** returns **stsMessageIgnored**). This processing is also done for horizontal scrolling gestures and the horizontal scrollbar.

The above processing also is done whenever the **scrollWin**'s inner window receives **msgGWinGesture**.

Return Value

stsOK a scrolling gesture would have had to be sent to an inactive scrollbar.

stsMessageIgnored not a scrolling gesture, or message originated with the scrollbar to which **msgGWinGesture** would be sent.

msgGWinForwardedGesture

Message recieved when object is forwarded a gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

The **scrollWin** compares the **pArgs**->msg with the state of the corresponding scrollbar. If the message is not a scrolling gesture, then the **scrollWin** returns **stsMessageIgnored**. If it is a vertical scrolling gesture and the vertical scrollbar is not active, then the **scrollWin** returns **stsOK**. Finally, if the message is a vertical scrolling gesture and the vertical scrollbar is active, the **scrollWin** transforms the **pArgs** to the scrollbar's space and return the result of sending **msgGWinGesture** to the scrollbar (unless the **msgGWinGesture** originated with the scrollbar, i.e. **pArgs**->uid == the scrollbar -- in this case the **scrollWin** returns **stsMessageIgnored**). This processing is also done for horizontal scrolling gestures and the horizontal scrollbar.

The above processing also is done whenever the **scrollWin**'s inner window receives **msgGWinGesture**.

Return Value

stsOK a scrolling gesture would have had to be sent to an inactive scrollbar.

stsMessageIgnored not a scrolling gesture, or message originated with the scrollbar to which **msgGWinGesture** would be sent.

msgGWinXList

Call back to announce gesture translation completed.

Takes P_XLIST, returns STATUS.

Comments

If there is no current **clientWin**, or style.forward is not **swForwardXList**, then the **scrollWin** just calls its ancestor.

Otherwise, the **scrollWin** transforms the **pArgs** to the **clientWin** and return the result of sending **msgGWinXList** to the **clientWin**.

The above processing also is done whenever the **scrollWin**'s inner window receives **msgGWinXList**.

msgScrollbarVertScroll

Client should perform vertical scroll.

Takes P_SCROLLBAR_SCROLL, returns STATUS. Category: client responsibility.

Comments

Responding to this message is one of the key functions that **scrollWins** provide. Since the default **scrollWin** style.**vertClient** and .**horizClient** are both **swClientScrollWin**, it is usually the case that the scrollbars send their scrolling messages to the **scrollWin**.

If there is no current **clientWin**, or the **pArgs**->action is **sbEndScroll**, the **scrollWin** just returns **stsOK**.

If style.**getDelta** is true, the **scrollWin** sends **msgScrollWinProvideDelta** to the client (if that is non-null) or the **clientWin** (if the client was null). Otherwise, the **scrollWin** uses metrics.**rowDelta** for the **sbLine*** actions, and the inner window's height - metrics.**rowDelta** for the **sbPage*** actions.

Once the **scrollWin** has determined the amount to scroll, it sends **msgWinDelta** to the **clientWin**.

msgScrollbarHorizScroll

Client should perform horizontal scroll.

Takes P_SCROLLBAR_SCROLL, returns STATUS. Category: client responsibility.

Comments

Responding to this message is one of the key functions that **scrollWins** provide. Since the default **scrollWin** style.**vertClient** and .**horizClient** are both **swClientScrollWin**, it is usually the case that the scrollbars send their scrolling messages to the **scrollWin**.

If there is no current **clientWin**, or the **pArgs**->action is **sbEndScroll**, the **scrollWin** just returns **stsOK**.

If style.**getDelta** is true, the **scrollWin** sends **msgScrollWinProvideDelta** to the client (if that is non-null) or the **clientWin** (if the client was null). Otherwise, the **scrollWin** uses metrics.**colDelta** for the **sbLine*** actions, and the inner window's width - metrics.**colDelta** for the **sbPage*** actions.

Once the **scrollWin** has determined the amount to scroll, it sends **msgWinDelta** to the **clientWin**.

msgScrollbarProvideVertInfo

Client should provide the document and view info.

Takes P_SCROLLBAR_PROVIDE, returns STATUS. Category: client responsibility.

Comments

clsScrollWin responds by filling out the **pArgs** fields. It sets the **viewLength** to the height of the inner window. If there is a current **clientWin**, then the **scrollWin** sets the **docLength** to the height of the **clientWin**, and the offset to the difference between the top of the **clientWin** and the top of the inner window. If there is no current **clientWin**, the **scrollWin** sets both **docLength** and offset to 0.

msgScrollbarProvideHorizInfo

Client should provide the document and view info.

Takes P_SCROLLBAR_PROVIDE, returns STATUS. Category: client responsibility.

Comments

clsScrollWin responds by filling out the **pArgs** fields. It sets the **viewLength** to the width of the inner window. If there is a current **clientWin**, then the **scrollWin** sets the **docLength** to the width of the **clientWin**, and the offset to the negative of the **clientWin**'s x. If there is no current **clientWin**, the **scrollWin** sets both **docLength** and offset to 0.

msgEmbeddedWinShowChild

Display a given area of an **embeddedWin** to the user

Takes P_EMBEDDED_WIN_SHOW_CHILD, returns STATUS.

Comments

clsScrollWin responds by sending messages to the vertical and/or horizontal scrollbars to scroll the client window area into view.

TABBAR.H

This file contains the API definition for **clsTabBar**.

clsTabBar inherits from **clsTkTable.**

Implements a window that lays out its children in a single column or row.

TabBars are most often seen at the side of Notebooks. **clsTabBar** will overlap its children in a regular fashion if they won't fit in the long dimension. **clsTabBar** also handles flick gestures forwarded to it by rearranging the children.

Debugging Flags

The **clsTabBar** debugging flag is 'K'. Defined values are:

flag12 (0x1000) general debug info

```
#ifndef TABBAR_INCLUDED
#define TABBAR_INCLUDED

#include <tktable.h>
```

```
#ifndef TKTABLE_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT TAB_BAR, *P_TAB_BAR;
```

Direction

```
#define tbDirectionVertical     0   // vertical tab bar
#define tbDirectionHorizontal   1   // horizontal tab bar
typedef struct TAB_BAR_STYLE {
    U16 direction           : 1,    // vertical or horizontal
        incrementalLayout   : 1,    // careful about add and remove children
        spare               : 14;   // unused (reserved)
} TAB_BAR_STYLE, *P_TAB_BAR_STYLE;
```

Default TabBar style:

```
direction           = tbDirectionVertical
incrementalLayout   = true
```

Messages

msgNew

Creates a **tabBar** window.

Takes P_TAB_BAR_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct TAB_BAR_NEW_ONLY {
    TAB_BAR_STYLE       style;          // overall style
    U32                 spare;          // unused (reserved)
} TAB_BAR_NEW_ONLY, *P_TAB_BAR_NEW_ONLY;
#define tabBarNewFields     \
    tkTableNewFields        \
    TAB_BAR_NEW_ONLY        tabBar;
typedef struct TAB_BAR_NEW {
    tabBarNewFields
} TAB_BAR_NEW, *P_TAB_BAR_NEW;
```

Comments

The fields you commonly set are:

pArgs->tabBar.style.direction whether horizontal or vertical

msgNewDefaults

Initializes the TAB_BAR_NEW structure to default values.

Takes P_TAB_BAR_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct TAB_BAR_NEW {
    tabBarNewFields
} TAB_BAR_NEW, *P_TAB_BAR_NEW;
```

Comments

Zeroes out **pArgs**->tabBar and sets

```
pArgs->win.flags.style |= wsTransparent | wsClipChildren;
pArgs->win.flags.input |= inputDisable | inputTransparent;

pArgs->gWin.style.gestureEnable = false;

pArgs->border.style.backgroundInk |= bsInkExclusive;
pArgs->border.style.leftMargin = bsMarginNone;
pArgs->border.style.rightMargin = bsMarginNone;
pArgs->border.style.bottomMargin = bsMarginNone;
pArgs->border.style.topMargin = bsMarginNone;

pArgs->tableLayout.style.tblXAlignment = tlAlignCenter;
pArgs->tableLayout.style.tblYAlignment = tlAlignCenter;
pArgs->tableLayout.style.growChildHeight = false;
pArgs->tableLayout.style.reverseY = true;

pArgs->tableLayout.numCols.constraint = tlAbsolute;
pArgs->tableLayout.numCols.value = 1;
pArgs->tableLayout.numRows.constraint = tlInfinite;
pArgs->tableLayout.colWidth.constraint = tlChildrenMax;
pArgs->tableLayout.colWidth.gap = 0;
pArgs->tableLayout.rowHeight.constraint = tlGroupMax;
pArgs->tableLayout.rowHeight.gap = defaultRowGap;

pArgs->tabBar.style.incrementalLayout = true;
```

Also sets the default child structure in **pArgs**->tkTable.**pButtonNew** to be appropriate for labels and buttons that may be rotated 270 degrees and have curved overlapping "tabs".

msgTabBarGetStyle

Passes back the style values.

Takes P_TAB_BAR_STYLE, returns STATUS.

```
#define msgTabBarGetStyle       MakeMsg(clsTabBar, 1)
```

Message Arguments

```
typedef struct TAB_BAR_STYLE {
    U16 direction           : 1,    // vertical or horizontal
        incrementalLayout   : 1,    // careful about add and remove children
        spare               : 14;   // unused (reserved)
} TAB_BAR_STYLE, *P_TAB_BAR_STYLE;
```

msgTabBarSetStyle

Sets the style values.

Takes P_TAB_BAR_STYLE, returns STATUS.

```
#define msgTabBarSetStyle       MakeMsg(clsTabBar, 2)
```

Message Arguments

```
typedef struct TAB_BAR_STYLE {
    U16 direction           : 1,    // vertical or horizontal
        incrementalLayout   : 1,    // careful about add and remove children
        spare               : 14;   // unused (reserved)
} TAB_BAR_STYLE, *P_TAB_BAR_STYLE;
```


Messages from Other Classes

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments **clsTabBar** responds by filing away its instance data.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments **clsTabBar** responds by restoring its instance data.

msgWinLayoutSelf

Tells a window to layout its children.

Takes P_WIN_METRICS, returns STATUS.

Comments When a **tabBar** receives **msgWinLayoutSelf**, it will ignore the current positions of its children and do a full relayout, crunching the children toward the bottom (right) of itself, if necessary.

To insert or remove a child and cause the **tabBar** to incrementally fix up the tab positions (i.e., without doing a full relayout), use **msgTkTableAdd*** and **msgTkTableRemove**. When a **tabBar** receives these messages, it checks its **incrementalLayout** style bit. If this is on, the **tabBar** will fix up the area around the inserted/removed child. If the style bit is off, the **tabBar** will not do relayout.

If you want to add/remove more than a few tabs, turn **incrementalLayout** off, add/remove the children, then send **msgWinLayout** to the **tabBar**.

See Also **msgTkTableAdd*** adds a child and will immediately fix up the layout of the **tabBar**'s children (if style.**incrementalLayout** is true).

msgTkTableRemove removes a child and will immediately fix up the layout of the **tabBar**'s children (if style.**incrementalLayout** is true).

msgWinSend

Sends a message up a window ancestry chain.

Takes P_WIN_SEND, returns STATUS.

Comments

When a **tabBar** receives this message, it is usually because the **tabBar** has an "expand" menu up, and the user has tapped on one of those menu buttons.

If the **pArgs**->msg is not **msgMenuDone**, or the **tabBar** does not have a menu up, the **tabBar** will just return the result of calling its ancestor.

Otherwise, the **tabBar** will take down the menu via **msgMenuShow**, post a **msgDestroy** to it, and then return **stsOK**. This is all the **tabBar** must do at this point, since the principle work of the **menuButton** was done when it sent its message to its client (in this case, the client is the **tabBar**).

msgGWinForwardedGesture

Message received when object is forwarded a gesture.

Takes P_GWIN_GESTURE, returns STATUS.

Comments

TabBars respond to flick gestures by potentially altering the layout of their child windows. This allows a user to rearrange the child buttons when there's not enough room to display all the children fully.

The **tabBar** will first test **pArgs**->msg to see if it is not a flick gesture or it is but it would have no meaning. If either is true, the **tabBar** will return **stsMessageIgnored**.

If all the children are fully displayed, the **tabBar** will return **stsOK**.

If style.direction is **tbDirectionVertical** and **pArgs**->msg is **xgsFlickLeft**, or the direction is **tbDirectionHorizontal** and **pArgs**->msg is **xgsFlickUp**, the **tabBar** will create and put up a menu over itself that looks like an expanded **tabBar**. The user then tap on one of the menu buttons; this will have the same effect as tapping on the corresponding **tabBar** child. After putting up the menu, the **tabBar** will return **stsOK**.

If all of the above checks failed, the **tabBar** will process the flick gesture by moving its children as appropriate and then returning **stsOK**.

msgTkTableChildDefaults

Sets the defaults in P_ARGS for a common child.

Takes P_UNKNOWN, returns STATUS.

Comments

Here is how a **tabBar** processes this message if style.direction is **tbDirectionVertical**:

```
pArgs->win.flags.style &= ~wsParentClip;
pArgs->win.flags.style |= wsClipSiblings | wsClipChildren;
if <pArgs->object.class inherits from clsBorder> {
    pArgs->border.style.edge = bsEdgeTop | bsEdgeRight | bsEdgeBottom;
    pArgs->border.style.join = bsJoinRound;
    pArgs->border.style.backgroundInk = bsInkWhite;
    pArgs->border.style.topMargin = bsMarginMedium;
    pArgs->border.style.bottomMargin = bsMarginMedium;
    pArgs->border.style.shadow = bsShadowThinBlack;
}
if <pArgs->object.class inherits from clsLabel> {
    pArgs->label.style.xAlignment = lsAlignCenter;
    pArgs->label.style.yAlignment = lsAlignCenter;
    pArgs->label.style.rotation = lsRotate270;
    pArgs->label.scale = lsScaleMedium;
}
```

Here is how a **tabBar** processes this message if style.direction is **tbDirectionHorizontal**:

```
pArgs->win.flags.style &= ~wsParentClip;
pArgs->win.flags.style |= wsClipSiblings | wsClipChildren;
if <pArgs->object.class inherits from clsBorder> {
    pArgs->border.style.edge = bsEdgeLeft | bsEdgeRight | bsEdgeBottom;
    pArgs->border.style.join = bsJoinRound;
    pArgs->border.style.backgroundInk = bsInkWhite;
    pArgs->border.style.leftMargin = bsMarginMedium;
    pArgs->border.style.rightMargin = bsMarginMedium;
    pArgs->border.style.topMargin = bsMarginSmall;
    pArgs->border.style.bottomMargin = bsMarginSmall;
    pArgs->border.style.shadow = bsShadowThinBlack;
    pArgs->border.style.shadowGap = bsGapNone;
}
if <pArgs->object.class inherits from clsLabel> {
    pArgs->label.style.xAlignment = lsAlignCenter;
    pArgs->label.style.yAlignment = lsAlignCenter;
    pArgs->label.style.rotation = lsRotateNone;
    pArgs->label.scale = lsScaleMedium;
}
```


msgTkTableAddAsFirst

Adds specified window as the first child in the table.

Takes WIN, returns STATUS.

Comments

clsTabBar responds by first calling its ancestor, then checking style.**incrementalLayout**. If this is false, the **tabBar** will just return **stsOK**.

Otherwise, the **tabBar** will do whatever layout is necessary to fix up the positions of its children.

msgTkTableAddAsLast

Adds specified window as the last child in the table.

Takes WIN, returns STATUS.

Comments

clsTabBar responds by first calling its ancestor, then checking style.**incrementalLayout**. If this is false, the **tabBar** will just return **stsOK**.

Otherwise, the **tabBar** will do whatever layout is necessary to fix up the positions of its children.

msgTkTableAddAsSibling

Inserts specified window in front of or behind an existing child.

Takes P_TK_TABLE_ADD_SIBLING, returns STATUS.

Comments

clsTabBar responds by first calling its ancestor, then checking style.**incrementalLayout**. If this is false, the **tabBar** will just return **stsOK**.

Otherwise, the **tabBar** will do whatever layout is necessary to fix up the positions of its children.

msgTkTableAddAt

Inserts specified window table at specified index.

Takes P_TK_TABLE_ADD_AT, returns STATUS.

Comments

clsTabBar responds by first calling its ancestor, then checking style.**incrementalLayout**. If this is false, the **tabBar** will just return **stsOK**.

Otherwise, the **tabBar** will do whatever layout is necessary to fix up the positions of its children.

msgTkTableRemove

Extracts specified window.

Takes WIN, returns STATUS.

Comments

Currently, the **tabBar** just calls its ancestor and does not attempt to fix up the layout of its children. This may change in the future.

TBAR.H

This file contains the API definition for **clsTitleBar.**

clsTitleBar inherits from **clsButton.**

Title bars are the standard frame decorations which support dragging a frame, bringing a frame to the front, and flicking to zoom.

```
#ifndef TBAR_INCLUDED
#define TBAR_INCLUDED

#include <button.h>
```

```
#ifndef BUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT TITLE_BAR;
typedef struct TITLE_BAR_STYLE {
    U16 spare       : 16;   // unused (reserved)
} TITLE_BAR_STYLE, *P_TITLE_BAR_STYLE;
```

Messages

msgNew

Creates a title bar window.

Takes P_TITLE_BAR_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct TITLE_BAR_NEW_ONLY {
    TITLE_BAR_STYLE style;
    U32             spare1; // unused (reserved)
    U32             spare2; // unused (reserved)
} TITLE_BAR_NEW_ONLY, *P_TITLE_BAR_NEW_ONLY;
#define titleBarNewFields   \
    buttonNewFields         \
    TITLE_BAR_NEW_ONLY      titleBar;
typedef struct TITLE_BAR_NEW {
    titleBarNewFields
} TITLE_BAR_NEW, *P_TITLE_BAR_NEW;
```

msgNewDefaults

Initializes the TITLE_BAR_NEW structure to default values.

Takes P_TITLE_BAR_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct TITLE_BAR_NEW {
    titleBarNewFields
} TITLE_BAR_NEW, *P_TITLE_BAR_NEW;
```

Comments

Zeroes out pArgs->titleBar and sets

```
pArgs->border.style.join            = bsJoinSquare;
pArgs->border.style.shadow          = bsShadowNone;
pArgs->border.style.leftMargin      = bsMarginMedium;
pArgs->border.style.rightMargin     = bsMarginMedium;
pArgs->border.style.bottomMargin    = bsMarginSmall + bsMarginSmall;
pArgs->border.style.topMargin       = bsMarginMedium + bsMarginSmall;
pArgs->border.style.drag = bsDragHoldDown;
pArgs->border.style.top = bsTopUp;
pArgs->border.style.getDeltaWin = true;
pArgs->control.style.previewEnable = false;
pArgs->label.style.xAlignment = lsAlignCustom;
pArgs->button.style.feedback = bsFeedbackNone;
```

msgTitleBarGetStyle

Passes back the current style values.

Takes P_TITLE_BAR_STYLE, returns STATUS.

```
#define msgTitleBarGetStyle     MakeMsg(clsTitleBar, 1)
```

Message Arguments

```
typedef struct TITLE_BAR_STYLE {
    U16 spare       : 16;   // unused (reserved)
} TITLE_BAR_STYLE, *P_TITLE_BAR_STYLE;
```

msgTitleBarSetStyle

Sets the style values.

Takes P_TITLE_BAR_STYLE, returns STATUS.

```
#define msgTitleBarSetStyle     MakeMsg(clsTitleBar, 2)
```

Message Arguments

```
typedef struct TITLE_BAR_STYLE {
    U16 spare       : 16;   // unused (reserved)
} TITLE_BAR_STYLE, *P_TITLE_BAR_STYLE;
```

TBUTTON.H

This file contains the API definition for **clsTabButton.**

clsTabButton inherits from **clsButton.**

Provides a class of button useful in the popup choice contained in the title of option sheets, because tab buttons hold some flags, a window uid, and an extra client.

```
#ifndef TBUTTON_INCLUDED
#define TBUTTON_INCLUDED

#include <clsmgr.h>

#include <button.h>
```

```
#ifndef CLSMGR_INCLUDED

#endif
#ifndef BUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef struct TAB_BUTTON_METRICS {
    U16     flags;          // arbitrary flags
    WIN     win;            // associated window uid
    OBJECT  client;         // associated client
    U32     clientData[2];  // arbitrary client data
    U32     spare;          // reserved
} TAB_BUTTON_METRICS, *P_TAB_BUTTON_METRICS;
```

---

msgNew

Creates a tab button.

Takes P_TAB_BUTTON_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct TAB_BUTTON_NEW_ONLY {
    TAB_BUTTON_METRICS  metrics;
    U32                 spare;      // reserved
} TAB_BUTTON_NEW_ONLY, *P_TAB_BUTTON_NEW_ONLY;
#define tabButtonNewFields  \
    buttonNewFields         \
    TAB_BUTTON_NEW_ONLY     tabButton;
typedef struct TAB_BUTTON_NEW {
    tabButtonNewFields
} TAB_BUTTON_NEW, *P_TAB_BUTTON_NEW;
```

Comments

The fields you commonly set are:

pArgs->tabButton.metrics.win a window uid to hold

pArgs->tabButton.metrics.client a client uid to hold

msgNewDefaults

Initializes the TAB_BUTTON_NEW structure to default values.

Takes P_TAB_BUTTON_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct TAB_BUTTON_NEW {
    tabButtonNewFields
} TAB_BUTTON_NEW, *P_TAB_BUTTON_NEW;
```

Comments

Zeroes out pArgs->tabButton.

msgTabButtonGetMetrics

Passes back the metrics of a tab button.

Takes P_TAB_BUTTON_METRICS, returns STATUS.

```
#define msgTabButtonGetMetrics  MakeMsg(clsTabButton, 1)
```

Message Arguments

```
typedef struct TAB_BUTTON_METRICS {
    U16     flags;          // arbitrary flags
    WIN     win;            // associated window uid
    OBJECT  client;         // associated client
    U32     clientData[2];  // arbitrary client data
    U32     spare;          // reserved
} TAB_BUTTON_METRICS, *P_TAB_BUTTON_METRICS;
```

msgTabButtonSetMetrics

Sets the metrics of a tab button.

Takes P_TAB_BUTTON_METRICS, returns STATUS.

```
#define msgTabButtonSetMetrics  MakeMsg(clsTabButton, 2)
```

Message Arguments

```
typedef struct TAB_BUTTON_METRICS {
    U16     flags;          // arbitrary flags
    WIN     win;            // associated window uid
    OBJECT  client;         // associated client
    U32     clientData[2];  // arbitrary client data
    U32     spare;          // reserved
} TAB_BUTTON_METRICS, *P_TAB_BUTTON_METRICS;
```

msgTabButtonGetFlags

Passes back the flags of a tab button.

Takes P_U16, returns STATUS.

```
#define msgTabButtonGetFlags    MakeMsg(clsTabButton, 3)
```

msgTabButtonSetFlags

Sets the flags of a tab button.

Takes U16, returns STATUS.

```
#define msgTabButtonSetFlags    MakeMsg(clsTabButton, 4)
```

Messages from Other Classes

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

clsTabButton will save its instance data.

If the TAB_BUTTON_METRICS.win is not null and the window's **wsSendFile** flag is on, the window will be filed with **msgResPutObject** (the window's **wsFileInline** flag is cleared first).

If the TAB_BUTTON_METRICS.client is OSThisApp(), this fact is saved so that **clsTabButton**'s response to **msgRestore** will restore the client to OSThisApp() again. If the client is not OSThisApp(), **msgRestore** will set the client to null.

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsTabButton restores its instance data.

If the TAB_BUTTON_METRICS.client had been OSThisApp() at **msgSave** time, **msgRestore** will set the client to OSThisApp() again.

TKFIELD.H

This file contains the API definitions for **clsDateField**, **clsFixedField**, **clsIntegerField**, and **clsTextField**.

clsDateField inherits from **clsField.**

Provides a field that treats its label string as a date.

clsFixedField inherits from **clsField.**

Provides a field that treats its label string as a number in hundredths.

clsIntegerField inherits from **clsField.**

Provides a field that treats its label string as an integer.

clsTextField inherits from **clsField.**

Provides a field that treats its label string as a string.

These four classes are used mainly on option sheets. Because these subclasses provide a simple API and somewhat limited functionality, clients should consider subclassing **clsField** rather than these.

```
#ifndef TKFIELD_INCLUDED
#define TKFIELD_INCLUDED

#include <clsmgr.h>

#include <field.h>

#include <time.h>
```

```
#ifndef CLSMGR_INCLUDED

#endif
#ifndef FIELD_INCLUDED

#endif
```

clsDateField

This section describes the API for **clsDateField.**

Debugging Flags

The **clsDateField** debugging flag is 'K'. Defined values are:

flag0 (0x0001) general

Common #defines and typedefs

```
#define stsDateFieldEmpty       MakeStatus(clsDateField, 1)
#define stsDateFieldInvalid     MakeStatus(clsDateField, 2)

// Date Flags
#define dfsMonthName    flag0
#define dfsFullName     flag1

typedef struct {
    U16     flags;
    U16     spare;
} DATE_FIELD_STYLE, *P_DATE_FIELD_STYLE;
```

Default DATE_FIELD_STYLE:

```
    flags   = 0
typedef struct tm   TIME_DESC, *P_TIME_DESC;
```

msgNew

Creates a date field.

Takes P_DATE_FIELD_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct {
    DATE_FIELD_STYLE    style;
    U32                 spare;
} DATE_FIELD_NEW_ONLY, *P_DATE_FIELD_NEW_ONLY;
#define dateFieldNewFields  \
    fieldNewFields          \
    DATE_FIELD_NEW_ONLY     dateField;
typedef struct DATE_FIELD_NEW {
    dateFieldNewFields
} DATE_FIELD_NEW, *P_DATE_FIELD_NEW;
```

Comments

The fields you commonly set are:

pArgs->dateField.style.flags appropriate flags

msgNewDefaults

Initializes the DATE_FIELD_NEW structure to default values.

Takes P_DATE_FIELD_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct DATE_FIELD_NEW {
    dateFieldNewFields
} DATE_FIELD_NEW, *P_DATE_FIELD_NEW;
```

Comments

Zeroes out **pArgs**->dateField and sets:

```
    pArgs->border.style.edge = bsEdgeNone;
    pArgs->border.style.borderInk = bsInkGray66;
    pArgs->field.style.editType = fstOverWrite;
```

msgDateFieldGetStyle

Passes back the receiver's style.

Takes P_DATE_FIELD_STYLE, returns STATUS.

```
#define msgDateFieldGetStyle    MakeMsg(clsDateField, 1)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} DATE_FIELD_STYLE, *P_DATE_FIELD_STYLE;
```

msgDateFieldSetStyle

Sets the receiver's style.

Takes P_DATE_FIELD_STYLE, returns STATUS.

```
#define msgDateFieldSetStyle    MakeMsg(clsDateField, 2)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} DATE_FIELD_STYLE, *P_DATE_FIELD_STYLE;
```

msgDateFieldGetValue

Passes back the receiver's value in the time descriptor.

Takes P_TIME_DESC, returns STATUS.

```
#define msgDateFieldGetValue    MakeMsg(clsDateField, 3)
```

Return Value

stsDateFieldEmpty field has no content (*pArgs not set).

stsDateFieldInvalid field's content unrecognized (*pArgs not set).

msgDateFieldSetValue

Sets the receiver's label string from the time descriptor.

Takes P_TIME_DESC, returns STATUS.

```
#define msgDateFieldSetValue    MakeMsg(clsDateField, 4)
```

msgControlGetValue

Passes back the receiver's value in YYYYMMDD format.

Takes P_U32, returns STATUS.

Return Value

stsDateFieldEmpty field has no content (*pArgs not set).

stsDateFieldInvalid field's content unrecognized (*pArgs not set).

msgControlSetValue

Sets the receiver's label string from a U32 in YYYYMMDD format.

Takes U32, returns STATUS.

msgControlSetDirty

Sets style.dirty.

Takes BOOLEAN, returns STATUS.

Comments

The date field will alter the ink of its bottom edge (if it has one) to **bsInkBlack** if dirty, **bsInkGray66** if not.

In PenPoint 1.0, **clsDateField** does not respond to **msgControlSetStyle** or **msgControlSetMetrics** to watch for the CONTROL_STYLE.enable bit changing.

clsFixedField

This section describes the API for **clsFixedField**.

Common #defines and typedefs

```
#define stsFixedFieldEmpty      MakeStatus(clsFixedField, 1)
#define stsFixedFieldInvalid    MakeStatus(clsFixedField, 2)
typedef struct {
    U16     flags;
    U16     spare;
} FIXED_FIELD_STYLE, *P_FIXED_FIELD_STYLE;
```

msgNew

Creates a fixed field.

Takes P_FIXED_FIELD_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct {
    FIXED_FIELD_STYLE   style;
    U32                 spare;
} FIXED_FIELD_NEW_ONLY, *P_FIXED_FIELD_NEW_ONLY;
#define fixedFieldNewFields \
    fieldNewFields          \
    FIXED_FIELD_NEW_ONLY    fixedField;
typedef struct FIXED_FIELD_NEW {
    fixedFieldNewFields
} FIXED_FIELD_NEW, *P_FIXED_FIELD_NEW;
```

msgNewDefaults

Initializes the FIXED_FIELD_NEW structure to default values.

Takes P_FIXED_FIELD_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct FIXED_FIELD_NEW {
    fixedFieldNewFields
} FIXED_FIELD_NEW, *P_FIXED_FIELD_NEW;
```

Comments

Zeroes out **pArgs**->fixedField and sets:

```
pArgs->border.style.edge = bsEdgeNone;
pArgs->border.style.borderInk = bsInkGray66;
pArgs->field.style.editType = fstOverWrite;
pArgs->field.style.noSpace = true;
pArgs->field.style.veto = true;
```

msgFixedFieldGetStyle

Passes back the receiver's style.

Takes P_FIXED_FIELD_STYLE, returns STATUS.

```
#define msgFixedFieldGetStyle   MakeMsg(clsFixedField, 1)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} FIXED_FIELD_STYLE, *P_FIXED_FIELD_STYLE;
```

msgFixedFieldSetStyle

Sets the receiver's style.

Takes P_FIXED_FIELD_STYLE, returns STATUS.

```
#define msgFixedFieldSetStyle   MakeMsg(clsFixedField, 2)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} FIXED_FIELD_STYLE, *P_FIXED_FIELD_STYLE;
```

msgControlGetValue

Get the receiver's value as an S32 in hundredths.

Takes P_S32, returns STATUS.

Return Value

stsFixedFieldEmpty field has no content (*pArgs not set).

stsFixedFieldInvalid field's content unrecognized (*pArgs not set).

msgControlSetValue

Sets the receiver's label string from a S32 in hundredths.

Takes S32, returns STATUS.

msgControlSetDirty

Sets style.dirty.

Takes BOOLEAN, returns STATUS.

Comments

The fixed field will alter the ink of its bottom edge (if it has one) to **bsInkBlack** if dirty, **bsInkGray66** if not.

In PenPoint 1.0, **clsFixedField** does not respond to **msgControlSetStyle** or **msgControlSetMetrics** to watch for the CONTROL_STYLE.enable bit changing.

clsIntegerField

This section describes the API for **clsIntegerField**.

Common #defines and typedefs

```
#define stsIntegerFieldEmpty    MakeStatus(clsIntegerField, 1)
#define stsIntegerFieldInvalid  MakeStatus(clsIntegerField, 2)
typedef struct {
    U16     flags;
    U16     spare;
} INTEGER_FIELD_STYLE, *P_INTEGER_FIELD_STYLE;
```

msgNew

Creates an integer field.

Takes P_INTEGER_FIELD_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct {
    INTEGER_FIELD_STYLE style;
    U32                 spare;
} INTEGER_FIELD_NEW_ONLY, *P_INTEGER_FIELD_NEW_ONLY;
#define integerFieldNewFields   \
    fieldNewFields              \
    INTEGER_FIELD_NEW_ONLY      integerField;
typedef struct INTEGER_FIELD_NEW {
    integerFieldNewFields
} INTEGER_FIELD_NEW, *P_INTEGER_FIELD_NEW;
```

msgNewDefaults

Initializes the INTEGER_FIELD_NEW structure to default values.

Takes P_INTEGER_FIELD_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct INTEGER_FIELD_NEW {
    integerFieldNewFields
} INTEGER_FIELD_NEW, *P_INTEGER_FIELD_NEW;
```

Comments

Zeroes out **pArgs**->integerField and sets:

```
pArgs->border.style.edge = bsEdgeNone;
pArgs->border.style.borderInk = bsInkGray66;
pArgs->field.style.editType = fstOverWrite;
pArgs->field.style.noSpace = true;
pArgs->field.style.veto = true;
```

msgIntegerFieldGetStyle

Passes back the receiver's style.

Takes P_INTEGER_FIELD_STYLE, returns STATUS.

```
#define msgIntegerFieldGetStyle     MakeMsg(clsIntegerField, 1)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} INTEGER_FIELD_STYLE, *P_INTEGER_FIELD_STYLE;
```

msgIntegerFieldSetStyle

Sets the receiver's style.

Takes P_INTEGER_FIELD_STYLE, returns STATUS.

```
#define msgIntegerFieldSetStyle     MakeMsg(clsIntegerField, 2)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} INTEGER_FIELD_STYLE, *P_INTEGER_FIELD_STYLE;
```

msgControlGetValue

Passes back the receiver's value as an S32.

Takes P_S32, returns STATUS.

Return Value

stsIntegerFieldEmpty field has no content (*pArgs not set).

stsIntegerFieldInvalid field's content unrecognized (*pArgs not set).

msgControlSetValue

Sets the receiver's label string from a S32.

Takes S32, returns STATUS.

msgControlSetDirty

Sets style.dirty.

Takes BOOLEAN, returns STATUS.

Comments

The integer field will alter the ink of its bottom edge (if it has one) to **bsInkBlack** if dirty, **bsInkGray66** if not.

In PenPoint 1.0, **clsIntegerField** does not respond to **msgControlSetStyle** or **msgControlSetMetrics** to watch for the CONTROL_STYLE.enable bit changing.

clsTextField

This section describes the API for **clsTextField**.

Common #defines and typedefs

```
typedef struct {
    U16     flags;
    U16     spare;
} TEXT_FIELD_STYLE, *P_TEXT_FIELD_STYLE;
```

msgNew

Creates a text field.

Takes P_TEXT_FIELD_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct {
    TEXT_FIELD_STYLE    style;
    U32                 spare;
} TEXT_FIELD_NEW_ONLY, *P_TEXT_FIELD_NEW_ONLY;
#define textFieldNewFields  \
    fieldNewFields          \
    TEXT_FIELD_NEW_ONLY     textField;
typedef struct TEXT_FIELD_NEW {
    textFieldNewFields
} TEXT_FIELD_NEW, *P_TEXT_FIELD_NEW;
```

msgNewDefaults

Initializes the TEXT_FIELD_NEW structure to default values.

Takes P_TEXT_FIELD_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct TEXT_FIELD_NEW {
    textFieldNewFields
} TEXT_FIELD_NEW, *P_TEXT_FIELD_NEW;
```

Comments

Zeroes out **pArgs**->textField and sets:

```
pArgs->border.style.edge = bsEdgeBottom;
pArgs->border.style.borderInk = bsInkGray66;
```

msgTextFieldGetStyle

Passes back the receiver's style.

Takes P_TEXT_FIELD_STYLE, returns STATUS.

```
#define msgTextFieldGetStyle    MakeMsg(clsTextField, 1)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} TEXT_FIELD_STYLE, *P_TEXT_FIELD_STYLE;
```

msgTextFieldSetStyle

Sets the receiver's style.

Takes P_TEXT_FIELD_STYLE, returns STATUS.

```
#define msgTextFieldSetStyle    MakeMsg(clsTextField, 2)
```

Message Arguments

```
typedef struct {
    U16     flags;
    U16     spare;
} TEXT_FIELD_STYLE, *P_TEXT_FIELD_STYLE;
```

msgControlSetDirty

Sets style.dirty.

Takes BOOLEAN, returns STATUS.

Comments

The text field will alter the ink of its bottom edge (if it has one) to **bsInkBlack** if dirty, **bsInkGray66** if not.

In PenPoint 1.0, **clsTextField** does not respond to **msgControlSetStyle** or **msgControlSetMetrics** to watch for the CONTROL_STYLE.enable bit changing.

TKTABLE.H

This file contains the API definition for **clsTkTable.**

clsTkTable inherits from **clsTableLayout.**

Toolkit tables support complex nested arrangements of buttons, labels, and even other toolkit tables.

Debugging Flags

The **clsTkTable** debugging flag is 'K'. Defined values are:

flag12 (0x1000) general debug info

```
#ifndef TKTABLE_INCLUDED
#define TKTABLE_INCLUDED

#include <ostypes.h>

#include <tlayout.h>

#include <button.h>
```

```
#ifndef OSTYPES_INCLUDED

#endif
#ifndef TLAYOUT_INCLUDED

#endif
#ifndef BUTTON_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT TK_TABLE;
typedef struct TK_TABLE_STYLE {
    U16 spare           : 16;   // unused (reserved)
} TK_TABLE_STYLE, *P_TK_TABLE_STYLE;
```

TK_TABLE_ENTRY Flags

```
#define tkLabelEntry            ((U32)flag2)    // arg1 is a P_TK_TABLE_ENTRY
#define tkLabelStringId         ((U32)flag14)   // arg1 is a string resid
#define tkPNew                  ((U32)flag4)    // arg1 is a pNew
#define tkLabelBold             ((U32)flag3)    // use a bold system font
#define tkLabelWordWrap         ((U32)flag25)   // word-wrap the label string
#define tkButtonPargsValue      ((U32)flag5)    // send value instead of Data
#define tkButtonPargsUID        ((U32)flag6)    // send UID instead of Data
#define tkButtonOn              ((U32)flag7)    // turn on the button
#define tkButtonHalfHeight      ((U32)flag19)   // use half-height button border
#define tkButtonManagerNone     ((U32)flag20)   // set button manager to bsManagerNone
#define tkButtonToggle          ((U32)flag8)    // make button a toggle
#define tkButtonBox             ((U32)flag1)    // use bsFeedbackBox
#define tkMenuPullRight         ((U32)flag9)    // arg2 is pEntries for pull-right
#define tkMenuPullDown          ((U32)flag10)   // arg2 is pEntries for pull-down
#define tkContentsSection       ((U32)flag9)    // arg2 is pEntries for section contents
#define tkInputDisable          ((U32)flag21)   // disable input
#define tkBorderEdgeTop         ((U32)flag11)   // turn on top border
#define tkBorderEdgeBottom      ((U32)flag12)   // turn on bottom border
#define tkBorderMarginNone      ((U32)flag22)   // turn off all margins
#define tkBorderLookInactive    ((U32)flag13)   // make entry inactive
```

```
#define tkTableWideGap          ((U32)flag15)   // wide gap between col 1 & 2
#define tkTableHorizontal       ((U32)flag17)   // table is horizontal
#define tkTableVertical         ((U32)flag24)   // table is vertical
#define tkTableXAlignBaseline   ((U32)flag0)    // childXAlignment = tlAlignBaseline
#define tkTableYAlignBaseline   ((U32)flag27)   // childYAlignment = tlAlignBaseline
#define tkNoProto               ((U32)flag18)   // don't use prototypical pButtonNew
#define tkNoClient              ((U32)flag23)   // don't copy client field
#define tkPopupChoiceFont       ((U32)flag26)   // use current font names
#define tkControlDynamicClient  ((U32)flag0)    // dynamicEnable = csDynamicClient
#define tkControlDynamicObject  ((U32)flag27)   // dynamicEnable = csDynamicObject
#define tkControlDynamicPargs   ((U32)flag28)   // dynamicEnable = csDynamicPargs
#define tkControlCallSel        tkControlDynamicObject
#define tkControlSelLocal       tkControlDynamicPargs
#define tkMenuButtonGetMenu     ((U32)flag29)   // send msgMenuButtonProvideMenu
#define tkMenuButtonEnableMenu  ((U32)flag30)   // send msgControlEnable
// Available flags: flag16, flag31
typedef struct TK_TABLE_ENTRY {
    P_UNKNOWN       arg1;           // argument for class, e.g. pString
    U32             arg2;           // argument for class, e.g. msg
    U32             arg3;           // argument for class, e.g. data
    U32             tag;            // window tag
    U32             flags;          // e.g. tkLabelBold | tkButtonPargs
    CLASS           childClass;     // class to create or objNull for default
    U32             helpId;         // help id for clsGWin
    U32             spare;          // unused (reserved)
} TK_TABLE_ENTRY, *P_TK_TABLE_ENTRY;
```

Interpretation of arg1, arg2, and arg3 for different classes:

```
clsLabel            pString
clsButton           pString, msg,data
clsMenuButton       pString, pEntries   if (tkMenuPullRight || tkMenuPullDown)
clsMenuButt on      pString, msg, data  if !(tkMenuPullRight || tkMenuPullDown))
clsContentsButton   pString, pEntries   if (tkContentsSection)
clsContentsButton   pString, msg, data  if !(tkContentsSection)
clsTkTable      pEntries,   numRows/cols
clsChoice       pEntries,   numRows/cols
clsToggleTable  pEntries,   numRows/cols
clsPopupChoice  pEntries,   numRows/cols        if (!tkPopupChoiceFont)
clsPopupChoice  prune,      numRows/cols        if (tkPopupChoiceFont)
clsField        pString,    numCols,    maxLen
clsListBox      nEntries,   nEntriesToView
clsFontListBox  role,       nEntriesToView, look
```

Messages

msgNew

Creates a tk table window.

Takes P_TK_TABLE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct TK_TABLE_NEW_ONLY {
    TK_TABLE_STYLE      style;          // overall style
    OBJECT              client;         // client for each button
    P_TK_TABLE_ENTRY    pEntries;       // in/out: description for each child
    U32                 spare4;         // unused (reserved)
    P_BUTTON_NEW        pButtonNew;     // default new struct
    U16                 spare3;         // unused (reserved)
    BUTTON_NEW          buf;            // default storage
    OBJECT              manager;        // manager to notify
    U32                 spare1;         // unused (reserved)
    U32                 spare2;         // unused (reserved)
} TK_TABLE_NEW_ONLY, *P_TK_TABLE_NEW_ONLY;
```

```
#define tkTableNewFields        \
    tableLayoutNewFields            \
    TK_TABLE_NEW_ONLY   tkTable;
typedef struct TK_TABLE_NEW {
    tkTableNewFields
} TK_TABLE_NEW, *P_TK_TABLE_NEW;
```

Comments

clsTkTable will create and insert a child window for each entry in **pArgs**->tkTable.**pEntries**.

After **msgNew** returns, **pArgs**->tkTable.**pEntries** will be left pointing to the null-terminating entry.

Note that **pArgs**->tkTable.**pEntries** is used during **msgNew** only, and the original value can be freed (if allocated) after **msgNew** returns.

For each entry, **pArgs**->pButtonNew will be used as the "prototypical" child new struct. The fields arg1, arg2, arg3, tag, **helpId** and the semantics of each flag will be applied to the child new struct before creating the child.

pArgs->client will be used to set the client for entries which inherit from **clsTkTable**, **clsListBox**, or **clsControl**, unless the **tkNoClient** flag is on for the entry.

Before **msgNew** is sent to each child's class, **msgTkTableInit** will be sent to the child's class with the following TK_TABLE_INIT parameters:

```
pTkTableNew     = pArgs;
pChildNew       = pointer to child's new struct;
pEntry          = pointer to child's TK_TABLE_ENTRY struct;
```

This allows other classes to define mappings for TK_TABLE_ENTRY to child new structs.

msgNewDefaults

Initializes the TK_TABLE_NEW structure to default values.

Takes P_TK_TABLE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct TK_TABLE_NEW {
    tkTableNewFields
} TK_TABLE_NEW, *P_TK_TABLE_NEW;
```

Comments

Zeroes out **pArgs**->tkTable and sets

```
pArgs->tableLayout.style.growChildWidth = false;
pArgs->tableLayout.style.growChildHeight = true;

pArgs->tableLayout.numCols.constraint = tlInfinite;
pArgs->tableLayout.numRows.constraint = tlAbsolute;
pArgs->tableLayout.numRows.value = 1;

pArgs->tableLayout.colWidth.constraint = tlGroupMax;
pArgs->tableLayout.colWidth.gap = defaultColGap;
pArgs->tableLayout.rowHeight.constraint = tlChildrenMax;
pArgs->tableLayout.rowHeight.gap = defaultRowGap;


// default is a table of regular buttons
pArgs->tkTable.pButtonNew = &pArgs->tkTable.buf;
```

Sends **msgNewDefaults**(**pArgs**->tkTable.**pButtonNew**) to **clsButton**, then alters **pArgs**->tkTable.**pButtonNew** as described in **msgTkTableChildDefaults**.

msgTkTableGetStyle

Passes back the current style values.

Takes P_TK_TABLE_STYLE, returns STATUS.

```
#define msgTkTableGetStyle      MakeMsg(clsTkTable, 1)
```

Message Arguments

```
typedef struct TK_TABLE_STYLE {
    U16 spare           : 16;   // unused (reserved)
} TK_TABLE_STYLE, *P_TK_TABLE_STYLE;
```

msgTkTableSetStyle

Sets the style values.

Takes P_TK_TABLE_STYLE, returns STATUS.

```
#define msgTkTableSetStyle      MakeMsg(clsTkTable, 2)
```

Message Arguments

```
typedef struct TK_TABLE_STYLE {
    U16 spare           : 16;   // unused (reserved)
} TK_TABLE_STYLE, *P_TK_TABLE_STYLE;
```

msgTkTableGetClient

Passes back the client of the first child in the table. Note that the children may have been created with different clients.

Takes P_UID, returns STATUS.

```
#define msgTkTableGetClient     MakeMsg(clsTkTable, 3)
```

Comments

clsTkTable sends **msgControlGetClient(pArgs)** to the first (bottom-most) child to retrieve the client.

msgTkTableSetClient

Sets the client of each child in the table to **pArgs**.

Takes UID, returns STATUS.

```
#define msgTkTableSetClient     MakeMsg(clsTkTable, 4)
```

Comments

clsTkTable sends **msgControlSetClient(pArgs)** to each child.

msgTkTableGetManager

Passes back the manager.

Takes P_UID, returns STATUS.

```
#define msgTkTableGetManager    MakeMsg(clsTkTable, 7)
```

msgTkTableSetManager

Sets the manager.

Takes UID, returns STATUS.

```
#define msgTkTableSetManager    MakeMsg(clsTkTable, 8)
```

msgTkTableGetMetrics

Passes back the metrics.

Takes P_TK_TABLE_METRICS, returns STATUS.

```
#define msgTkTableGetMetrics    MakeMsg(clsTkTable, 5)
```

Arguments

```
typedef struct TK_TABLE_METRICS {
    TK_TABLE_STYLE      style;          // overall style
    OBJECT              manager;        // manager to notify
    U32                 spare1;         // unused (reserved)
    U32                 spare2;         // unused (reserved)
} TK_TABLE_METRICS, *P_TK_TABLE_METRICS;
```

msgTkTableSetMetrics

Sets the metrics.

Takes P_TK_TABLE_METRICS, returns STATUS.

```
#define msgTkTableSetMetrics    MakeMsg(clsTkTable, 6)
```

Message Arguments

```
typedef struct TK_TABLE_METRICS {
    TK_TABLE_STYLE      style;          // overall style
    OBJECT              manager;        // manager to notify
    U32                 spare1;         // unused (reserved)
    U32                 spare2;         // unused (reserved)
} TK_TABLE_METRICS, *P_TK_TABLE_METRICS;
```

msgTkTableChildDefaults

Sets the defaults in **pArgs** for a common child.

Takes P_UNKNOWN, returns STATUS.

```
#define msgTkTableChildDefaults MakeMsg(clsTkTable, 14)
```

Comments

pArgs should be an initialized (**msgNewDefaults**) P_NEW struct.

Clients should use this on children manually inserted into the table. For example, send **msgNewDefaults** to class of child, then send **msgTkTableChildDefaults** to the table, then send **msgNew** to class of child, then add child to table with, e.g., **msgTkTableAddAsLast**.

clsTkTable responds to **msgTktTableChildDefaults** as follows:

- sets **pArgs**->win.device to self's device
- turns on shared parent/child/sibling clipping:

```
pArgs->win.flags.style |= wsParentClip;
pArgs->win.flags.style &= ~(wsClipSiblings | wsClipChildren);
```

- if **pArgs**->object.class inherits from **clsBorder**, sets **pArgs**->border.style.**backgroundInk** to **bsInkTransparent**
- if **pArgs**->object.class inherits from **clsButton**, sets **pArgs**->button.style.manager to **bsManagerParent**

msgTkTableAddAsFirst

Inserts **pArgs** as the first child in the table.

Takes WIN, returns STATUS.

```
#define msgTkTableAddAsFirst    MakeMsg(clsTkTable, 9)
```

msgTkTableAddAsLast

Inserts **pArgs** as the last child in the table.

Takes WIN, returns STATUS.

```
#define msgTkTableAddAsLast     MakeMsg(clsTkTable, 10)
```

msgTkTableAddAsSibling

Inserts **pArgs**->newChild in front of or behind **pArgs**->sibling.

Takes P_TK_TABLE_ADD_SIBLING, returns STATUS.

```
#define msgTkTableAddAsSibling  MakeMsg(clsTkTable, 11)
```

Arguments

```
typedef struct TK_TABLE_ADD_SIBLING {
    WIN         newChild;   // new child to add
    WIN         sibling;    // existing child already in tkTable
    BOOLEAN     before;     // true: add before sibbling; false: after
    U32         spare;      // unused (reserved)
} TK_TABLE_ADD_SIBLING, *P_TK_TABLE_ADD_SIBLING;
```

msgTkTableAddAt

Inserts **pArgs**->newChild table at zero-based index **pArgs**->index.

Takes P_TK_TABLE_ADD_AT, returns STATUS.

```
#define msgTkTableAddAt         MakeMsg(clsTkTable, 12)
```

Arguments

```
typedef struct TK_TABLE_ADD_AT {
    WIN         newChild;   // new child to add
    U16         index;      // zero-based desired index of newChild
    U32         spare;      // unused (reserved)
} TK_TABLE_ADD_AT, *P_TK_TABLE_ADD_AT;
```

msgTkTableRemove

Extracts **pArgs** from the table.

Takes WIN, returns STATUS.

```
#define msgTkTableRemove        MakeMsg(clsTkTable, 13)
```

msgTkTableInit

Sent to TK_TABLE_ENTRY.class after default entry-to-pChildNew mappings.

Takes P_TK_TABLE_INIT, returns STATUS. Category: third-party notification.

```
#define msgTkTableInit          MsgNoError(MakeMsg(clsTkTable, 15))
```

Arguments

```
typedef struct TK_TABLE_INIT {
    P_TK_TABLE_NEW      pTkTableNew;    // in: tkTable traversing the entry
    P_UNKNOWN           pChildNew;      // in: child new struct
    P_TK_TABLE_ENTRY    pEntry;         // in: this entry; out: last entry used
    U32                 spare;          // unused (reserved)
} TK_TABLE_INIT, *P_TK_TABLE_INIT;
```

Comments

The receiver should be sure to advance **pArgs**->pEntry to the last entry used.

TkTableFillArrayWithFonts

Fills in an array of entries with the names of the currently installed fonts.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED TkTableFillArrayWithFonts (
    OS_HEAP_ID          heapId,     // In: heap from which to allocate entries
    U16                 prune,      // In: controls pruning (see fontmgr.h)
    P_TK_TABLE_ENTRY    * ppEntries // Out: pointer to array of entries
);
```

Comments

This function allocates an array of TK_TABLE_ENTRY's from the heap given and then fills it in with the names of the fonts that are currently installed on the machine. The function sets each field of every entry to null except for arg1, which is set to point at a string allocated from the given heap. It is the client's responsibility to free this array and its strings when done using it. **clsTkTable** provides the utility function TkTableFreeArray() for freeing this allocated storage.

This function also sets the tag field of each entry to be the FIM_SHORT_ID of the corresponding font.

TkTableFreeArray

Frees an array of TK_TABLE_ENTRY's allocated by TkTableFillArrayWithFonts().

Returns STATUS.

Function Prototype

```
STATUS EXPORTED TkTableFreeArray (
    P_TK_TABLE_ENTRY    pEntries    // In: pointer to array of entries
);
```

Comments

This function enumerates an array of TK_TABLE_ENTRY's, frees the string pointed to by the arg1 fields, and then frees the array itself. This function is meant to be used in concert with TkTableFillArrayWithFonts().

Messages from Other Classes

msgFree

Sent as the last of three msgs to destroy an object.

Takes OBJ_KEY, returns STATUS.

Comments

Note that **clsTkTable** does not destroy metrics.manager.

msgSave

Causes an object to file itself in an object file.

Takes P_OBJ_SAVE, returns STATUS.

Comments

Note that **clsTkTable** will not save metrics.manager.

msgControlGetClient

Passes back the control's client.

Takes P_UID, returns STATUS.

Comments

clsTkTable responds as in **msgTkTableGetClient**.

msgControlSetClient

Sets the control's client.

Takes UID, returns STATUS.

Comments **clsTkTable** responds as in **msgTkTableSetClient.**

msgControlGetDirty

Passes back true if the control has been altered since dirty was set false.

Takes P_BOOLEAN, returns STATUS.

```
#define msgControlGetDirty      MakeMsg(clsControl, 15)
```

Comments **clsTkTable** passes back true if any child is dirty. Each child is sent **msgControlGetDirty.**

msgControlSetDirty

Clears/sets the control's dirty bit.

Takes BOOLEAN, returns STATUS.

Comments **clsTkTable** sets the dirty bit on each child by sending **msgControlSetDirty** to each child.

msgWinSend

Sends a message up a window ancestry chain.

Takes WIN_SEND, returns STATUS.

Comments **clsTkTable** will pass **msgWinSend** on to the **tkTable**'s manager.

If metrics.manager is **objNull**, does nothing and calls ancestor.

Sends **msgWinSend**(**pArgs**) to metrics.manager. If the manager returns **stsManagerContinue**, calls ancestor; otherwise returns manager's return status.

TLAYOUT.H

This file contains the API definition for **clsTableLayout.**

clsTableLayout inherits from **clsBorder.**

Table layout windows position (and optionally size) their child windows in a grid whose parameters you specify.

Debugging Flags

The **clsTableLayout** debugging flag is '%'. Defined values are:

flag4 (0x0010) msgWinLayoutSelf info

flag7 (0x0080) layout timing

```
#ifndef TLAYOUT_INCLUDED
#define TLAYOUT_INCLUDED

#include <border.h>
```

```
#ifndef BORDER_INCLUDED

#endif
```

Common #defines and typedefs **********

```
typedef OBJECT TBL_LAYOUT;
```

X and Y Alignment Styles

```
#define tlAlignLeft             0               // left-justified
#define tlAlignCenter           1               // centered
#define tlAlignRight            2               // right-justified
#define tlAlignBottom           tlAlignLeft     // bottom-justified
#define tlAlignTop              tlAlignRight    // top-justified
#define tlAlignBaseline         3               // vertical/horizontal baseline aligned
```

Placement Styles

```
#define tlPlaceRowMajor         0   // across each row first
#define tlPlaceColMajor         1   // down each column first
#define tlPlaceStack            2   // stack on top of each other
#define tlPlaceOrientation      3   // landscape: RowMajor, portrait: ColMajor
```

Extra Space Styles

```
#define tlExtraNone             0   // leave extra space alone
#define tlExtraFirst            1   // add extra space to 1st row/col
#define tlExtraAfterFirst       2   // put extra space after 1st row/col
#define tlExtraLast             3   // add extra space to last row/col
#define tlExtraBeforeLast       4   // put extra space before last row/col
#define tlExtraAll              5   // add extra space evenly to each row/col
#define tlExtraBetweenAll       6   // divide extra space after each row/col
//                              7   // unused (reserved)
//                              .. // unused (reserved)
//                              15  // unused (reserved)
```

```
typedef struct TBL_LAYOUT_STYLE {
    U16 tblXAlignment   : 2,        // table x alignment within window
        tblYAlignment   : 2,        // table y alignment within window
        childXAlignment : 2,        // child x alignment within grid cell
        childYAlignment : 2,        // child y alignment within grid cell
        placement       : 2,        // order for placing children in the table
        growChildWidth  : 1,        // true to size child to col width
        growChildHeight : 1,        // true to size child to row height
        senseOrientation: 1,        // adjust according to current orientation
        reverseX        : 1,        // layout from right to left
        reverseY        : 1,        // layout from bottom to top
        wrap            : 1;        // wrap around row/column
    U16 widthExtra      : 4,        // what to do with extra width
        heightExtra     : 4,        // what to do with extra height
        spare1          : 8;        // unused (reserved)
} TBL_LAYOUT_STYLE, *P_TBL_LAYOUT_STYLE;
```

Default TBL_LAYOUT_STYLE:

```
    tblXAlignment       = tlLeft
    tblYAlignment       = tlTop
    childXAlignment     = tlLeft
    childYAlignment     = tlBottom
    growChildWidth      = true
    growChildHeight     = true
    placement           = tlPlaceRowMajor
    reverseX            = false
    reverseY            = false
    widthExtra          = tlExtraNone
    heightExtra         = tlExtraNone
```

constraints for Table Layout

```
Enum16(TBL_LAYOUT_CONSTRAINT) {
    // for numRows, numCols, colWidth, rowHeight
    tlAbsolute      = 0,        // fixed
    // for colWidth, rowHeight; can also or-in tlBaselineBox
    tlChildrenMax   = 1,        // max of all children
    tlGroupMax      = 2,        // max of all children on same row/column
    // for numRows, numCols, colWidth, rowHeight
    tlMaxFit        = 3,        // as many rows/cols as fit given current
                                // rowHeight, colWidth, gaps, and parent size
                                // or as wide a col/high a row as possible
                                // given current numRows, numCols
    // for numRows, numCols
    tlInfinite      = 4         // unbounded number of rows/cols
};
```

The following can be OR'ed into **tlChildrenMax** or **tlGroupMax** to use max. ascender and descender of each child Note: not implemented for **tlChildrenMax**

```
#define tlBaselineBox       flag7
```

The following can be OR'ed into any **colWidth/rowHeight** constraint to use the provided baseline rather than the max. baseline

Note: not implemented yet.

```
#define tlAbsoluteBaseline  flag6
```

The following can be OR'ed into any **colWidth/rowHeight** constraint to use **tlMaxFit** if the width/height is constrained during layout (i.e. **wsLayoutResize** is off or **wsShrinkWrapWidth/Height** is off).

```
#define tlMaxFitIfConstrained   flag8
```

macros to extract the parts of a constraint

```
#define TlConstraint(c)     ((c) & 0xF)
typedef struct TBL_LAYOUT_COUNT {
    TBL_LAYOUT_CONSTRAINT   constraint; // see above
    S16                     value;      // absolute value
    U32                     spare;      // unused (reserved)
} TBL_LAYOUT_COUNT, *P_TBL_LAYOUT_COUNT;
typedef struct TBL_LAYOUT_SIZE {
    TBL_LAYOUT_CONSTRAINT   constraint;         // see above
    S16                     value;              // absolute value
    S16                     gap;                // space between rows/columns
    S16                     baseline;           // absolute baseline (not implemented)
    U16                     valueUnits  : 6,    // units for value/gap/baseline
                                                // (e.g. bsUnitsLayout)
                            spare1      : 10;   // unused (reserved)
    U32                     spare;              // unused (reserved)
} TBL_LAYOUT_SIZE, *P_TBL_LAYOUT_SIZE;
typedef struct TBL_LAYOUT_METRICS {
    TBL_LAYOUT_COUNT    numRows, numCols;
    TBL_LAYOUT_SIZE     rowHeight, colWidth;
    TBL_LAYOUT_STYLE    style;
    U32                 spare;                  // unused (reserved)
} TBL_LAYOUT_METRICS, *P_TBL_LAYOUT_METRICS;
```

Status Values

These are possible return values from **msgWinLayoutSelf**

```
#define stsTblLayoutLoop            MakeStatus(clsTableLayout, 1)
#define stsTblLayoutBadConstraint   MakeStatus(clsTableLayout, 2)
```

---

msgNew

Creates a table layout window.

Takes P_TBL_LAYOUT_NEW, returns STATUS. Category: class message.

```
typedef TBL_LAYOUT_METRICS TBL_LAYOUT_NEW_ONLY, *P_TBL_LAYOUT_NEW_ONLY;
#define tableLayoutNewFields        \
    borderNewFields                 \
    TBL_LAYOUT_NEW_ONLY     tableLayout;
```

Arguments

```
typedef struct {
    tableLayoutNewFields
} TBL_LAYOUT_NEW, *P_TBL_LAYOUT_NEW;
```

Comments

You first create a table layout window, then insert the children, then send **msgWinLayout** to layout the children.

Note: if you are using **tlAlignBaseline** for the **childX/YAlignment**, you must use a **colWidth/rowHeight** constraint of **tlGroupMax | tlBaselineBox**. Baseline alignment is not implemented with other **colWidth** or **rowHeight** constraints.

See Also

msgWinLayoutSelf

---

msgNewDefaults

Initializes the TBL_LAYOUT_NEW structure to default values.

Takes P_TBL_LAYOUT_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct {
    tableLayoutNewFields
} TBL_LAYOUT_NEW, *P_TBL_LAYOUT_NEW;
```

Comments

Zeroes out **pArgs**->tableLayout and sets

```
pArgs->win.flags.style |=
            wsShrinkWrapWidth | wsShrinkWrapHeight | wsFileInline;
pArgs->tableLayout.style.tblXAlignment = tlAlignLeft;
pArgs->tableLayout.style.tblYAlignment = tlAlignTop;
pArgs->tableLayout.style.childXAlignment = tlAlignLeft;
pArgs->tableLayout.style.childYAlignment = tlAlignBottom;
pArgs->tableLayout.style.growChildWidth = true;
pArgs->tableLayout.style.growChildHeight = true;

// Default is horizontal layout.
pArgs->tableLayout.numRows.constraint = tlAbsolute;
pArgs->tableLayout.numRows.value = 1;

pArgs->tableLayout.numCols.constraint = tlInfinite;
pArgs->tableLayout.numCols.value = 0;

pArgs->tableLayout.rowHeight.constraint = tlChildrenMax;
pArgs->tableLayout.rowHeight.value = 0;
pArgs->tableLayout.rowHeight.gap = 0;

pArgs->tableLayout.colWidth.constraint = tlGroupMax;
pArgs->tableLayout.colWidth.value = 0;
pArgs->tableLayout.colWidth.gap = 0;
```

msgTblLayoutGetMetrics

Passes back current metrics.

Takes P_TBL_LAYOUT_METRICS, returns STATUS.

```
#define msgTblLayoutGetMetrics  MakeMsg(clsTableLayout, 1)
```

Message Arguments

```
typedef struct TBL_LAYOUT_METRICS {
    TBL_LAYOUT_COUNT    numRows, numCols;
    TBL_LAYOUT_SIZE     rowHeight, colWidth;
    TBL_LAYOUT_STYLE    style;
    U32                 spare;                  // unused (reserved)
} TBL_LAYOUT_METRICS, *P_TBL_LAYOUT_METRICS;
```

msgTblLayoutSetMetrics

Sets current metrics.

Takes P_TBL_LAYOUT_METRICS, returns STATUS.

```
#define msgTblLayoutSetMetrics  MakeMsg(clsTableLayout, 2)
```

Message Arguments

```
typedef struct TBL_LAYOUT_METRICS {
    TBL_LAYOUT_COUNT    numRows, numCols;
    TBL_LAYOUT_SIZE     rowHeight, colWidth;
    TBL_LAYOUT_STYLE    style;
    U32                 spare;                  // unused (reserved)
} TBL_LAYOUT_METRICS, *P_TBL_LAYOUT_METRICS;
```

Comments

clsTableLayout self-sends **msgWinLayoutDirty**(true).

msgTblLayoutGetStyle

Passes back current style values.

Takes P_TBL_LAYOUT_STYLE, returns STATUS.

```
#define msgTblLayoutGetStyle    MakeMsg(clsTableLayout, 3)
```

Message Arguments

```
typedef struct TBL_LAYOUT_STYLE {
    U16 tblXAlignment   : 2,        // table x alignment within window
        tblYAlignment   : 2,        // table y alignment within window
        childXAlignment : 2,        // child x alignment within grid cell
        childYAlignment : 2,        // child y alignment within grid cell
        placement       : 2,        // order for placing children in the table
        growChildWidth  : 1,        // true to size child to col width
        growChildHeight : 1,        // true to size child to row height
        senseOrientation: 1,        // adjust according to current orientation
        reverseX        : 1,        // layout from right to left
        reverseY        : 1,        // layout from bottom to top
        wrap            : 1;        // wrap around row/column
    U16 widthExtra      : 4,        // what to do with extra width
        heightExtra     : 4,        // what to do with extra height
        spare1          : 8;        // unused (reserved)
} TBL_LAYOUT_STYLE, *P_TBL_LAYOUT_STYLE;
```


msgTblLayoutSetStyle

Sets style values.

Takes P_TBL_LAYOUT_STYLE, returns STATUS.

```
#define msgTblLayoutSetStyle    MakeMsg(clsTableLayout, 4)
```

Message Arguments

```
typedef struct TBL_LAYOUT_STYLE {
    U16 tblXAlignment   : 2,        // table x alignment within window
        tblYAlignment   : 2,        // table y alignment within window
        childXAlignment : 2,        // child x alignment within grid cell
        childYAlignment : 2,        // child y alignment within grid cell
        placement       : 2,        // order for placing children in the table
        growChildWidth  : 1,        // true to size child to col width
        growChildHeight : 1,        // true to size child to row height
        senseOrientation: 1,        // adjust according to current orientation
        reverseX        : 1,        // layout from right to left
        reverseY        : 1,        // layout from bottom to top
        wrap            : 1;        // wrap around row/column
    U16 widthExtra      : 4,        // what to do with extra width
        heightExtra     : 4,        // what to do with extra height
        spare1          : 8;        // unused (reserved)
} TBL_LAYOUT_STYLE, *P_TBL_LAYOUT_STYLE;
```

Comments

clsTableLayout self-sends **msgWinLayoutDirty**(true).

msgTblLayoutXYToIndex

Determines a child zero-based index from an xy position.

Takes P_TBL_LAYOUT_INDEX, returns STATUS.

```
#define msgTblLayoutXYToIndex   MakeMsg(clsTableLayout, 5)
```

Arguments

```
typedef struct TBL_LAYOUT_INDEX {
    XY32    xy;         //  In: table-relative coords
    U16     index;      // Out: zero-based position at which to insert a child
    U32     spare;      // unused (reserved)
} TBL_LAYOUT_INDEX, *P_TBL_LAYOUT_INDEX;
```

Comments

The index returned is such that if a child were inserted there and the table layed out, that child would be at the given xy.

msgTblLayoutAdjustSections

Adjusts the border edges and margins of children to correctly reflect a sectioned table.

Takes BOOLEAN, returns STATUS.

```
#define msgTblLayoutAdjustSections      MakeMsg(clsTableLayout, 6)
```

Comments

If you have a table layout window in one column and many rows, and the children have top or bottom border edges on to demarcate groups, you should send **msgTblLayoutAdjustSections** to the table layout window after you add or remove children. **clsTableLayout** will turn off borders that are not needed.

If the table needs to be relayed out, **msgWinLayout** will be self-sent if **pArgs** is true; otherwise **msgWinSetLayoutDirty**(true) will be self-sent.

Note that the current implementation assumes the table is one column, infinite rows.

msgTblLayoutComputeGrid

Computes the table grid parameters given the current constraints.

Takes P_TBL_LAYOUT_GRID, returns STATUS.

```
#define msgTblLayoutComputeGrid     MakeMsg(clsTableLayout, 7)
#define tblLayoutAvgChildren    10
```

Arguments

```
typedef struct TBL_LAYOUT_GRID_VALUE {
    S32     value;          // value in device units
    S32     maxBaseline;    // max. baseline for the column/row
    S32     gap;            // gap after row/col, in device units
    U32     spare;          // unused (reserved)
} TBL_LAYOUT_GRID_VALUE, *P_TBL_LAYOUT_GRID_VALUE;
typedef struct TBL_LAYOUT_GRID {
    U16                     numCols;    // # of columns
    U16                     numRows;    // # of rows
    S32                     colWidth;   // column width if pColWidths is pNull
    S32                     rowHeight;  // row height if pRowHeights is pNull
    P_TBL_LAYOUT_GRID_VALUE pColWidths; // per-column widths, if not pNull
    P_TBL_LAYOUT_GRID_VALUE pRowHeights;// per-row heights, if not pNull
    TBL_LAYOUT_METRICS      metrics;    // actual metrics
    SIZE32                  gap;        // col/row gap, in device units
    U8                      placement;  // actual placement
    XY32                    xy;         // 1st grid cell in parent space
    // default storage for column widths, row heights
    TBL_LAYOUT_GRID_VALUE   colWidthBuf[tblLayoutAvgChildren];
    TBL_LAYOUT_GRID_VALUE   rowHeightBuf[tblLayoutAvgChildren];
    P_UNKNOWN               pData;      // reserved for clsTableLayout
    U32                     spare1;     // unused (reserved)
    U32                     spare2;     // unused (reserved)
} TBL_LAYOUT_GRID, *P_TBL_LAYOUT_GRID;
```

Comments

This message is self-sent by **clsTableLayout** in response to **msgWinLayoutSelf**. **clsTableLayout** responds by computing all of the grid information based on the current TBL_LAYOUT_METRICS and current children.

You can send this message at any time to determine the grid parameters.

When you send **msgTblLayoutComputeGrid**, you must set **pArgs**->pData to **pNull**.

You should send **msgTblLayoutFreeGrid**(**pArgs**) when finished to free any storage allocated by **msgTblLayoutComputeGrid**.

If you subclass **clsTableLayout**, you can respond to this message and compute custom grid parameters (e.g. different per-column absolute column widths).

Note that **pArgs**->xy is not computed here. The location of the first grid cell can be computed by sending **msgTblLayoutComputeGridXY**.

See Also **msgTblLayoutFreeGrid**

typical number of children in a table layout window

msgTblLayoutComputeGridXY

Computes the table grid start xy given the other grid parameters.

Takes P_TBL_LAYOUT_GRID, returns STATUS.

```
#define msgTblLayoutComputeGridXY       MakeMsg(clsTableLayout, 8)
```

Message Arguments

```
typedef struct TBL_LAYOUT_GRID {
    U16                     numCols;    // # of columns
    U16                     numRows;    // # of rows
    S32                     colWidth;   // column width if pColWidths is pNull
    S32                     rowHeight;  // row height if pRowHeights is pNull
    P_TBL_LAYOUT_GRID_VALUE pColWidths; // per-column widths, if not pNull
    P_TBL_LAYOUT_GRID_VALUE pRowHeights;// per-row heights, if not pNull
    TBL_LAYOUT_METRICS      metrics;    // actual metrics
    SIZE32                  gap;        // col/row gap, in device units
    U8                      placement;  // actual placement
    XY32                    xy;         // 1st grid cell in parent space
    // default storage for column widths, row heights
    TBL_LAYOUT_GRID_VALUE   colWidthBuf[tblLayoutAvgChildren];
    TBL_LAYOUT_GRID_VALUE   rowHeightBuf[tblLayoutAvgChildren];
    P_UNKNOWN               pData;      // reserved for clsTableLayout
    U32                     spare1;     // unused (reserved)
    U32                     spare2;     // unused (reserved)
} TBL_LAYOUT_GRID, *P_TBL_LAYOUT_GRID;
```

Comments

This message is self-sent by **clsTableLayout** in response to **msgWinLayoutSelf**. **clsTableLayout** responds by computing the lower-left of the first grid cell given the specified grid information.

You should first send **msgTblLayoutComputeGrid**(**pArgs**) to compute the grid parameters, then send **msgTblLayoutComputeGridXY** to determine the location of the first cell.

If style.**reverseX** is true, the first grid cell is actually at **pArgs**->xy.x - **pArgs**->colWidth.

If style.**reverseY** is true, the first grid cell is actually at **pArgs**->xy.y - **pArgs**->rowHeight.

If you subclass **clsTableLayout**, you can respond to this message and compute a custom grid starting location (e.g. something not based on style.**tblXAlignment** or style.**tblYAlignment**).

See Also **msgTblLayoutComputeGrid**

msgTblLayoutFreeGrid

Frees any storage allocated by **msgTblLayoutComputeGrid**.

Takes P_TBL_LAYOUT_GRID, returns STATUS.

```
#define msgTblLayoutFreeGrid        MakeMsg(clsTableLayout, 9)
```

Message Arguments

```
typedef struct TBL_LAYOUT_GRID {
    U16                     numCols;    // # of columns
    U16                     numRows;    // # of rows
    S32                     colWidth;   // column width if pColWidths is pNull
    S32                     rowHeight;  // row height if pRowHeights is pNull
    P_TBL_LAYOUT_GRID_VALUE pColWidths; // per-column widths, if not pNull
    P_TBL_LAYOUT_GRID_VALUE pRowHeights;// per-row heights, if not pNull
    TBL_LAYOUT_METRICS      metrics;    // actual metrics
```

```
    SIZE32                  gap;        // col/row gap, in device units
    U8                      placement;  // actual placement
    XY32                    xy;         // 1st grid cell in parent space
    // default storage for column widths, row heights
    TBL_LAYOUT_GRID_VALUE   colWidthBuf[tblLayoutAvgChildren];
    TBL_LAYOUT_GRID_VALUE   rowHeightBuf[tblLayoutAvgChildren];
    P_UNKNOWN               pData;      // reserved for clsTableLayout
    U32                     spare1;     // unused (reserved)
    U32                     spare2;     // unused (reserved)
} TBL_LAYOUT_GRID, *P_TBL_LAYOUT_GRID;
```

Comments

This message is self-sent by **clsTableLayout** after self-sending **msgTblLayoutComputeGrid**.

You should send **msgTblLayoutFreeGrid** when finished with the grid information computed using **msgTblLayoutComputeGrid** to free any storage allocated by **msgTblLayoutComputeGrid**.

See Also

msgTblLayoutComputeGrid

Messages from other classes

msgRestore

Creates and restores an object from an object file.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsTableLayout will self-send **msgWinSetLayoutDirty**(true) if the system font or system font scale changed since the table was filed. **pArgs**->pEnv is cast to a P_WIN_RESTORE_ENV and must be a valid window environment pointer.

msgWinLayoutSelf

Tell a window to layout its children (sent during layout).

Takes P_WIN_METRICS, returns STATUS.

Comments

clsTableLayout responds by laying out its children. The grid cells of the table are computed based on the TBL_LAYOUT_METRICS specified. Each child is placed in the corresponding grid cell.

clsTableLayout will self-send **msgTblLayoutComputeGrid** to compute the grid in which the children will be placed. **msgTblLayoutComputeGridXY** will be self-sent to determine the origin of the grid in self's window.

The number of columns and rows are computed based on the **numCols** and **numRows** constraints. The width and height of each column and row are computed based on the **colWidth** and **rowHeight** constraints.

The children are placed acording to style.placement. For example, if style.placement is **tlPlaceRowMajor**, the children are placed across the first row, then the next row, etc.. If style.placement is **tlPlaceOrientation**, then the placement will be based on the current orientation of self's window device:

Orientation	Placement
orientPortraitNormal	**tlPlaceColMajor**
orientPortraitReverse	**tlPlaceColMajor**
orientLandscapeNormal	**tlPlaceRowMajor**
orientLandscapeReverse	**tlPlaceRowMajor**

If style.**senseOrientation** is true and the orientation is Landscape, the layout metrics are "swapped" as follows:

if style.placement is **tlPlaceRowMajor**, **tlPlaceColMajor** is usedif style.placement is **tlPlaceColMajor**, **tlPlaceRowMajor** is used

metrics.**numRows** and metrics.**numCols** are swapped.**rowHeight** and metrics.**colWidth** are swapped

So if you want a layout that is sensitive to the orientation, set the constraints to make sense for Portrait orientation and turn on style.**senseOrientation**. If the orientation is Landscape when the window is layed out, the metrics will be altered for you.

Within each grid cell, each child is aligned acording to style.**childXAlignment** and style.**yAlignment**. For example, if style.**childXAlignment** and style.**childYAlignment** are both **tlAlignCenter**, the children are centered in each grid cell.

If style.**growChildWidth/Height** is true, the width/height of each child is set to the width/height of the child's grid cell.

The entire table is aligned within self acording to style.**tblXAlignment** and style.**tblYAlignment**. For example, if style.**tblXAlignment** and style.**tblYAlignment** are both **tlAlignCenter**, the table is centered in self's window.

The rows and columns of the table are normally filled out top to bottom, left to right. If style.**reverseY** is true, the rows are filled out bottom to top. If style.**reverseX** is true, the columns are filled out right to left.

If **pArgs**->options has **wsLayoutResize** on and self has shrink wrap width/height on, the width and height of the resulting table will be passed back in **pArgs**->bounds.size.

Return Value

stsTblLayoutLoop The specified set of constraints results in a circular layout loop. For example, **tlMaxFit** for **numCols** and **tlMaxFit** for **colWidth**.

stsTblLayoutBadConstraint A constraint specified is not a valid value.

msgWinGetBaseline

Gets the desired x,y alignment of a window.

Takes P_WIN_METRICS, returns STATUS.

Comments

If the table is one column, **clsTableLayout** will return the x-baseline of the first child in the table (i.e. send **msgWinGetBaseline** to the first child). Otherwise the x-baseline will be zero.

If the table is one row, **clsTableLayout** will return the y-baseline of the first child in the table (i.e. send **msgWinGetBaseline** to the first child). Otherwise the y-baseline will be zero.

msgControlEnable

The control re-evaluates whether it is enabled.

Takes P_CONTROL_ENABLE, returns STATUS.

Comments

clsTableLayout recursively enumerates its children (i.e. **wsEnumRecursive** option to **msgWinEnum**) and forwards this message to each child that inherits from **clsControl**. This allows each control in the table to respond to alter its enabled state.

This is used by, for example, **clsMenuButton** when **menuButton.style.enableMenu** is set to true.

See Also

clsMenuButton

TRACK.H

This file contains the API definition for **clsTrack**.

clsTrack inherits from **clsObject**.

Provides transient drawing feedback for various pen dragging situations, such as resizing and dragging frames.

Debugging Flags

The **clsTrack** debugging flag is 'K'. Defined values are:

flag15 (0x8000) general debug info

```
#ifndef TRACK_INCLUDED
#define TRACK_INCLUDED

#include <win.h>

Common #defines and typedefs **********
```

```
#ifndef WIN_INCLUDED

#endif
```

Track Styles

```
#define tsTrackMove         0
#define tsTrackResize       1
```

Anchor Styles

```
#define tsAnchorUL          0   // upper-left
#define tsAnchorUR          1   // upper-right
#define tsAnchorLR          2   // lower-right
#define tsAnchorLL          3   // lower-left
```

Draw Styles

```
#define tsDrawRect          0   // simple rectangle
#define tsDrawTabBarRect    1   // rectangle with vertical tab bar on right
#define tsDrawCmdBarRect    2   // rectangle with command bar at bottom
#define tsDrawTabCmdBarRect 3   // rectangle with both tab and command bars
#define tsDrawBitmap        4   // not implemented
#define tsDrawViaMessages   5   // forward msgTrackShow/Hide to client
#define tsDrawDoubleRect    6   // double rect as in clsBorder double thickness
```

Thickness Styles

```
#define tsThicknessSingle   0   // single-thick lines
#define tsThicknessDouble   1   // double-thick lines
```

Line Pattern Styles

```
#define tsPatForeground     0   // foreground ink
#define tsPatDashed         1   // sysDcPatLD50
//                          2   // unused (reserved)
//                          3   // unused (reserved)
typedef struct TRACK_STYLE {
    U16     track           : 2,    // track style (move or resize)
            anchor          : 2,    // corner to anchor (tsTrackResize only)
            draw            : 4,    // visual to draw
            update          : 1,    // send msgTrackUpdate to client
            autoDestroy     : 1,    // destroy self when done
            thickness       : 2,    // thickness of drawn lines
            pattern         : 2,    // line pattern of drawn lines
            startThickness  : 2;    // thickness of initial drawn lines
    U16     useThreshold    : 1,    // start tracking after msgPenMoveDown
            spare           : 15;   // reserved
} TRACK_STYLE, *P_TRACK_STYLE;
```

---

msgNew

Creates a tracker.

Takes P_TRACK_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
    RECT32          constrainRect;  // in device units, relative to win
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
  TRACK_NEW_ONLY, *P_TRACK_NEW_ONLY;
#define trackNewFields  \
    objectNewFields     \
    TRACK_NEW_ONLY      track;
typedef struct TRACK_NEW {
    trackNewFields
} TRACK_NEW, *P_TRACK_NEW;
```

Comments

Note that if you change the default value for **pArgs**->track.**constrainRect** you should also insure **pArgs**->track.**keepRect** is correct for your new **constrainRect**.

Here is some sample code for creating an instance of **clsTrack** to resize a window. This is taken from **clsGrabBox**. **pInst**->client is the window to be resized.

```
// distance to stay away from edge of parent after resize, in device units
#define trBottomParentMargin    0
#define trRightParentMargin 0
```

```
 // min. distance from bottom of child to top of parent, in device units
#define trTopParentMargin       12

// min. distance from right of child to left of parent, in device units
#define trLeftParentMargin  12

// absolute minimum resize width and height, in device units
#define trMinResizeWidth        20
#define trMinResizeHeight       20

TRACK_NEW       tn;

// start a resize tracker
ObjCallRet(msgNewDefaults, clsTrack, &tn, s);

ObjCallRet(msgWinGetMetrics, pInst->client, &wm, s);

tn.track.style.track = tsTrackResize;
tn.track.win = wm.parent;
tn.track.client = self;
tn.track.clientData = pInst->client;        // window being resized
tn.track.tag = tagBorderResize;
tn.track.initRect = wm.bounds;

// don't allow the grabbox to go off the edge of client's parent
ObjCallRet(msgWinGetMetrics, wm.parent, &rm, s);

tn.track.maxWH.w = rm.bounds.size.w - trRightParentMargin -
  wm.bounds.origin.x;
tn.track.maxWH.h = RectTop(&wm.bounds) - trBottomParentMargin;

tn.track.minWH.w = RectRight(&wm.bounds) - (rm.bounds.size.w - trLeftParentMargin);
tn.track.minWH.h = RectTop(&wm.bounds) - (rm.bounds.size.h - trTopParentMargin);

tn.track.minWH.w = Max(tn.track.minWH.w, trMinResizeWidth);
tn.track.minWH.h = Max(tn.track.minWH.h, trMinResizeHeight);

switch (pInst->style.loc) {
    case gbLocTopEdge:
    case gbLocULCorner:
        tn.track.style.anchor = tsAnchorLR;
        break;

    case gbLocRightEdge:
    case gbLocURCorner:
        tn.track.style.anchor = tsAnchorLL;
        break;

    case gbLocLeftEdge:
    case gbLocLLCorner:
        tn.track.style.anchor = tsAnchorUR;
        break;

    case gbLocBottomEdge:
    default:
        tn.track.style.anchor = tsAnchorUL;
        break;
}

switch (pInst->style.loc) {
    default:
        // unconstrained
        break;
```

```
        case gbLocLeftEdge:
        case gbLocRightEdge:
            // constrained to horizontal
            tn.track.minWH.h = wm.bounds.size.h;
            tn.track.maxWH.h = wm.bounds.size.h;
            break;

        case gbLocBottomEdge:
        case gbLocTopEdge:
            // constrained to vertical
            tn.track.minWH.w = wm.bounds.size.w;
            tn.track.maxWH.w = wm.bounds.size.w;
            break;
    }

    ObjCallRet(msgTrackProvideMetrics, pInst->client, &tn.track, s);
    ObjCallRet(msgNew, clsTrack, &tn, s);

    // start tracking at the initial down point
    wm.bounds.origin = *pXY;
    ObjCallRet(msgWinTransformBounds, theRootWindow, &wm, s);
    ObjCallRet(msgTrackStart, tn.object.uid, &wm.bounds.origin, s);
```

Here is some sample code for creating an instance of **clsTrack** to drag a window. This is taken from **clsBorder**. **deltaWin** is the window to be dragged.

```
// keep rect size for drag, in device units
#define trDefaultMoveKeep       12

TRACK_NEW       tn;

ObjCallRet(msgNewDefaults, clsTrack, &tn, s);

// constraint to parent's bounds
ObjSendUpdateRet(msgWinGetMetrics, deltaWin, &clientMetrics, SizeOf(clientMetrics), s);
if (!clientMetrics.parent)
    return stsOK;

ObjSendUpdateRet(msgWinGetMetrics, clientMetrics.parent, &wm, SizeOf(wm), s);

tn.track.style.startThickness = tsThicknessDouble;
tn.track.win = clientMetrics.parent;
tn.track.client = self;
tn.track.clientData = deltaWin;
tn.track.initRect = clientMetrics.bounds;
tn.track.constrainRect.size = wm.bounds.size;
tn.track.tag = tagBorderDrag;

// start tracking at the initial point
wm.parent = clientMetrics.parent;
wm.bounds.origin = *pXY;
ObjCallRet(msgWinTransformBounds, self, &wm, s);

tn.track.keepRect.size.w = tn.track.keepRect.size.h = trDefaultMoveKeep;
tn.track.keepRect.origin = wm.bounds.origin;
tn.track.keepRect.origin.x -= trDefaultMoveKeep / 2;
tn.track.keepRect.origin.y -= trDefaultMoveKeep / 2;

ObjSendUpdateRet(msgTrackProvideMetrics, deltaWin, &tn.track, SizeOf(tn.track), s);
ObjCallRet(msgNew, clsTrack, &tn, s);

ObjCallRet(msgTrackStart, tn.object.uid, &wm.bounds.origin, s);
```

msgNewDefaults

Initializes the TRACK_NEW structure to default values.

Takes P_TRACK_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct TRACK_NEW {
    trackNewFields
} TRACK_NEW, *P_TRACK_NEW;
```

Sets all of **pArgs**->track to 0, then ...

```
pArgs->object.cap |= objCapCall;
pArgs->track.style.autoDestroy      = true;
pArgs->track.constrainRect.size.w   = maxS32 / 2;
pArgs->track.constrainRect.size.h   = maxS32 / 2;
pArgs->track.keepRect.origin.x      = maxS32 / 4;
pArgs->track.keepRect.origin.y      = maxS32 / 4;
pArgs->track.keepRect.size.w        = 1;
pArgs->track.keepRect.size.h        = 1;
pArgs->track.maxWH.w                = maxS32 / 2;
pArgs->track.maxWH.h                = maxS32 / 2;
```

Default style:

```
track           = tsTrackMove
anchor          = tsAnchorUL        (ignored when tsTrackMove)
draw            = tsDrawRect
update          = false
autoDestroy     = true
thickness       = tsThicknessSingle
pattern         = tsPatForeground
startThickness  = tsThicknessSingle
useThreshold    = false
```

msgTrackGetStyle

Passes back current style values.

Takes P_TRACK_STYLE, returns STATUS.

```
#define msgTrackGetStyle        MakeMsg(clsTrack, 1)
```

Message Arguments

```
typedef struct TRACK_STYLE {
    U16     track           : 2,    // track style (move or resize)
            anchor          : 2,    // corner to anchor (tsTrackResize only)
            draw            : 4,    // visual to draw
            update          : 1,    // send msgTrackUpdate to client
            autoDestroy     : 1,    // destroy self when done
            thickness       : 2,    // thickness of drawn lines
            pattern         : 2,    // line pattern of drawn lines
            startThickness  : 2;    // thickness of initial drawn lines
    U16     useThreshold    : 1,    // start tracking after msgPenMoveDown
            spare           : 15;   // reserved
} TRACK_STYLE, *P_TRACK_STYLE;
```

msgTrackSetStyle

Sets style values.

Takes P_TRACK_STYLE, returns STATUS.

```
#define msgTrackSetStyle        MakeMsg(clsTrack, 2)
```

Message Arguments

```
typedef struct TRACK_STYLE {
    U16     track           : 2,    // track style (move or resize)
            anchor          : 2,    // corner to anchor (tsTrackResize only)
            draw            : 4,    // visual to draw
            update          : 1,    // send msgTrackUpdate to client
            autoDestroy     : 1,    // destroy self when done
            thickness       : 2,    // thickness of drawn lines
            pattern         : 2,    // line pattern of drawn lines
            startThickness  : 2;    // thickness of initial drawn lines
    U16     useThreshold    : 1,    // start tracking after msgPenMoveDown
            spare           : 15;   // reserved
} TRACK_STYLE, *P_TRACK_STYLE;
```

Comments

If the new style values result in a different visual, and **msgTrackStart** has been sent, you should first send **msgTrackHide** with **pArgs** of the old TRACK_METRICS, then **msgTrackSetStyle**, then **msgTrackShow** with the new TRACK_METRICS.

msgTrackGetMetrics

Passes back the current metrics.

Takes P_TRACK_METRICS, returns STATUS.

```
#define msgTrackGetMetrics      MakeMsg(clsTrack, 3)
```

Message Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
    RECT32          constrainRect;  // in device units, relative to win
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
```

msgTrackSetMetrics

Sets the metrics.

Takes P_TRACK_METRICS, returns STATUS.

```
#define msgTrackSetMetrics      MakeMsg(clsTrack, 4)
```

Message Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
```

```
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
    RECT32          constrainRect;  // in device units, relative to win
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
```

Comments — See **msgTrackSetStyle** for notes on changing metrics after **msgTrackStart** has been sent.

See Also — **msgTrackSetStyle**

msgTrackStart

Starts the tracker.

Takes P_XY32, returns STATUS.

```
#define msgTrackStart           MakeMsg(clsTrack, 5)
```

Comments — The **pArgs** indicates the initial position of the pen (in device units, in the space of the metrics.win). If **pArgs** is **pNull**, then metrics.**origXY** is used as the initial pen position.

clsTrack will do the following:

- self-send **msgTrackConstrain** to constrain the initial point.
- grab all input events using InputSetGrab().
- self-send **msgTrackShow**(&metrics) to paint the tracker.

Client Messages

msgTrackDone

Sent by **clsTrack** to metrics.client when the track is done.

Takes P_TRACK_METRICS, returns STATUS. Category: client notification.

```
#define msgTrackDone            MakeMsg(clsTrack, 6)
```

Message Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
```

```
    RECT32          constrainRect;  // in device units, relative to win
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
```

msgTrackUpdate

Sent by **clsTrack** to metrics.client when the pen moves if style.update is true.

Takes P_TRACK_METRICS, returns STATUS. Category: client notification.

```
#define msgTrackUpdate          MakeMsg(clsTrack, 7)
```

Message Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
    RECT32          constrainRect;  // in device units, relative to win
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
```

msgTrackProvideMetrics

Sent to a tracker client before tracker is created.

Takes P_TRACK_METRICS, returns STATUS. Category: third-party notification.

```
#define msgTrackProvideMetrics  MsgNoError(MakeMsg(clsTrack, 9))
```

Message Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
    RECT32          constrainRect;  // in device units, relative to win
```

```
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
```

Comments

Before it sends **msgNew** to **clsTrack**, code creating a tracker may choose to send out this message to another object, allowing it to modify the tracker metrics. See frame.h for a sample response to **msgTrackProvideMetrics**.

Self-sent Messages

msgTrackConstrain

Constrains a point.

Takes P_XY32, returns STATUS. Category: self-sent.

```
#define msgTrackConstrain       MakeMsg(clsTrack, 8)
```

Comments

If style.track is **tsTrackMove**, a new value for metrics.**keepRect** is computed based on the offset from metrics.**origXY** to **pArgs**. **pArgs** is altered to insure the new **keepRect** lies within metrics.**constrainRect**.

If style.track is **tsTrackResize**, a new value for metrics.rect is computed based on the offset from metrics.**origXY** to **pArgs**. **pArgs** is altered to insure the new rect.size lies within metrics.**maxWH** and metrics.**minWH**.

msgTrackShow

Displays the tracker visuals at **pArgs**->rect.

Takes P_TRACK_METRICS, returns STATUS. Category: self-sent.

```
#define msgTrackShow            MakeMsg(clsTrack, 10)
```

Message Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
    RECT32          constrainRect;  // in device units, relative to win
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
```

Comments

clsTrack will self-send this message when the tracker needs to be displayed.

msgTrackHide

Removes the tracker visuals at **pArgs**->rect.

Takes P_TRACK_METRICS, returns STATUS. Category: self-sent.

```
#define msgTrackHide            MakeMsg(clsTrack, 11)
```

Message Arguments

```
typedef struct TRACK_NEW_ONLY {
    TRACK_STYLE     style;
    WIN             win;            // objNull means use theRootWindow
    OBJECT          client;         // client to send msgTrackDone to
    P_UNKNOWN       image;          // optional image instead of box (not implemented)
    P_UNKNOWN       clientData;     // data for client to set
    OBJECT          tracker;        // ignored in msgInit
    RECT32          initRect;       // in device units, relative to win
    RECT32          rect;           // in device units, relative to win
    S32             tabBarW;        // tsDrawTabBarRect | tsDrawTabCmdBarRect
    S32             cmdBarH;        // tsDrawCmdBarRect | tsDrawTabCmdBarRect
    XY32            origXY;         // in device units, relative to win
    XY32            curXY;          // in device units, relative to win
    TAG             tag;            // optional distinguishing tag
    // if tsTrackMove
    RECT32          keepRect;       // in device units, relative to win
    RECT32          constrainRect;  // in device units, relative to win
    // if tsTrackResize
    SIZE32          minWH;          // in device units
    SIZE32          maxWH;          // in device units
    U32             spare;          // unused (reserved)
    U32             spare1;         // unused (reserved)
} TRACK_METRICS, *P_TRACK_METRICS,
```

Comments

clsTrack will self-send this message when the tracker needs to be erased.

Messages from other classes

msgInputEvent

Notification of an input event.

Takes P_INPUT_EVENT, returns STATUS.

Comments

clsTrack will respond to input events by updating and/or terminating the tracker.

If **pArgs**->devCode is not one of **msgPenMoveDown**, **msgPenUp**, or **msgPenOutProxDown** **stsInputGrabTerminate** is returned.

The new point is constrained by self-sending **msgTrackConstrain**. The new value for metrics.rect and metrics.**curXY** is computed based on the constrained **pArgs**->xy.

If **pArgs**->devCode is **msgPenUp** or **msgPenOutProxDown**, **clsTrack** does the following:

- send **msgTrackDone**(&metrics) to metrics.client
- self-send **msgTrackHide** to remove the old tracker visuals
- if style.**autoDestroy** is true, self-send **msgDestroy**(**pNull**)

If **pArgs**->devCode is **msgPenMoveDown**, and the constrained version of **pArgs**->xy is different from metrics.**curXY**, **clsTrack** does the following:

- if style.update is true, send **msgTrackUpdate**(&metrics) to metrics.client
- self-send **msgTrackHide** to remove the old tracker visuals
- self-send **msgTrackShow** to paint the new tracker visuals

TTABLE.H

This file contains the API definition for **clsToggleTable**.

clsToggleTable inherits from **clsTkTable.**

Toggle tables implement non-exclusive choices.

```
#ifndef TTABLE_INCLUDED
#define TTABLE_INCLUDED

#include <tktable.h>
```

```
#ifndef TKTABLE_INCLUDED

#endif
```

Common #defines and typedefs

```
typedef OBJECT TOGGLE_TABLE;
```

msgNew

Creates a toggle table window.

Takes P_TOGGLE_TABLE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct TOGGLE_TABLE_NEW_ONLY {
    U32     spare;      // unused (reserved)
} TOGGLE_TABLE_NEW_ONLY, *P_TOGGLE_TABLE_NEW_ONLY;

#define toggleTableNewFields    \
    tkTableNewFields            \
    TOGGLE_TABLE_NEW_ONLY       toggleTable;

typedef struct TOGGLE_TABLE_NEW {
    toggleTableNewFields
} TOGGLE_TABLE_NEW, *P_TOGGLE_TABLE_NEW;
```

msgNewDefaults

Initializes the TOGGLE_TABLE_NEW structure to default values.

Takes P_TOGGLE_TABLE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct TOGGLE_TABLE_NEW {
    toggleTableNewFields
} TOGGLE_TABLE_NEW, *P_TOGGLE_TABLE_NEW;
```

Comments

Sets the following values:

```
    pArgs->gWin.style.gestureEnable = false;

    pArgs->tableLayout.style.growChildHeight = false;
    pArgs->tableLayout.style.growChildWidth = true;

    pArgs->tableLayout.numCols.constraint = tlAbsolute;
    pArgs->tableLayout.numCols.value = 1;

    pArgs->tableLayout.numRows.constraint = tlInfinite;
```

```
pArgs->tableLayout.colWidth.constraint = tlChildrenMax;
pArgs->tableLayout.colWidth.gap = 0;

pArgs->tableLayout.rowHeight.constraint = tlGroupMax;
pArgs->tableLayout.rowHeight.gap = 0;
```

Messages from Other Classes

msgTkTableChildDefaults

Sets the defaults in P_ARGS for a common child.

Takes P_UNKNOWN, returns STATUS.

Comments

Here is how a choice processes this message:

```
if <pArgs->object.class inherits from clsGWin>
    pArgs->gWin.style.gestureEnable = false;

if <pArgs->object.class inherits from clsBorder> {
    pArgs->border.style.edge = bsEdgeNone;
    pArgs->border.style.topMargin = 1;
    pArgs->border.style.bottomMargin = 1;
}

if <pArgs->object.class inherits from clsLabel>
    pArgs->label.style.xAlignment = lsAlignLeft;

if <pArgs->object.class inherits from clsButton> {
    pArgs->button.style.notifyDetail = true;
    pArgs->button.style.contact = bsContactToggle;
    pArgs->button.style.feedback = bsFeedbackDecorate;
    pArgs->button.style.offDecoration =
        lsDecorationNonExclusiveOff;
    pArgs->button.style.onDecoration =
        lsDecorationNonExclusiveOn;
}
```

msgControlGetDirty

Passes back the dirty state of the control.

Takes P_BOOLEAN, returns STATUS.

Comments

clsToggleTable responds by setting *pArgs up as a 32 bit collection of the results of sending **msgControlGetDirty** to its first 32 children. The result of the first (bottom) child is placed in bit 0, the second in bit 1, and so on.

The resulting *pArgs is undefined if the toggle table has more than 32 children.

msgControlGetEnable

Passes back whether the control is enabled.

Takes P_BOOLEAN, returns STATUS.

Comments

clsToggleTable responds by setting *pArgs up as a 32 bit collection of the results of sending **msgControlGetEnable** to its first 32 children. The result of the first (bottom) child is placed in bit 0, the second in bit 1, and so on.

The resulting *pArgs is undefined if the toggle table has more than 32 children.

msgControlGetValue

Passes back the value of the control.

Takes P_TAG, returns STATUS.

Comments

clsToggleTable responds by setting *pArgs up as a 32 bit collection of the results of sending **msgControlGetValue** to its first 32 children. The result of the first (bottom) child is placed in bit 0, the second in bit 1, and so on.

The resulting *pArgs is undefined if the toggle table has more than 32 children.

msgControlSetDirty

Sets dirty state of the control.

Takes BOOLEAN, returns STATUS.

Comments

clsToggleTable treats the **pArgs** as a 32 bit collection of values to send via **msgControlSetDirty** to its first 32 children. The value of bit 0 is sent to the first (bottom) child, bit 1 is sent to the second child, and so on.

msgControlSetEnable

Sets whether the control is enabled.

Takes BOOLEAN, returns STATUS.

Comments

clsToggleTable treats the **pArgs** as a 32 bit collection of values to send via **msgControlSetEnable** to its first 32 children. The value of bit 0 is sent to the first (bottom) child, bit 1 is sent to the second child, and so on.

msgControlSetValue

Sets the value of the control.

Takes TAG, returns STATUS.

Comments

clsToggleTable treats the **pArgs** as a 32 bit collection of values to send via **msgControlSetValue** to its first 32 children. The value of bit 0 is sent to the first (bottom) child, bit 1 is sent to the second child, and so on.

Part 5 / Input and Handwriting Translation

ACETATE.H

Interface file for the acetate.

The functions described in this file are contained in INPUT.LIB.

WARNING: Inking and the acetate layer are subject to major changes in future releases.

```
#ifndef ACETATE_INCLUDED
#define ACETATE_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
//prototypes
```

AcetateTransform

Converts coordinate to/from screen device root window and pen units.

Returns void.

Function Prototype

```
void EXPORTED AcetateTransform(
    P_XY32 pXY,          // coordinates to transform
    U16 type             // 0 for root-to-pen
                         // 1 for pen-to-root
    );
```

Comments

Warning: This works only when transforming to or from the screen device root window. Other transforms must use drawing contexts.

AcetateCursorRequestVisible

Used to request that the cursor turn on or off.

Returns void.

Function Prototype

```
void EXPORTED AcetateCursorRequestVisible(
    BOOLEAN requestVisibleOn
    );
```

AcetateCursorThaw

Unfreezes the cursor for pen movements.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED AcetateCursorThaw(
    void
    );
```

AcetateCursorFreezePosition

Freezes the cursor at the given Root window coordinate until the cursor image is reset to **pNull** (standard cursor).

Returns STATUS.

Function Prototype

```
STATUS EXPORTED AcetateCursorFreezePosition(
    P_XY32 pLoc         // location in the root window
    );
```

AcetateCursorXY

Sets the cursor position.

Returns void.

Function Prototype

```
void EXPORTED AcetateCursorXY(
    COORD32 x,
    COORD32 y
    );
```

AcetateCursorImage

Sets the cursor image.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED AcetateCursorImage(
    P_UNKNOWN pNewCursor,
    BOOLEAN sticky
    );
```

Comments

If **pCursor** == **pNull**, resets to the pen cursor and frees the substitute cursor memory.

AcetateCursorUpdateImage

Updates the current cursor image.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED AcetateCursorUpdateImage(
    P_UNKNOWN pNewCursor
    );
```

Comments

This interface should only be used for cursor animations and not to change the actual cursor to a different style.

AcetateClear

Clears (makes transparent) the entire acetate plane.

Returns void.

Function Prototype

```
void EXPORTED AcetateClear(
    void
    );
```

AcetateClearDisable

Used while grabbing to keep the acetate from being cleared.

Returns void.

Function Prototype
```
void EXPORTED AcetateClearDisable(
    void
    );
```

Comments

Call it during input event processing and return one of the grab status **returnValues**. While the Clear Disable is active, calls to AcetateClear

will have no effect. Calls to AcetateClearRect will still work however.

AcetateClearRect

Clears (makes transparent) the indicated acetate rect. **pNull** implies the entire plane.

Returns void.

Function Prototype
```
void EXPORTED AcetateClearRect(
    P_RECT32 pRect
    );
```

ANIMSP.H

This file contains the API definitions for **clsAnimSPaper.**

clsAnimSPaper inherits from **clsSPaper.**

Records pen strokes and plays them back at a reduced speed. Provides settable speed, interstroke delay, line attribute and scaling parameters.

Introduction

clsAnimSPaper "animates" the drawing of scribbles by painting a few points, then pausing for the specified number of milliseconds before continuing. The animated playback is performed in a separate task, so playbacks will not disturb other events on the screen. A semaphore is used internally to prevent multiple tasks from painting in the AnimSPaper window simultaneously. The painting task is created whenever playback starts, and terminated when it finishes.

The animation behavior is triggered by **msgWinRepaint**--that is, whenever the AnimSPaper is asked to paint itself. This means that you'll get slow, "animated" painting regardless of the cause of the **msgWinRepaint**: layout, resize, scrolling, unclipping, and so forth. If you want slow painting only under certain circumstances (e.g., when the user taps a button), set the Delay and Interstroke parameters to 0, then do this:

```
OS_MILLISECONDS om;

om = yourDelay;
ObjectCall(msgAnimSPaperSetDelay,       animSPaperInstance, &om);
om = yourInterstroke;
ObjectCall(msgAnimSPaperSetInterstroke, animSPaperInstance, &om);

ObjectCall(msgWinDirtyRect,             animSPaperInstance, NULL);
ObjectCall(msgWinUpdate,                animSPaperInstance, NULL);

om = 0;
ObjectCall(msgAnimSPaperSetDelay,       animSPaperInstance, &om);
ObjectCall(msgAnimSPaperSetInterstroke, animSPaperInstance, &om);
```

clsAnimSPaper Parameters

There are four gettable/settable parameters having to do with scribble redisplay. Delay specifies the number of milliseconds to wait between painting line segments. It varies in inversely with the animation speed. Interstroke delay is a separate delay to be used between scribble strokes. It simulates the writer lifting and moving the pen from the end of one stroke to the beginning of the next. Line sets the thickness and other attributes used in playing back the scribble. Generally you shouldn't need to set anything except thickness. Scale affects the size of the scribbles when they're played back. The scale parameters will stretch/compress the scribble along the x and y axes, also scaling the scribble's distance from the lower-left corner (0,0). This is especially useful for applications which wish to scale in proportion to the system font size. Note that since scribble scaling is in proportion to the original scribble, you may need to save what the system font size was when the scribble was recorded.

Other Facilities

If pArgs->animSPaper.**sendDone** is true, an AnimSPaper will send **msgAnimSPaperDone** to its client when the animation is completed.

For convenience two messages are provided to read and write scribbles to/from resource files.

Note on Delay and Interstroke Parameters

AnimSPaper uses OSTaskDelay() to create the Delay and Interstroke delay. The minimum increment of OSTaskDelay is a system tick (systick), whose length is device dependent. Use OSSystemInfo() to find the length of a systick (see OS.H for details). On an average PC or 386 system the systick is 55 milliseconds, or about an eighteenth of a second. So micro-adjustments of Delay and Interstroke from, say, 60 milliseconds to 80 milliseconds will be ineffective.

Debugging Flags

clsAnimSPaper uses the Handwriting debug flag set 'Z'. **clsAnimSPaper** uses:

80000 Show all internal debugging messages

```
#ifndef ANIMSP_INCLUDED
#define ANIMSP_INCLUDED

                                                    #ifndef SPAPER_INCLUDED
#include <spaper.h>      // ancestor flags
                                                    #endif
                                                    #ifndef SYSGRAF_INCLUDED
#include <sysgraf.h>     // line & scale def'ns
                                                    #endif
                                                    #ifndef FS_INCLUDED
#include <fs.h>          // filing def'ns
                                                    #endif
```

Common #defines and typedefs

```
typedef struct ANIM_SPAPER_NEW_ONLY {
    SYSDC_LINE      line;        // line attributes for scribble playback
    OS_MILLISECONDS delay;       // delay between stroke segments on playback
                                 // (inverse of playback speed)
    OS_MILLISECONDS interstroke; // delay between strokes on playback
    OBJECT          client;      // recipient of msgAnimSPaperDone
    BOOLEAN         sendDone;    // if TRUE, animSPaper will send client
                                 // msgAnimSPaperDone when animation's done
    SCALE           scale;       // how much larger or smaller to scale the
                                 // scribble when it's played back. (1,1)
                                 // plays back at same scale as recorded.
    S32             spare1;      // unused (reserved)
    S32             spare2;      // unused (reserved)
} ANIM_SPAPER_NEW_ONLY,  *P_ANIM_SPAPER_NEW_ONLY;
#define animSPaperNewFields     \
    sPaperNewFields             \
    ANIM_SPAPER_NEW_ONLY    animSPaper;
typedef struct ANIM_SPAPER_NEW {
    animSPaperNewFields
} ANIM_SPAPER_NEW, *P_ANIM_SPAPER_NEW;
```

Messages

msgNew

Creates an AnimSPaper window.

Takes P_ANIM_SPAPER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct ANIM_SPAPER_NEW {
    animSPaperNewFields
} ANIM_SPAPER_NEW, *P_ANIM_SPAPER_NEW;
```

Comments

The fields you commonly set are:

```
pArgs->animSPaper.line.thickness:   thickness of line on playback
pArgs->animSPaper.delay:            inverse of animation speed
pArgs->animSPaper.interstroke:      delay between strokes
pArgs->animSPaper.client:           whom to notify when animation is done
pArgs->animSPaper.sendDone:         whether to notify client
pArgs->animSPaper.scale:            playback size relative to input size
```

msgNewDefaults

Initialize **pArgs**.

Takes P_ANIM_SPAPER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct ANIM_SPAPER_NEW {
    animSPaperNewFields
} ANIM_SPAPER_NEW, *P_ANIM_SPAPER_NEW;
```

Comments

Sets:

```
pArgs->animSPaper.line.cap        = sysDcCapRound;
pArgs->animSPaper.line.join       = sysDcJoinRound;
pArgs->animSPaper.line.thickness  = 6;
pArgs->animSPaper.line.miterLimit = 10;
pArgs->animSPaper.line.radius     = 0;
pArgs->animSPaper.delay           = 40;
pArgs->animSPaper.interstroke     = 160;
pArgs->animSPaper.client          = objNull;
pArgs->animSPaper.sendDone        = TRUE;
pArgs->animSPaper.scale.x         = FxIntToFx(1);
pArgs->animSPaper.scale.y         = FxIntToFx(1);
pArgs->sPaper.flags              &= (~spScribbleEdit
                                   & ~spRedisplay
                                   & ~spVRuling
                                   & ~spRuling
                                   & ~spBackground);
pArgs->win.flags.input           |= inputInkThrough;
```

msgAnimSPaperReadScribble

Reads a scribble from a resource file, sets it into the AnimSPaper and displays it.

Takes P_ANIM_SPAPER_SCRIBBLE, returns STATUS. Category: class message.

```
#define msgAnimSPaperReadScribble   MakeMsg(clsAnimSPaper, 1)
```

Arguments

```
typedef struct ANIM_SPAPER_SCRIBBLE {
    FS_LOCATOR  locator;    // resource file locator
    RES_ID      resId;      // resource id for the scribble
} ANIM_SPAPER_SCRIBBLE, *P_ANIM_SPAPER_SCRIBBLE;
```

msgAnimSPaperWriteScribble

Writes the AnimSPaper's current scribble to a resource file.

Takes P_ANIM_SPAPER_SCRIBBLE, returns STATUS. Category: class message.

```
#define msgAnimSPaperWriteScribble  MakeMsg(clsAnimSPaper, 2)
```

Message Arguments

```
typedef struct ANIM_SPAPER_SCRIBBLE {
    FS_LOCATOR  locator;    // resource file locator
    RES_ID      resId;      // resource id for the scribble
} ANIM_SPAPER_SCRIBBLE, *P_ANIM_SPAPER_SCRIBBLE;
```

msgAnimSPaperSetDelay

Specifies delay for scribble playback

Takes P_OS_MILLISECONDS, returns STATUS. Category: class message.

```
#define msgAnimSPaperSetDelay   MakeMsg(clsAnimSPaper, 4)
```

msgAnimSPaperGetDelay

Passes back delay for scribble playback

Takes P_OS_MILLISECONDS, returns STATUS. Category: class message.

```
#define msgAnimSPaperGetDelay   MakeMsg(clsAnimSPaper, 5)
```

msgAnimSPaperSetInterstroke

Specifies interstroke delay for scribble playback

Takes P_OS_MILLISECONDS, returns STATUS. Category: class message.

```
#define msgAnimSPaperSetInterstroke MakeMsg(clsAnimSPaper, 6)
```

msgAnimSPaperGetInterstroke

Passes back interstroke delay for scribble playback

Takes P_OS_MILLISECONDS, returns STATUS. Category: class message.

```
#define msgAnimSPaperGetInterstroke MakeMsg(clsAnimSPaper, 7)
```

msgAnimSPaperSetLine

Specifies line attributes for scribble playback

Takes P_SYSDC_LINE, returns STATUS. Category: class message.

```
#define msgAnimSPaperSetLine    MakeMsg(clsAnimSPaper, 8)
```

msgAnimSPaperGetLine

Passes back line attributes for scribble playback

Takes P_SYSDC_LINE, returns STATUS. Category: class message.

```
#define msgAnimSPaperGetLine    MakeMsg(clsAnimSPaper, 9)
```

msgAnimSPaperSetScale

Specifies scaling for scribble playback.

Takes P_SCALE, returns STATUS. Category: class message.

```
#define msgAnimSPaperSetScale    MakeMsg(clsAnimSPaper, 11)
```

Comments

The scribble will be played back at a SCALE relative to the size at which it was recorded. X and Y scales may be set independently. The SCALE affects both the scribble and its distance from the lower-left corner (0,0).

msgAnimSPaperGetScale

Passes back scaling for scribble playback

Takes P_SCALE, returns STATUS. Category: class message.

```
#define msgAnimSPaperGetScale    MakeMsg(clsAnimSPaper, 12)
```


Notifications

msgAnimSPaperDone

Sent to client when animation is complete.

Takes OBJECT, returns STATUS. Category: advisory message.

```
#define msgAnimSPaperDone        MakeMsg(clsAnimSPaper, 3)
```

Comments

pArgs is the **animSPaper**'s UID. This message is sent only if there is a client and **pArgs**->animSPaper.**sendDone** was true at **msgNew** time.

GWIN.H

This file contains the API definition for **clsGWin**.

clsGWin inherits from **clsWin**.

Introduction

clsGWin provides a convenient default implementation of several important PenPoint features -- gesture and keyboard processing, quick help interaction and event forwarding.

clsGWin is an ancestor of many of PenPoint's window-based classes, including all of the Toolkit classes.

Many tasks involving the input system and the handwriting recognition system can be handled very simply using only a few **clsGWin** messages. Some tasks require use of some of **clsGWin**'s more sophisticated messages. And there are some task for which **clsGWin** is not appropriate. For instance, even a modest drawing application or "ink editor" will almost certainly have to interact more directly with the input system and handwriting recognition system.

Several important task can be accomplished by using just few **clsGWin** messages:

- To process gestures, see **msgGWinGesture**.
- To process keyboard input, see **msgGWinKey**.
- To implement quick help, use **gWin**'s **helpId**; see GWIN_NEW_ONLY and **msgGWinSetHelpId**.
- To process gestures and keyboard events which occurred in child windows, see **msgGWinForwardedGesture** or **msgGWinForwardedKey**.
- To control whether or not a window responds to gestures, see the **gestureEnable** field in GWIN_STYLE.

More complex subclasses will need to understand more details, as described below.

Debugging Flags

GWin's debugging flag set is '#' (0x23). Defined flags are:

0001 Display generally useful messages.

0004 Display messages during quick help processing.

0010 Display messages during timeout processing.

Keyboard Processing

Keyboard processing and forwarding occurs when a **gWin** receives **msgInputEvent** with a key event message in **pArgs**->devCode. The steps taken are:

- gWin self sends **msgGWinKey** with the event.

- If the response to **msgGWinKey** is **stsRequestDenied**, **gWin** self sends **msgGWinBadKey**. **gWin**'s default response to **msgGWinKey** is to return **stsRequestForward**, which causes **gWin** to perform key event forwarding.
- If the response to **msgGWinKey** is **stsRequestForward** and style.**keyboardForward** is set, **gWin** self sends **msgGWinForwardKey**. In response to this message, the **gWin** packages up the data and uses **msgWinSend** to forward the key information. This results in parent windows potentially receiving **msgGWinForwardedKey** (see **msgGWinForwardedKey** description). **gWin**'s default response to **msgGWinForwardedKey** is to return **stsRequestForward**, which causes the event forwarding to continue.
- If the response to **msgGWinForwardKey** is **stsRequestDenied** or **stsRequestForward**, **gWin** self sends **msgGWinBadKey**.

Gesture Processing

A **gWin** self sends **msgGWinGesture** when one of the following occurs. (Each of these is described more detail below.)

- Case 1: A **gWin** receives **msgGWinXList** (typically because a translation has completed).
- Case 2: A **gWin** receives **msgInputEvent** with an event of press-hold or a tap-press-hold.
- Case 3: A **gWin** receives **msgQuickHelpHelpShow** from **theQuickHelpManager**.

If the response to **msgGWinGesture** is **stsRequestDenied**, the gesture is unrecognized and one of the following actions is taken:

- In Case 1, a translated gesture, **msgGWinBadGesture** is self sent.
- In Case 2, normal gesture processing continues. This is because a press-hold or a tap-press-hold gesture is sent in response to an input event while potentially in the process of collecting data for another gesture (see below).
- In Case 3, the "no help available" help is displayed via **msgQuickHelpShow**.

If the response to **msgGWinGesture** is **stsRequestForward**, **msgGWinForwardGesture** is self sent. If the response to **msgGWinForwardGesture** is **stsRequestDenied** or **stsRequestForward**, the same action is taken as if **msgGWinGesture** returned **stsRequestDenied**.

Case 1: How a GWin Receives Translated Gestures.

msgGWinGesture is self sent in response to **msgGWinXList**. **msgGWinXList** is self sent by **gWin** after an **xGesture** translator has completed its translation. This occurs as follows:

When **msgPenStroke** is received from the input system, the **gWin** adds strokes to a gesture translator. This is done via a self send of **msgGWinStroke**, which adds the stroke via sending **msgScrAddStroke** to the gesture translator.

gWin --> **msgScrAddStroke** --> **xGesture** Translator

When an "out of proximity" event is received, **gWin** self sends **msgGWinComplete**. In response to the **msgGWinComplete**, **gWin** sends **msgScrComplete** to the gesture translator.

gWin --> **msgScrComplete** --> **xGesture** Translator

The translator then sends **msgXlateCompleted** back to the **gWin**, indicating translation is complete. GWin retrieves translated results by sending **msgXlateData** to the gesture translator.

gWin <-- **msgXlateCompleted** <-- **xGesture** Translator --> **msgXlateData** --> **xGesture** Translator

This returns an xlist containing the translated data (see xlist.h). GWin then self sends **msgGWinXList** to process the xlist. This extracts the appropriate information from the xlist (via XList2Gesture). **gWin** then performs the gesture processing and forwarding described below:

- Self send **msgGWinGesture.**
- If **msgGWinGesture** returns **stsRequestDenied**, **gWin** self sends **msgGWinBadGesture.**
- If **msgGWinGesture** returns **stsRequestForward** and style.**gestureForward** is set, **gWin** self sends **msgGWinForwardGesture.** Similar to the forwarding of keyboard events, the **gWin** packages up the gesture information and uses **msgWinSend** to forward the gesture. This results in parent windows potentially receiving **msgGWinForwardedGesture** (see **msgGWinForwardedGesture**).
- If **msgGWinForwardGesture** returns **stsRequestForward** and the gesture is the help gesture, **gWin** calls PenPoint's quick help with **hlpQuickHelpNoHelp**. This invokes quick help with the "No help available" text.
- If **msgGWinForwardGesture** returns **stsRequestDenied** or **stsRequestForward**, **gWin** self sends **msgGWinBadGesture**

Case 2: How a GWin Synthesizes Some Gestures.

If, when processing input events, **gWin** sees a press-hold or a tap-press-hold input event, gesture processing and forwarding takes place. If the gesture is unrecognized, then normal input processing continues. This means that if an end-user press-holds on an area where press-hold has no meaning, the window in question receives **msgGWinGesture** with **xgsPressHold.** The window returns **stsRequestForward** (as will all the windows that see **msgGWinForwardGesture**). Normal processing continues, and when the user lifts the pen the translation of the single tap occurs and the gesture processing mentioned above takes place. If the gesture is recognized, the gesture translation is aborted and input data is thrown away until (and including) the next Pen Up event. A description:

- gWin self sends **msgGWinGesture** with **xgsPressHold** or **xgsTapHold.**
- If the response to **msgGWinGesture** is **stsRequestDenied**, processing of the input continues.
- If the response to **msgGWinGesture** is **stsOK**, gesture processing is aborted.
- If the response to **msgGWinGesture** is **stsRequestForward** and style.**gestureForward** is set, **gWin** self sends **msgGWinForwardGesture.** This results in parent windows potentially receiving **msgGWinForwardedGesture** (see **msgGWinForwardedGesture**).
- If the response to **msgGWinForwardGesture** is **stsRequestDenied** or **stsRequestForward**, processing of the input continues.
- If the response to **msgGWinForwardGesture** is **stsOK**, gesture processing is aborted.

Case 3: How a GWin Responds to **msgQuickHelpHelpShow.**

The final case in which **msgGWinGesture** is sent is in response to **msgQuickHelpHelpShow.** This is sent from **theQuickHelpManager** when in help mode and the user taps on the screen. GWin responds by sending **msgGWinGesture** with the help gesture, and performing similar forwarding above. When **msgGWinGesture** returns **stsRequestDenied**, or **msgGWinForwardGesture** returns **stsRequestDenied** or **stsRequestForward**, **gWin** sends **msgQuickHelpShow** to display the No Help Available message.

style.gesture Local and Coordinate Transformations

When using large windows (width or height near or above 2^16), you should style.**gestureLocal** to true. Doing so avoids some potential numeric overflow conditions that can make gesture recognition unreliable.

Setting style.**gestureLocal** true changes the coordinate system used internally by **gWin**. It also changes the coordinate system used in some of **gWin**'s more sophisticated self sent messages. If you don't use these more sophisticated messages, you can just set style.**gestureLocal** true and never worry about it again, regardless of the size of your window. If you do use these messages, then you should read the rest of this section to understand what's different.

Here are the messages whose parameters are affected by style.**gestureLocal**:

- msgGWinStroke
- msgGWinXList
- msgGWinTransformGesture
- msgGWinTransformXList

Normal gesture processing (style.**gestureLocal** is false) is done using the following coordinate transformations:

- The stroke input event is delivered with **pArgs**->xy set to the local window coordinates and the pen data in root window pen coordinates.
- On the first stroke to the window, **gWin** remembers an offset of (0,0). This step is obviously trivial in this case but is important when style.**gestureLocal** is true.
- This value is first converted to root window coordinates and then the resulting value is converted to pen units.
- This vector is subtracted from the origin of the pen stroke data. The pen stroke data is still in pen units but has been shifted so that its origin is relative to the local window origin.
- This shifted stroke is self sent using **msgGWinStroke**. THIS IS IMPORTANT. Any object intercepting this message gets pen data that has been shifted to appear in the local window. This is slightly different than the pen stroke which comes from the input system.
- In response to the first **msgGWinStroke**, **gWin** creates a translator and makes itself an observer of the translator. The stroke is then added to the translator.
- Normal input collection of strokes continues. Eventually the gesture is completed and translation occurs.
- In response to **msgXlateComplete**, **gWin** gets the XList data and converts it from pen units to window units. Remember that since the pen strokes were shifted by the origin of the window (in digitizer units), the window units give locations in the local window. **gWin** then self sends **msgGWinXList**.
- In response to **msgGWinXList**, **gWin** converts the xlist information and self sends **msgGWinGesture**.

If style.**gestureLocal** is true, the same sequence of events occurs, but with the following change in coordinate systems:

- When the first stroke comes in to the **gWin**, the local window coordinates of the stroke are saved as the offset instead of 0,0. This value is converted to root window coordinates and then converted to

pen units and used to offset the stroke. This means that the stroke is no longer in local window space, but rather are in root window coordinate space.

- Subclasses which handle **msgGWinStroke** are getting data which is root window relative. If they need it in local window space then they have to transform it first.
- When the translation is complete, the offset that was remembered earlier is converted to root window coordinates and then to pen units. This offset is added to the points returned by the translator before converting back to screen units. The effect is that now the gesture is shifted back to its proper location in root window space.
- When converting the XList data to the GWin gesture, the important points are converted from root window coordinates back to local window coordinates before self sending **msgGWinGesture**.

```
#ifndef GWIN_INCLUDED
#define GWIN_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef WIN_INCLUDED
#include <win.h>
#endif
// Next up: 25  Recycled: 3
```


Common #defines and typedefs

```
typedef OBJECT GWIN;
```

Default Window Flags

These are the default input flags set by a **gWin** at **msgNew** time if **gestureEnable** is set. Changing these flags after new time is possible, but extreme care needs to be taken as these define the pen events that get generated to the window.

```
#define gWinInputFlags  (inputStroke | inputOutProx | \
                         inputInk | inputTip |inputTimeout | inputAutoTerm | \
                         inputEnter | inputHoldTimeout)
```

Style Structure

```
typedef struct GWIN_STYLE {
    U16 gestureEnable:      1,      // enables gesture translation
        gestureForward:     1,      // enables forwarding of gestures
        gestureLocal:       1,      // enables localized strokes for large
                                    // gesture windows (>32K digitizer pts)
        keyboardForward:    1,      // enables forwarding of key events
        privateData1:       2,      // private
        grabDown:           1,      // grab input on msgPenDown vs.
                                    // msgPenStroke
        grabActive:         1,      // private
        firstEnter:         1,      // grab on msgPenEnter if no other grab
        tossingEvents:      1,      // private
        askOtherWin:        1,      // ask other gWin if it wants event
        otherWinSaysYes:    1,      // answer yes if asked if you want event
        reserved:           4;      // reserved for future use
} GWIN_STYLE, *P_GWIN_STYLE;
```

Gesture Structure

This data structure defines all information returned by a gesture translator in the form of a simple data structure. It is used as a parameter to many of the gesture methods defined in **gWin**.

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Messages

msgNew

Creates and initializes a new instance.

Takes P_GWIN_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct GWIN_NEW_ONLY {
    GWIN_STYLE style;           // gWin style flags
    U32 helpId;                 // quick help id
    U32 reserved;
} GWIN_NEW_ONLY, *P_GWIN_NEW_ONLY;
#define gWinNewFields           \
    winNewFields                \
    GWIN_NEW_ONLY       gWin;
typedef struct GWIN_NEW {
    gWinNewFields
} GWIN_NEW, *P_GWIN_NEW;
```

Comments

If **gWin.style.gestureEnable** is true, then **gWin** ORs in **gWinInputFlags** into **pArgs**->win.flags.input before passing the message to its ancestors. These win.flags.input bits can be changed after the **gWin** is created, but extreme care should be taken!

If setting a **helpId**, setting the **pNew**->gWin.**helpId** to the same as the **pNew**->win.tag helps minimize memory needed by the object. It is recommended that the **helpId** be the same as the window tag if possible. However, if the window tag changes when the help id is the same as the window tag, then the help tag will change too.

msgNewDefaults

Initializes the GWIN_NEW structure to default values.

Takes P_GWIN_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct GWIN_NEW {
    gWinNewFields
} GWIN_NEW, *P_GWIN_NEW;
```

Comments

Zeros out **pNew**->gWin and sets:

```
pArgs->gWin.style.gestureEnable = TRUE;
pArgs->gWin.style.gestureForward = TRUE;
pArgs->gWin.style.keyboardForward = TRUE;
pArgs->gWin.style.grabDown = TRUE;
win.input = gWinInputFlags;
```

msgGWinGetStyle

Returns the current style.

Takes P_GWIN_STYLE, returns STATUS.

```
#define msgGWinGetStyle             MakeMsg(clsGWin, 12)
```

Message Arguments

```
typedef struct GWIN_STYLE {
    U16 gestureEnable:      1,      // enables gesture translation
        gestureForward:     1,      // enables forwarding of gestures
        gestureLocal:       1,      // enables localized strokes for large
                                    // gesture windows (>32K digitizer pts)
        keyboardForward:    1,      // enables forwarding of key events
        privateData1:       2,      // private
        grabDown:           1,      // grab input on msgPenDown vs.
                                    // msgPenStroke
        grabActive:         1,      // private
        firstEnter:         1,      // grab on msgPenEnter if no other grab
        tossingEvents:      1,      // private
        askOtherWin:        1,      // ask other gWin if it wants event
        otherWinSaysYes:    1,      // answer yes if asked if you want event
        reserved:           4;      // reserved for future use
} GWIN_STYLE, *P_GWIN_STYLE;
```

msgGWinSetStyle

Sets the style settings.

Takes P_GWIN_STYLE, returns STATUS.

```
#define msgGWinSetStyle             MakeMsg(clsGWin, 13)
```

Message Arguments

```
typedef struct GWIN_STYLE {
    U16 gestureEnable:      1,      // enables gesture translation
        gestureForward:     1,      // enables forwarding of gestures
        gestureLocal:       1,      // enables localized strokes for large
                                    // gesture windows (>32K digitizer pts)
        keyboardForward:    1,      // enables forwarding of key events
        privateData1:       2,      // private
        grabDown:           1,      // grab input on msgPenDown vs.
                                    // msgPenStroke
        grabActive:         1,      // private
        firstEnter:         1,      // grab on msgPenEnter if no other grab
        tossingEvents:      1,      // private
        askOtherWin:        1,      // ask other gWin if it wants event
        otherWinSaysYes:    1,      // answer yes if asked if you want event
        reserved:           4;      // reserved for future use
} GWIN_STYLE, *P_GWIN_STYLE;
```

Comments

If **gestureEnable** is true, **gWin** ORs in the **gWinInputFlags** with the window flags. (See the comments near **msgNew** in this file.) Setting **gestureEnable** to false does NOT clear these flags.

msgGWinSetHelpId

Sets the **gWin**'s **helpId** for quick help.

Takes U32, returns STATUS.

```
#define msgGWinSetHelpId            MakeMsg(clsGWin, 16)
```

Comments

Setting the **helpId** to be identical to the **gWin**'s win.tag helps minimize the amount of instance data taken by a **gWin**.

msgGWinGetHelpId

Returns the **gWin**'s **helpId**.

Takes P_U32, returns STATUS.

```
#define msgGWinGetHelpId            MakeMsg(clsGWin, 17)
```

msgGWinGetTranslator

Returns the **gWin**'s translator object.

Takes P_OBJECT, returns STATUS.

```
#define msgGWinGetTranslator        MakeMsg(clsGWin, 7)
```

Comments

gWin's default response is to return the current translator object.

By default, **gWin** has a null current translator unless strokes have been added since **msgNew** or since the last **msgGWinAbort** or **msgGWinComplete**. (In other words, **gWin** does not have a translator unless it is currently collecting or translating strokes.)

See Also

msgGWinAbort

msgGWinSetTranslator

Sets the translator object and returns the previous one.

Takes P_OBJECT, returns STATUS.

```
#define msgGWinSetTranslator        MakeMsg(clsGWin, 8)
```

Comments

This message has no affect if the **gWin** has not received a stroke from the input system since the last **msgGWinComplete** or **msgGWinAbort**.

Because of this limitation you probably should not use this message.

gWin's default response is to set its translator object to **pArgs** AND to set *pArgs to the uid of the previous translator.

See Also

msgGWinAbort

msgGWinTransformGesture

Transforms gesture information into local window coordinates.

Takes P_GWIN_GESTURE, returns STATUS.

```
#define msgGWinTransformGesture     MakeMsg(clsGWin, 14)
```

Message Arguments

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Comments

This message is useful for clients who handle **msgGWinForwardedGesture**.

Transforms the gesture bounds and **hotPoint** into the local window coordinate system.

This is only necessary if the gesture occurred in a window other then self.

gWin's default response modifies the bounds, **hotPoint**, and uid (set to self) fields.

msgGWinTransformXList

Transforms xlist information to local window coordinates.

Takes P_XLIST, returns STATUS.

```
#define msgGWinTransformXList        MakeMsg(clsGWin, 15)
```

Comments

This message is useful for clients who handle **msgGWinXList**.

This message is only necessary if the xlist was generated relative to a window other then self. This message transforms the gesture bounds and **hotPoint** to local window coordinates system.

Gesture Processing

msgGWinStroke

Self sent to process a pen stroke received from the input system.

Takes P_INPUT_EVENT, returns STATUS.

```
#define msgGWinStroke                MakeMsg(clsGWin, 5)
```

Comments

If style.**gestureEnable** is false, **gWin**'s default response is to return **stsOK**.

If style.**gestureEnable** is true, **gWin**'s default response is as follows. First, if the **gWin** has no translator, one is created by self sending **msgGWinTranslator** and **gWin** makes itself an observer of the translator. Next It then sends **msgScrAddedStroke** to the translator to tell the translator that the **gWin** has received a new stroke.

Subclasses can handle this message and process individual strokes. If style.**gestureLocal** is false, stroke coordinates are self relative; if style.**gestureLocal** is true, stroke coordinates are root window relative.

See Also

msgGWinTranslator

msgGWinTranslator

Self sent to retrieve the translator used to gather and translate strokes.

Takes P_OBJECT, returns STATUS.

```
#define msgGWinTranslator            MakeMsg(clsGWin, 4)
```

Comments

gWin's default response is to create an instance of **clsXGesture**.

gWin self sends **msgGWinTranslator** whenever it needs a translator to gather and translate strokes. For instance, when **gWin** receives **msgGWinStroke**, and the stroke is the first stroke in a new gesture, **gWin** self sends **msgGWinTranslator**.

The translator will be destroyed during **gWin**'s handling of **msgGWinComplete** or **msgGWinAbort**.

See Also

msgGWinComplete

msgGWinComplete

Self sent to complete a gesture.

Takes void, returns STATUS.

```
#define msgGWinComplete              MakeMsg(clsGWin, 6)
```

Comments

gWin self sends **msgGWinComplete** when "out of proximity" or a timeout occurs. Clients can send **msgGWinComplete** to cause gesture completion and translation.

gWin's default response to is cause translation as described in the introductory material at the beginning of this file. **gWin** then destroys its translator.

If the **gWin** has a grab (perhaps because it was collecting strokes when a client sends this message), the grab is NOT terminated in response to this message. But the **gWin** will remember that this message has been received and will terminate the grab in response to the next **msgInputEvent** it receives.

---

msgGWinAbort

Aborts a gesture.

Takes void, returns STATUS.

```
#define msgGWinAbort                MakeMsg(clsGWin, 9)
```

Comments

gWin's default response is very similar to its response to **msgGWinComplete**, except that the translation is aborted instead completed. As with **msgGWinComplete**, the **gWin** destroys its translator and ceases collecting strokes.

A client can send **msgGWinAbort** to abort the **gWin**'s processing of a gesture.

The grab behavior is identical to that described with **msgGWinComplete**.

Subclasses may field **msgGWinAbort** but must also allow their ancestor to see the message.

---

msgGWinXList

Self sent by **gWin** to process an xlist.

Takes P_XLIST, returns STATUS.

```
#define msgGWinXList                MakeMsg(clsGWin, 1)
```

Comments

After a translation has been completed (in other words, after **gWin** has received **msgXlateCompleted** from its translator), **gWin** extracts the translation data (in the form of an xlist) from the translator, and then self sends **msgGWinXList**.

gWin's default response is to extract the gesture information from the xlist (using the xlist utility routine XList2Gesture) and then self sends **msgGWinGesture**.

See Also

msgGWinGesture

Gesture Recognition and Forwarding Messages

---

msgGWinGesture

Self-sent to process a gesture.

Takes P_GWIN_GESTURE, returns STATUS.

```
#define msgGWinGesture              MakeMsg(clsGWin, 2)
```

Message Arguments

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Comments

The default response to **msgGWinGesture** is as follows:

For the help gesture(s), return the result of self sending **msgGWinHelp**. By default, **msgGWinHelp** returns **stsRequestForward** if the **helpId** is zero, or **stsOK** if there is a valid **helpId**.

For all other gestures, return **stsRequestForward**.

Effectively, the default response of **gWin** to **msgGWinGesture** is to return **stsOK** if the gesture is a help gesture on a window and the window has a valid **helpId**. Otherwise the default behavior is to return **stsRequestForward**.

GWin's default response to **msgGWinForwardedGesture** is the same as **msgGWinGesture**. This means that the help gesture(s) is forwarded up the window hierarchy until a **gWin** has a valid **helpId**, and then that **gWin** sends the appropriate message and quick help id to **theQuickHelpManager**.

Hence a window can have a common **helpId** (and corresponding help text) for all (or some) child windows, and the quick help text displayed will be the same regardless of the child window the gesture actually occurred in.

Return Value

stsRequestForward The gesture was not processed and should be forwarded.

stsRequestDenied The gesture was not processed and should not be forwarded.

stsOK The gesture was processed and should not be forwarded.

See Also

msgGWinXList

msgGWinForwardGesture

Causes a gesture to be forwarded to parent windows.

Takes P_GWIN_GESTURE, returns STATUS.

```
#define msgGWinForwardGesture       MakeMsg(clsGWin, 20)
```

Message Arguments

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Comments

Subclasses should not handle this message.

In response to this message, **gWin** initiates gesture forwarding. This results in each parent window within the same process receiving **msgGWinForwardedGesture**, from the immediate parent to the root.

If any window along the path returns **stsOK** from **msgGWinForwardedGesture**, or the window has style.**gestureForward** off, **stsOK** is returned.

gWin performs this forwarding via **msgWinSend**. The status returned to the sender of **msgGWinForwardGesture** is the status returned by this **msgWinSend**. See the comments for **msgGWinForwardedGesture** for return values and their interpretation.

The **msgWinSend** of **msgGWinForwardedGesture** is only delivered to windows in same process.

Return Value

stsRequestForward The gesture was not processed by any of the ancestor windows. Further processing should occur if possible.

stsRequestDenied The gesture was not processed by any of the ancestor windows, and was aborted at some level of the walk. No further processing should occur.

stsOK The gesture was processed. No further processing should occur.

See Also

msgGWinXList

msgGWinForwardedGesture

Message received when a gesture is forwarded.

Takes P_GWIN_GESTURE, returns STATUS.

```
#define msgGWinForwardedGesture     MakeMsg(clsGWin, 11)
```

Message Arguments

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Comments

See the comments describing **msgGWinGesture**.

msgGWinForwardedGesture is sent to a **gWin** when a gesture event has been forwarded from a child window. Subclasses wishing to process gestures forwarded from child windows should handle this message.

Do not send this message; it should only be self sent by **clsGWin**.

Return Value

stsRequestForward The gesture was not processed and should be forwarded further.

stsRequestDenied The gesture was not processed and should not be forwarded any further.

stsOK The gesture was processed and should not be forwarded any further.

See Also

msgGWinHelp

msgGWinBadGesture

Displays feedback for unrecognized and unknown gestures.

Takes P_GWIN_GESTURE, returns STATUS.

```
#define msgGWinBadGesture           MakeMsg(clsGWin, 10)
```

Message Arguments

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Comments

gWin's response is to display the unrecognized gesture feedback (if **pArgs->**msg == **xgsNull**) or the unknown gesture feedback (for any other value of **pArgs->**msg).

gWin's default response to **msgGWinXList** includes self-sending **msgGWinBadGesture** if the gesture is unrecognized by the recognition system (**xgsNull**) or if none of the recipients of **msgGWinGesture** and **msgGWinForwardedGesture** processed the gesture.

See Also

msgGWinXList

msgGWinHelp

The **gWin** displays quick help for itself.

Takes NULL, returns STATUS.

```
#define msgGWinHelp                 MakeMsg(clsGWin, 22)
```

Comments

If the **gWin**'s **helpId** is 0, **gWin** returns **stsRequestForward.** Otherwise, **gWin** sends **msgQuickHelpShow** to **theQuickHelpManager** with the **gWin**'s help id.

Return Value

stsRequestForward The **helpId** of self is 0.

stsOK Quick help was invoked for self.

Keyboard Processing and Forwarding Messages

msgGWinKey

Self sent to process a key input event.

Takes P_INPUT_EVENT, returns STATUS.

```
#define msgGWinKey                    MakeMsg(clsGWin, 21)
```

Comments

As part of its default response to **msgInputEvent**, **gWin** self sends **msgGWinKey** if the input event is a key event.

gWin's default response to **msgGWinKey** is to return **stsRequestForward.**

Return Value

stsRequestForward The key event was not processed and should be forwarded further.

stsRequestDenied The key event was not processed and should not be forwarded any further.

stsOK The key event was processed and should not be forwarded.

msgGWinForwardKey

Initiates keyboard event forwarding.

Takes P_INPUT_EVENT, returns STATUS.

```
#define msgGWinForwardKey             MakeMsg(clsGWin, 19)
```

Comments

Subclasses should not handle this message.

In response this message, **gWin** initiates keyboard event forwarding. This results in each parent window within the same process receiving **msgGWinForwardedKey**, from the immediate parent to the root.

If any window along the path returns **stsOK** from **msgGWinForwardedGesture**, or the window has style.**keyboardForward** off, **stsOK** is returned.

gWin performs this forwarding via **msgWinSend.** The status returned to the sender of **msgGWinForwardKey** is the status returned by this **msgWinSend.** See the comments for **msgGWinForwardedKey** for return values and their interpretation.

The **msgWinSend** of **msgGWinForwardedKey** is only delivered to windows in same process.

Return Value

stsRequestForward The key event was not processed by any of the ancestor windows, and should be forwarded further if meaningful.

stsRequestDenied The key event was not processed by any of the ancestor windows, and was aborted at some level of the walk. No further processing should occur.

stsOK The key event was processed. No further processing should occur.

See Also

msgWinSend

msgGWinForwardedKey

Message received when a keyboard event is forwarded to a **gWin**.

Takes P_INPUT_EVENT, returns STATUS.

```
#define msgGWinForwardedKey          MakeMsg(clsGWin, 18)
```

Comments

msgGWinForwardedKey is sent to a **gWin** when a keyboard event has been forwarded from a child window. Subclasses wishing to handle keyboard events forwarded from child windows should handle this message.

gWin's default response is to return **stsRequestForward.**

Do not send this message; it should only be self sent by **clsGWin.**

Return Value

stsRequestForward The key event was not processed and should be forwarded further.

stsRequestDenied The key event was not processed and should not be forwarded any further.

stsOK The key event was processed and should not be forwarded any further.

msgGWinBadKey

Self sent to allow a subclass to handle bad keys.

Takes P_INPUT_EVENT, returns STATUS.

```
#define msgGWinBadKey                MakeMsg(clsGWin, 23)
```

Comments

gWin's default response is to return **stsOK.**

gWin self sends **msgGWinBadKey** when (1) **msgGWinKey** returns **stsRequestDenied**, (2) **msgGWinKey** returns **stsRequestForward** and style.**keyboardForward** is not set, or (3) **msgGWinForwardKey** returns **stsRequestDenied** or **stsRequestForward.**

msgGWinIsComplete

Called to determine if a gesture was sent while processing input.

Takes P_GWIN_GESTURE, returns STATUS.

```
#define msgGWinIsComplete            MakeMsg(clsGWin, 24)
```

Message Arguments

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Comments

This message is used to determine if the gesture may have been sent other than when processing **msgGWinXList** or **msgQuickHelpHelpShow.** Put simply, this message returns **stsOK** for any gesture other then those sent while processing input where gesture processing may continue. Examples are press-hold and tap-press hold.

Return Value

stsRequestDenied The gesture was sent while processing input from **msgGWinXList** or**msgQuickHelpHelpShow.** The gesture was sent

msgGWinGestureDone

Sent to indicate the end of a gesture.

Takes P_GWIN_GESTURE, returns STATUS. Category: self-sent.

```
#define msgGWinGestureDone          MakeMsg(clsGWin, 25)
```

Message Arguments

```
typedef struct GWIN_GESTURE {
    MESSAGE     msg;        // gesture Id
    RECT32      bounds;     // bounding box in LWC
    XY32        hotPoint;   // gesture hot point
    OBJECT      uid;        // object in which the gesture was generated
    U32         reserved;   // reserved for future use
} GWIN_GESTURE, *P_GWIN_GESTURE;
```

Comments

As part of its default response to **msgGWinXList**, **gWin** self sends **msgGWinGestureDone**. (**msgGWinXList** is self sent after the forwarding protocol has completed but before **msgQuickHelpShow** or **msgGWinBadGesture** is sent.)

It is intended for use by classes that modify their state in anticipation of receiving **msgGWinGesture** and fail to receive it. (For instance, a subclass could handle **msgGWinGesture** and not pass the message along to its ancestor). Such classes should watch for **msgGWinAbort** and **msgGWinGestureDone**. Either, but not both, could be sent for any one gesture.

Subclasses may field **msgGWinGestureDone** but must also allow their ancestor to see the message.

Messages from Other Classes

msgFree

Defined in clsmgr.h.

Takes OBJ_KEY, returns STATUS.

Comments

In response to **msgFree**, **gWin** removes itself as an observer of its translator and then destroys the translator. In addition, **gWin** frees any memory it has allocated.

msgSave

Defined in clsmgr.h.

Takes P_OBJ_SAVE, returns STATUS.

Comments

In response to **msgSave**, **gWin** saves state information. **gWin** files its **helpId** if the **helpId** is different then the window tag.

Note that the **gWin**'s translator is not saved or restored since the translator only exists while the **gWin** is actively collecting strokes.

msgRestore

Defined in clsmgr.h.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

In response to **msgRestore**, **gWin** restores state information, including the **helpId**.

Note that the **gWin**'s translator is not saved or restored since the translator only exists while the **gWin** is actively collecting strokes.

msgWinSend

Defined in win.h.

Takes P_WIN_SEND, returns STATUS.

Comments

gWin handles **msgWinSend** if **pArgs**->msg is **msgGWinForwardedGesture** or **msgGWinForwardedKey**. For all other values of **pArgs**->msg, **gWin** simply passes the message to its ancestor.

If **pArgs**->msg is **msgGWinForwardedGesture**, **gWin** self sends **msgGWinForwardedGesture**. If this returns **stsRequestForward** and the **gWin**'s style.**gestureForward** is set, **gWin** passes the **msgWinSend** to its ancestor, allowing the forwarding to continue. Otherwise **gWin** returns the result of the self send of **msgGWinForwardedGesture**.

If **pArgs**->msg is **msgGWinForwardedKey**, **gWin** self sends **msgGWinForwardedKey**. The response to this message is handled similarly to the gesture case, except that style.**keyboardForward** is checked rather than style.**gestureForward**.

See Also

msgGWinForwardKey

msgInputEvent

Defined in input.h.

Takes P_INPUT_EVENT, returns STATUS.

Comments

This is the main processing message for **gWin**.

For keyboard events, **gWin** self sends **msgGwinKey**, and performs the keyboard processing and forwarding as described earlier.

For pen events, **gWin** returns **stsInputTerminate** if **gestureEnable** is not set. Otherwise, **gWin** initiates a grab by returning **stsInputGrabTerminate** on **msgPenDown** if style.**grabDown** is set.

On **msgPenStroke** events **gWin** self sends **msgGWinStroke** and continues the grab by returning **stsInputGrabTerminate**.

On **msgPenOutProxUp**, **msgPenOutProxDown**, or **msgPenTimeout** **gWin** self sends **msgGWinComplete** and releases the grab by returning **stsInputTerminate**.

For other pen events, **gWin** returns **stsInputTerminate** or **stsInputTerminate** if it "grabbing" (has returned **stsInputGrabTerminate** due to a **msgPenDown** or **msgPenStroke**), and not "released-the-grab" (returned **stsInputTerminate** due to a **msgPenOutProxDown**, **msgPenOutProxUp**, or **msgPenTimeout**).

If **gWin** receives a **msgPenTap**, is not "grabbing", and has **gestureEnable** set, **gWin** synthesizes a tap gesture by self sending **msgGWinXList**. Thus, even though if **inputStroke** events are turned off in the window, **gWin** can still recognize tap gestures.

Return Value

stsInputGrabTerminate	Temporarily grabbing input events	Not grabbing input events.

See Also

msgGWinStroke

msgQuickHelpHelpShow

Defined in qhelp.h.

Takes P_XY32, returns STATUS.

Comments

The **theQuickHelpManager** sends **msgQuickHelpHelpShow** to a **gWin** to ask the **gWin** to display the **gWin**'s quick help. (This is the message that **theQuickHelpManager** sends when the user taps while in quick help mode.)

gWin's default response is to self send **msgGWinGesture**; the gesture sent along with this **msgGWinGesture** is a synthesized help gesture.

If the response to the **msgGWinGesture** is **stsRequestForward**, **gWin** self sends **msgGWinForwardGesture**. If the response to the **msgGWinForwardGesture** is **stsRequestForward**, **gWin** self sends **msgQuickHelpShow** to **theQuickHelpManager** with a **helpId** of **hlpQuickHelpNoHelp**. (In response to this, **theQuickHelpManager** displays the "no help available" text to the user.)

msgXlateCompleted

Defined in xlate.h.

Takes nothing, returns STATUS.

Comments

A **gWin**'s gesture translator sends **msgXlateCompleted** to the **gWin** when a gesture translation is complete. (The **gWin** has previously started the translation by sending **msgScrComplete** to the gesture translator.)

gWin's default response is to extract the xlist from the translator and self send **msgGWinXList**.

See Also

msgGWinXList

HWCUSTOM.H

This file contains definitions for **clsHWCustomFrame.**

clsHWCustomFrame inherits from **clsFrame.**

This file contains the API definition for **clsHWCustomFrame.** Instances of **clsHWCustomFrame** are created by the Settings Notebook when the user taps the "Customize" button on the Installed Handwriting page. The Settings Notebook will pass in the handle of the prototype set to be customized. It is up to **clsHWCustomFrame** instances to carry out the customization and destroy themselves when finished.

Debugging Flags

clsHWCustomFrame uses the Handwriting debug flag set 'Z'. **clsHWCustomFrame** uses:

40000 Show all internal debugging messages

```
#ifndef HWCUSTOM_INCLUDED
#define HWCUSTOM_INCLUDED
#ifndef FRAME_INCLUDED
#include <frame.h>
#endif
#ifndef FS_INCLUDED
#include <fs.h>
#endif
```

Common #defines and typedefs

```
typedef struct HWCUSTOM_NEW_ONLY {
    OBJECT  protoSetHandle;     // handle of prototype set to customize
} HWCUSTOM_NEW_ONLY;
#define hwCustomNewFields \
    frameNewFields       \
    HWCUSTOM_NEW_ONLY   hwcustom;
typedef struct HWCUSTOM_NEW {
    hwCustomNewFields
} HWCUSTOM_NEW, *P_HWCUSTOM_NEW;
```

File System Attributes

The values for the 32-bit attribute **hwCustomAttrCustomizable** are:

0: This profile is fully customizable.

1: This engine allows customization, but this profile is the original, generic profile for this engine; users must rename it before they customize it. This will to prevent users from inadvertently overwriting the original copy of the profile on the distribution media. If the attribute is 1, Handwriting Customization will pop up a dialog forcing the user to copy or rename the profile before customization.

2: This profile is not customizable.

Any other value: Same as 0; profile is fully customizable.

If the attribute is missing from the directory, Customization will assume the profile is fully customizable.

Here is the magic incantation to stamp the attribute on a profile:

```
STAMP /G "<profile>" /A 800278 <value>
```

For instance, the GOWrite profile gets stamped like this:

```
STAMP /G "GOWrite" /A 800278 1
```

This will stamp a value of 1 on the GOWrite directory for Admin 316 (**clsHWCustomFrame**), Index 1.

```
#define hwCustomAttrCustomizable    FSMakeFix32Attr(clsHWCustomFrame, 1)
```

Messages

msgNewDefaults

Initializes the HWCUSTOM_NEW structure to default values. Default values are the same as for **clsFrame**, with a **protoSetHandle** of 0.

Takes P_HWCUSTOM_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct HWCUSTOM_NEW {
    hwCustomNewFields
} HWCUSTOM_NEW, *P_HWCUSTOM_NEW;
```

msgNew

Creates a handwriting customization frame window, acting on the handwriting prototype set in **pArgs**->hwcustom.**protoSetHandle**. If **protoSetHandle==0**, acts on **theCurrentInstalledHWXProtos**.

Takes P_HWCUSTOM_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct HWCUSTOM_NEW {
    hwCustomNewFields
} HWCUSTOM_NEW, *P_HWCUSTOM_NEW;
```

Quick Help Tags

```
#define hlpHWCustomIcon             MakeTag(clsHWCustomFrame, 0)
#define hlpHWCustomNote             MakeTag(clsHWCustomFrame, 1)
#define hlpHWCustomAlert            MakeTag(clsHWCustomFrame, 2)
#define hlpHWCustomExitNote         MakeTag(clsHWCustomFrame,25)
#define hlpHomeWinLCLabel           MakeTag(clsHWCustomFrame, 5)
#define hlpHomeWinUCLabel           MakeTag(clsHWCustomFrame, 6)
#define hlpHomeWinNumLabel          MakeTag(clsHWCustomFrame, 7)
#define hlpHomeWinSymLabel          MakeTag(clsHWCustomFrame, 8)
#define hlpHomeWinSCLabel           MakeTag(clsHWCustomFrame, 9)
#define hlpHomeWinExitLabel         MakeTag(clsHWCustomFrame,10)
#define hlpHomeWinNextArrow         MakeTag(clsHWCustomFrame, 4)
#define hlpHomeWinStatTitle         MakeTag(clsHWCustomFrame,21)
#define hlpHomeWinStatTSets         MakeTag(clsHWCustomFrame,22)
#define hlpHomeWinStatRecRt         MakeTag(clsHWCustomFrame,23)
#define hlpHomeWinStatLearn         MakeTag(clsHWCustomFrame,24)
#define hlpHomeWinStatRecom         MakeTag(clsHWCustomFrame,26)
#define hlpHomeWinInstrs            MakeTag(clsHWCustomFrame,11)
#define hlpHomeWinBlankAreas        MakeTag(clsHWCustomFrame, 3)
#define hlp26WinTitle               MakeTag(clsHWCustomFrame,12)
#define hlp26WinLearnBtn            MakeTag(clsHWCustomFrame,13)
#define hlp26WinClearBtn            MakeTag(clsHWCustomFrame,14)
#define hlp26WinNextBtn             MakeTag(clsHWCustomFrame,15)
#define hlp26WinDoneBtn             MakeTag(clsHWCustomFrame,16)
#define hlp26WinInstrs              MakeTag(clsHWCustomFrame,18)
#define hlp26WinInputLabel          MakeTag(clsHWCustomFrame,19)
#define hlp26WinInputBox            MakeTag(clsHWCustomFrame,20)
#define hlp26WinBlankAreas          MakeTag(clsHWCustomFrame,17)
```

HWLETTER.H

This file contains definitions for **clsHWLetterFrame.**

clsHWLetterFrame inherits from **clsFrame.**

This file contains the API definition for **clsHWLetterFrame.** Instances of **clsHWLetterFrame** are created by the Settings Notebook when the user taps the "Practice" button on the Installed Handwriting page. The Settings Notebook will pass in the handle of the prototype set to practice. It is up to **clsHWLetterFrame** instances to carry out the practice session and destroy themselves when finished.

Debugging Flags

clsHWLetterFrame uses the Handwriting debug flag set 'Z'. **clsHWLetterFrame** uses:

10000 Show all internal debugging messages

```
#ifndef HWLETTER_INCLUDED
#define HWLETTER_INCLUDED
#ifndef FRAME_INCLUDED
#include <frame.h>
#endif
```

Common #defines and typedefs

```
typedef struct HWLETTER_NEW_ONLY {
    OBJECT  protoSetHandle;     // handle of prototype set to practice
} HWLETTER_NEW_ONLY;
#define hwLetterNewFields \
    frameNewFields       \
    HWLETTER_NEW_ONLY   hwletter;
typedef struct HWLETTER_NEW {
    hwLetterNewFields
} HWLETTER_NEW, *P_HWLETTER_NEW;
```

Messages

msgNewDefaults

Initializes the HWLETTER_NEW structure to default values. Default values are the same as for **clsFrame,** with a **protoSetHandle** of 0.

Takes P_HWLETTER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct HWLETTER_NEW {
    hwLetterNewFields
} HWLETTER_NEW, *P_HWLETTER_NEW;
```

msgNew

Creates a handwriting practice frame window, using the handwriting prototype set in **pArgs->hwletter.protoSetHandle**. If **protoSetHandle==0**, uses the current InstalledHWXProtos.

Takes P_HWLETTER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct HWLETTER_NEW {
    hwLetterNewFields
} HWLETTER_NEW, *P_HWLETTER_NEW;
```

Quick Help Tags

```
#define hlpLetterPractice   MakeTag(clsHWLetterFrame, 1)
#define hlpLWInputSPaper    MakeTag(clsHWLetterFrame, 2)
#define hlpLWKeyboard       MakeTag(clsHWLetterFrame, 3)
#define hlpLWPrevScribble   MakeTag(clsHWLetterFrame, 4)
#define hlpLWXlateResult    MakeTag(clsHWLetterFrame, 5)
#define hlpLWAnimationWin   MakeTag(clsHWLetterFrame, 6)
```

INPUT.H

This file contains the API definition for **clsInput** and PenPoint's input system.

clsInput inherits from **clsObject.**

clsInput provides the object-oriented interface to PenPoint's input system.

The functions described in this file are contained in INPUT.LIB.

Introduction

PenPoint's input system collects events generated by devices such as **thePen** and **theKeyboard.** It then distributes those events to other objects in the system.

The input system is almost always single-threaded. Usually only one input event is being distributed through the system at any given time. The exception is when using **msgInputModalStart** and **msgInputModalEnd.**

Road Map

This file contains general information about PenPoint's input system and input events. Information specific to pen events is in pen.h. Information specific to key events is in key.h.

Most PenPoint application programs do not need to use the PenPoint input system directly. PenPoint has several classes that manage input for clients. Check these classes to see if they meet your needs. Candidate classes include the following (and their subclasses). (This list is not exhaustive.)

- clsGWin (gwin.h)
- clsSPaper (spaper.h)
- clsIP (insert.h)
- clsNotePaper (notepapr.h)
- all toolkit classes.

Any client handling input directly (rather than using PenPoint classes which handle input) needs to understand the following:

- How to set up window input flags so that desired input events are received. See the section "Input Flags."
- How to handle **msgInputEvent** in general, and how to handle the device-specific values for **msgInputEvent**'s **pArgs**->devCode. See pen.h and key.h.
- How to return appropriate status values in response to **msgInputEvent.** See "Return Values From **msgInputEvent.**"

Any client that needs to grab input needs to understand:

- General grabbing information. See the section "Grabs and Grabbers."

- msgInputEvent return values that start a grab and keep a grab going. See "Return Values From **msgInputEvent.**"

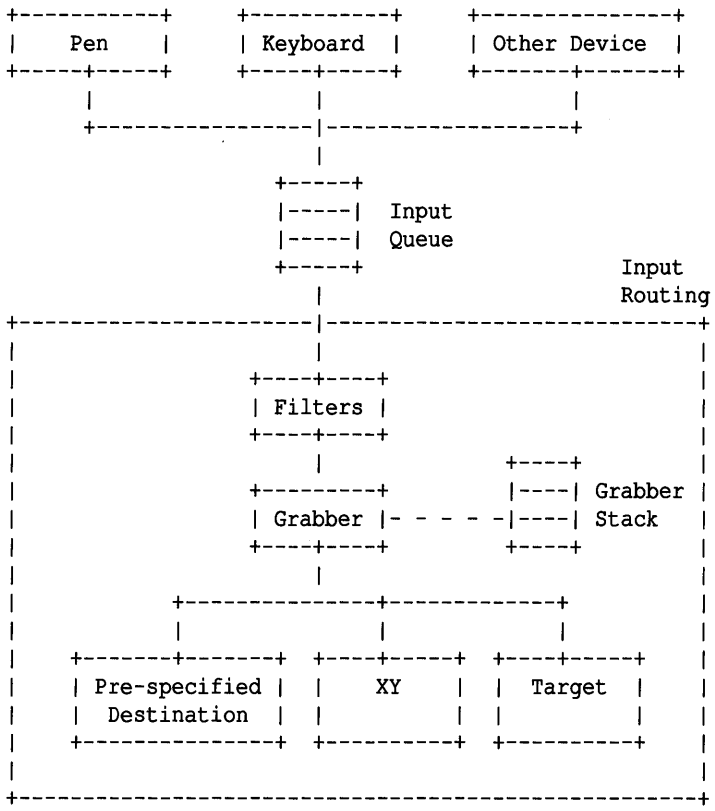
Any client that needs to be the input target (and therefore the recipient of keyboard events) needs to understand:

- InputSetTarget()

The other interfaces described in this file are typically used by sophisticated clients.

Overview

This diagram illustrates the flow of events into, through and out of the input system:



Each of these major pieces is described below:

- Devices such as the pen and keyboard generate low-level input events. (These "devices" are partially implemented in the MIL and partially implemented in PenPoint.) These low-level input events are converted into PenPoint input events and are sent to the Input Queue.
- The input system pulls events off the queue one at a time and decides where to send or "route" the event.

There the "event routing" process starts.

- First the event is run through the list of Filters. Filters have the opportunity to examine each input event. Filters are ordered by their priority. Filters return a status which indicates how processing of the event should continue.
- Next the event is sent to the current grab object, or grabber. (There might not be a current grabber, in which case this step is skipped.) The grabber returns a status which indicates how processing of

the event should continue and whether the grab should continue. The input system maintains a stack of grabbers to support nested modal behavior.

The next step in an event's routing depends in part on the event. (Only one of these alternatives is used.)

- If the event has a pre-specified destination, **msgInputEvent** is sent to that destination. If the event has a pre-specified destination, it is found in **pArgs->**listener for **msgInputEvent.** An event has a pre-specified destination only if the event has been programmatically inserted into the input system.
- If the event has a "valid" XY coordinate (which typically means it was generated by **thePen**), the event is routed to window objects. The top-most window (farthest from **theRootWindow**) which encloses the XY coordinate gets the first opportunity to process the event. Each window may terminate processing of the event or allow the input system to send the event to its (the window's) parent window.
- Otherwise the event is sent to the current input target, if the target is non-null. (This is how all keyboard events are routed.)

Filters

Filters are used to implement some types of modal behavior. Typically this modal behavior is relatively long-lived. For instance, PenPoint's Quick Help mode is implemented using filters.

It is extremely rare for PenPoint application programs to directly use or even be aware of filters.

```
Object          Priority
------          --------
qhelp win       16
vkey win        32
qhelp nb        32
vkey app        80
spell (proof)   96
insertion pad   96 ( if modal )
menu            112
note            160
option          160
```

Grabs and Grabbers

Grabbers are used to implement light-weight modal behavior. These modes are typically pen controlled in that they start and end with some pen event, such as **msgPenDown** and **msgOutProxUp.** For instance resize handles are implemented using grabbers.

Many application programs never use grabbers directly but rather use PenPoint classes that use grabbers.

As illustrated in the "Overview" section, the current grabber gets input messages after filters but before "normal" event distribution occurs. The grabber can "swallow" the event and stop any further distribution, or the grabber can allow distribution to continue.

There are two ways to start a grab.

- An object that is handling **msgInputEvent** can return a status value that tells the input system that it wants to be the grab object. See the section "Return Values from **msgInputEvent.**"
- Any object can call InputSetGrab() passing in the object to become the grabber.

A grabber terminates a grab by returning from **msgInputEvent** a status value that does not have "Grab" turned on, or by setting the current grabber to **objNull.**

In order to keep the grab "alive," the grabber must always return a status from **msgInputEvent** that implies "Grab." If the input system gets a status returned that does not have "Grab" implied, it terminates the grab.

```
#ifndef INPUT_INCLUDED
#define INPUT_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
```

Common #defines and typedefs

Miscellaneous

The following flags control event distribution to filters.

iflSendMyWindowOnly tells the input system to not bother sending the message to the filter unless the event happened in the filter or in one of the filter's window children or window ancestors. It is strictly a performance enhancement.

```
typedef U32 FILTER_FLAGS, *P_FILTER_FLAGS;
#define iflWindow               flag0   // Private. Internal use only.
#define iflSendMyWindowOnly     flag1
```

This is the number of bytes in the INPUT_EVENT's **eventData** field. The data stored in this field depends on the **devCode** field. Handlers of **msgInputEvent** never need to use this value; all handlers will cast **pArgs**->eventData to an appropriate type.

```
#define inptEDataSize   32      // no of bytes INPUT_EVENT's eventData field
```

Return Values From msgInputEvent

Overview

The status returned from **msgInputEvent** tells the input system how to continue processing the event. This section lists the STATUS values that recipients of **msgInputEvent** may return. Each of these statuses contains several "values." (Not all possible combinations of these are legal or supported.)

- Whether distribution for the event should continue or be terminated.
- Grab status. Whether to start or continue a grab for the recipient of **msgInputEvent**.
- Ancestor interest. Whether or not the ancestor class was interested in the event.
- Filter skip. For filters only, whether distribution of the event should skip certain filters.

The following table describes the relationship between the legal status codes and the values they "contain." For clarity, the "no" entries are left blank and the "Filter skip" information is not shown.

Return Values From msgInputEvent

	continue distribution	start or continue grab	ignored by ancestor
stsInputContinue	yes		
stsInputTerminate			
stsInputGrabContinue	yes	yes	
stsInputGrabTerminate		yes	
stsInputGrab		yes	
stsInputIgnored	yes		yes
stsInputGrabIgnored	yes	yes	yes

Details

These status values can be returned by any handler of **msgInputEvent**:

stsInputContinue Distribution of this event should continue.

stsInputTerminate Distribution of this event should terminate.

stsInputGrabContinue Distribution of this event should continue, and the grab should be continued (or started) for the recipient of **msgInputEvent**.

stsInputGrabTerminate Distribution of this event should terminate, and the grab should be continued (or started) for the recipient of **msgInputEvent**.

stsInputGrab Same as **stsInputGrabTerminate**.

stsInputIgnored An ancestor class may return **stsInputIgnored** to inform a subclass that the ancestor was not interested in the event. The input system treats **stsInputIgnored** just like **stsInputContinue**.

stsInputGrabIgnored An ancestor class may return **stsInputGrabIgnored** to inform a subclass that the ancestor was not interested in the event, but that the grab should be continued (or started) for the object the received **msgInputEvent**. The input system treats **stsInputGrabIgnored** just like **stsInputGrabContinue**.

These statuses should only be returned by Filters:

stsInputSkip Distribution of this event should continue but all remaining filters should be skipped.

stsInputSkipTo2 Distribution of this event should continue but all remaining filters in Range 1 (priority less than 64) should be skipped.

stsInputSkipTo3 Distribution of this event should continue but all remaining filters in Ranges 1 and 2 (priority less than 128) should be skipped.

stsInputSkipTo4 Distribution of this event should continue but all remaining filters in Ranges 1, 2 and 3 (priority less than 192) should be skipped.

stsInputTerminateRemoveStroke Distribution of this event should terminate, and any other events corresponding to the current stroke should not be sent at all.

stsInputGrabTerminateRemoveStroke Distribution of this event should terminate, the grab should be continued (or started) for the recipient of **msgInputEvent**, and any other events corresponding to the current stroke should not be sent at all.

```
#define stsInputContinue                InputMakeSts(0)
#define stsInputSkip                    InputMakeSts(evSkip)
#define stsInputSkipTo2                 InputMakeSts(evSkip | (1 << 4))
#define stsInputSkipTo3                 InputMakeSts(evSkip | (2 << 4))
#define stsInputSkipTo4                 InputMakeSts(evSkip | (3 << 4))
#define stsInputTerminate               InputMakeSts(evTerminate)
```

```
#define stsInputGrabContinue            InputMakeSts(evGrab)
#define stsInputGrabTerminate           InputMakeSts(evGrab | evTerminate)
#define stsInputGrab                    InputMakeSts(evGrab | evTerminate)
#define stsInputTerminateRemoveStroke   InputMakeSts(evTerminate | evStroke)
#define stsInputGrabTerminateRemoveStroke   \
                InputMakeSts(evGrab | evTerminate | evStroke)
#define stsInputIgnored                 InputMakeSts(evIgnore)
#define stsInputGrabIgnored             InputMakeSts(evGrab | evIgnore)
```

Other Statuses

```
#define stsInputQueueFull           MakeStatus(clsInput, evOther | 2)
```

Input Flags

Overview

Each window has a set of input flags that are stored in the window's win.flags.input field. These flags can be manipulated while handling **msgNew** and **msgNewDefaults**. They can also be manipulated with several other window messages; see win.h for more information.

InputSetGrab() and InputFilterAdd use these flags as one of their parameters.

```
typedef U32 INPUT_FLAGS, *P_INPUT_FLAGS;
```

"Interest" Flags

PenPoint's input system can generate many messages. Most clients are only interested in a subset of the messages that can be generated. So clients can provide hints to the input system about the input events the client is interested in. This reduces the message traffic and increases performance. For instance, if a client is not interested in pen movement events when the pen is up above the writing surface (but within proximity), the client can clear the **inputMoveUp** flag

Typically, a flag enables or disables several input events. For instance, setting the **inputTip** flag enables both **msgPenDown** and **msgPenUp** (see pen.h).

You should treat these flags as a hint to the input system. You should not assume that a specific input event will not arrive because you have not enabled the corresponding bit in the input flags.

This table contains examples of the messages that are enabled by setting various flags. This table is only representative -- it is not complete!

input flag	example of message(s) enabled	message defined in
inputTip	msgPenUp, msgPenDown	pen.h
inputMoveUp	msgPenMoveUp	pen.h
inputMoveDown	msgPenMoveDown	pen.h
inputEnter	msgPenEnterUp, msgPenEnterDown	pen.h
inputExit	msgPenExitUp, msgPenExitDown	pen.h
inputInProx	msgPenInProxUp	pen.h
inputOutProx	msgPenOutProxUp	pen.h
inputStroke	msgPenStroke	pen.h
inputTap	msgPenTap	pen.h
inputHoldTimeout	msgPenHoldTimeout	pen.h
inputChar	msgKeyChar	key.h
inputMultiChar	msgKeyMulti	key.h
inputMakeBreak	msgKeyUp, msgKeyDown	key.h

```
#define inputTip          (U32)(flag0)    // enable TipUp & TipDown events
#define inputMoveUp       (U32)(flag1)    // enable MoveUp events
#define inputMoveDown     (U32)(flag7)    // enable MoveDown events
#define inputEnter        (U32)(flag2)    // enable EnterUp & EnterDown
#define inputExit         (U32)(flag3)    // enable ExitUp & ExitDown
#define inputInProx       (U32)(flag4)    // enable InProxUp events
#define inputOutProx      (U32)(flag5)    // enable OutProxUp events
#define inputStroke       (U32)(flag6)    // enable Stroke events (See pen.h.)
#define inputTap          (U32)(flag10)   // enable tap events
#define inputChar         (U32)(flag13)   // enable character events
#define inputMultiChar    (U32)(flag14)   // enable multi-char events
#define inputMakeBreak    (U32)(flag15)   // enable make/break events
#define inputHoldTimeout  (U32)(flag8)    // enable HoldTimeout events  (See
                                          // "Hold Timeout Events" in pen.h)
#define inputTimeout      (U32)(flag9)    // obsolete.
#define inputHWTimeout    (U32)(flag11)   // obsolete.
#define inputMoveDelta    (U32)(flag18)   // enable compression of multiple
                                          // delta events into a single delta
                                          // event. Good news: fewer messages
                                          // and better performance. Bad news:
                                          // less information to the client.
#define inputDestOnly     (U32)(flag19)   // send event iff destination is self
#define inputLRContinue   (U32)(flag20)   // enable dist. to parent windows
#define inputDisable      (U32)(flag21)   // send no input event messages
#define inputEnableAll    (U32)(flag25)   // enables all events to be sent to
                                          // grabbers
```

Inking Flags

WARNING: Inking and the acetate are subject to major changes in future releases.

```
#define inputInk          (U32)(flag23)   // enable inking in the acetate layer
#define inputInkThrough   (U32)(flag24)   // enable inking in window rather
                                          // than acetate layer
#define inputInkDisable   (U32)(flag30)   // disables both inputInk and
                                          // inputInkThrough
```

Miscellaneous Flags

inputNoBusy If cleared, then the input system automatically turns on PenPoint's busy clock if the recipient of a message does not return before a certain timeout. If set, this default busy clock behavior is disabled.

inputResolution If set, **msgPenMoveUp** and **msgPenMoveDown** messages are sent each time the pen moves one digitizer unit. (In other words, the input system sends a move event for even the smallest detectable amount of movement. If cleared, move events are sent only when the pen has moved at least one display pixel's size.

inputAutoTerm Should only be set by a grabber. Specifies that all events that the grabber is not interested in should be treated as if the grabber returned **stsInputGrabTerminate**.

inputGrabTracker Should only be set by a grabber. Specifies that the grabber does not need the input system to perform its normal hit detection. This is strictly a performance enhancement. (The name of this value is an anachronism. Originally trackers were the only grabbers that didn't need hit detection.)

```
#define inputNoBusy       (U32)(flag12)   // disable default busy clock
#define inputResolution   (U32)(flag22)   // report pen resolution move events
#define inputAutoTerm     (U32)(flag26)   // automatically terminate all
                                          // events' distribution if grabber
                                          // doesn't have the event
                                          // flag enabled.
#define inputGrabTracker  (U32)(flag27)   // disables hit detect during grab
#define inputTransparent  (U32)(flag31)   // invisible to hit detect operations
                                          // See win.h.
```

```
#define inputSigVerify  (U32)(flag16)   // Sets pen sample rate to high and
                                        // MIL reporting threshold to 0.
                                        // This does not guarantee getting
                                        // every pen move event, so users
                                        // should check timestamps to see
                                        // if any data has been lost.
// Shorthand for all flags which correspond to real input events.
#define inputAllRealEventsFlags         (U32)0xEFFF
```

Event Distribution Flags

Input distribution flags give some additional information to thebeing sent the input event.

evfFilter object is getting this event because it is a filter;

evfGrab object is getting this event because it is a grabber;

evfListener object is getting because it was specified in the input event listener field;

evfTarget object is getting this event because it is the target;

evfXYLeafToRoot object is getting this event as part of the XY distribution;

evfInSelf event occurred in this window;

evfInChild event occurred in a child of this window;

NOTE: **evfInSelf** and **evfInChild** will become obsolete in future releases.

evfGrabTracker object had input grab tracker flag on.

```
typedef U32 INPUT_DIST_FLAGS, P_INPUT_DIST_FLAGS;

//  NOTE:   evfInSelf and evfInChild will become obsolete in future releases.
#define evfInParent     ((U32)flag9)    // Obsolete.
#define evfInChild      ((U32)flag10)   // event occurred in child window
#define evfInSelf       ((U32)flag11)   // event occurred in this window
#define evfGrabTracker  ((U32)flag12)   // event occurred during grab
#define evfFilter       ((U32)flag26)   // event in filter distribution
#define evfGrab         ((U32)flag27)   // event in grab distribution
#define evfXYLeafToRoot ((U32)flag29)   // event in XY dist
#define evfListener     ((U32)flag30)   // event in "pre-specified
                                        // destination" distribution
#define evfTarget       ((U32)flag31)   // event in target distribution
```

Messages

msgInputEvent

theInputManager uses this message to deliver input events.

Takes P_INPUT_EVENT, returns STATUS.

Arguments

```
typedef struct INPUT_EVENT {
    SIZEOF              length;                 // actual length of pArgs
    INPUT_DIST_FLAGS    flags;                  // distribution information
    MESSAGE             devCode;                // input event
    OS_MILLISECONDS     timestamp;              // time event was queued
    XY32                xy;                     // location of event
    OBJECT              listener;               // pre-specified destination
                                                // Normally objNull.
    OBJECT              destination;
    OBJECT              originator;             // originating device
    U8                  eventData[inptEDataSize];   // event specific data
} INPUT_EVENT, *P_INPUT_EVENT;
#define msgInputEvent               MakeMsg(clsInput, 0)
```

Comments

pArgs->devCode contains the "event" that is being delivered. These events are device-specific. See pen.h for a list of pen events and key.h for a list of key events.

The **pArgs** for **msgInputEvent** is best thought of as a union type. **pArgs** can always be cast to a P_INPUT_EVENT, but the content of **pArgs**->eventData depends on the value of **pArgs**->devCode. For some values of **pArgs**->devCode, the **pArgs** are actually larger than an INPUT_EVENT structure, so use the **pArgs**->length field to determine the length of the input event. For example, the **msgPenStroke** and **msgKeyMulti** events both have data which extends past the end of the INPUT_EVENT structure.

For events that have a valid XY, **pArgs**->destination is the top-most window with input enabled (FlagOff(**inputDisable**, ...)).

The recipient of this message must return one of the status values described in the section "Return Values from **msgInputEvent**."

Notification Messages

msgInputGrabPushed

Notifies a grabbing object that it is being pushed onto the grabber stack and the **pArgs** is the new grabber.

Takes OBJECT, returns STATUS.

```
#define msgInputGrabPushed          MsgNoError(MakeMsg(clsInput, 0x83))
```

msgInputGrabPopped

Notifies a grabbing object that is being popped from the grabber stack and becoming the current grabber.

Takes OBJECT, returns STATUS.

```
#define msgInputGrabPopped          MsgNoError(MakeMsg(clsInput, 0x84))
```

msgInputTargetDeactivated

Notifies the input target that some other object is become the input target.

Takes OBJECT, returns STATUS.

```
#define msgInputTargetDeactivated   MsgNoError(MakeMsg(clsInput, 0x85))
```

msgInputTargetActivated

Notifies an object that it is becoming the input target.

Takes OBJECT, returns STATUS.

```
#define msgInputTargetActivated     MsgNoError(MakeMsg(clsInput, 0x86))
```

Functions

InputFilterAdd

Adds a filter to the filter list.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED InputFilterAdd(
    OBJECT          newFilter,
    INPUT_FLAGS     inputEventFlags,
    FILTER_FLAGS    filterFlags,
    U8              priority
);
```

InputFilterRemove

Removes a filter from the filter list.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED0 InputFilterRemove(
    OBJECT listener     // filter to remove
);
```

InputEventInsert

Adds an event to the input event queue.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED0 InputEventInsert(
    P_INPUT_EVENT   pEvent,
    BOOLEAN         stamp
);
```

Comments

Most clients do not use this message.

If stamp is true, **pEvent**->timestamp is filled in with the current time and the event is added to the end of the queue. Otherwise, **pEvent**->timestamp is not modified and the event is placed at the head of the queue and the

Return Value

stsInputQueueFull the input system queue is full

InputSetTarget

Sets the input target object and flags.

Returns STATUS.

Function Prototype
```
STATUS EXPORTED InputSetTarget(
    OBJECT  target,         // new target object
    U32     flags           // new target flags
);
```

Comments

Clients use this message to set the input target. The input target is the object that receives **msgInputEvent** for all events that do not have an XY position -- in particular, keyboard events.

PenPoint's UI guidelines state that the selection owner and input target should usually be the same object. PenPoint does not enforce this association in any way. See the UI documentation and sel.h for more information.

See Also

msgInputTargetActivated.h

InputGetTarget

Returns the current input target.

Returns OBJECT.

Function Prototype
```
OBJECT EXPORTED InputGetTarget(void);
```

See Also

InputSetTarget

InputSetGrab

Sets the current grabber and its flags.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED InputSetGrab(
    OBJECT  grabber,    // new grabber
    U32     flags       // new grab input flags
);
```

Comments

The previous grabber is pushed onto the grabber stack.

If the flags parameter is 0, then **inputAllRealEventsFlags** is used.

If both parameters are null, the current grabber is removed and the grabber on the top of the grabber stack (if the stack isn't empty) becomes the current grabber.

InputGetGrab

Passes back the current grabber and its flags.

Returns void.

Function Prototype

```
void EXPORTED InputGetGrab(
    P_OBJECT    pGrabber,       // grabber
    P_U32       pFlags          // current grab flags
);
```

See Also

InputSetGrab

msgInputModalStart

Asks **theInputManager** to start recursive input.

Takes P_INPUT_MODAL_DATA, returns STATUS.

Arguments

```
typedef struct INPUT_MODAL_DATA {
    U32     reserved;
    U32     clientData[2];
} INPUT_MODAL_DATA, *P_INPUT_MODAL_DATA;
#define msgInputModalStart          MakeMsg(clsInput, 1)
```

Comments

This message is used to implement a system-wide mode. Typical application programs should not sent this message.

You must send this message to the input system using ObjectSendUpdate(). The sending task is blocked until the recursive task returns. The recursive task can pass data to the first task via **pArgs**.

See Also

msgInputModalEnd

msgInputModalEnd

Asks **theInputManager** to terminate recursive input.

Takes P_INPUT_MODAL_DATA, returns STATUS.

```
#define msgInputModalEnd            MakeMsg(clsInput, 2)
```

Message Arguments

```
typedef struct INPUT_MODAL_DATA {
    U32     reserved;
    U32     clientData[2];
} INPUT_MODAL_DATA, *P_INPUT_MODAL_DATA;
```

Comments

This message terminates a system-wide mode. Typical application programs should not send this message.

This message must be paired with **msgInputModalStart**.

The sender of this message can pass information to the sender of **msgInputModalStart** by filling in **pArgs**.

This message may be sent with ObjectCall() or ObjectSend().

See Also

msgInputModalStart

msgInputActivityTimer

Asks **theInputManager** to enable or disable the activity timer.

Takes BOOLEAN, returns STATUS.

```
#define msgInputActivityTimer       MakeMsg(clsInput, 5)
```

Comments

The input system maintains an "activity timer." Each time the input system has no events to process, the input system starts this timer. If no events are received before the timer expires, the input system puts PenPoint into Standby mode. This duration is typically several minutes long.

Long running background tasks should first send **msgInputActivityTimer** with **pArgs** of false to tell **theInputManager** to not turn off the machine. When the background operation is complete, the task should send the message again, but this time with a **pArgs** of true.

theInputManager keeps a nesting count which allows nested pairs of sends of this message.

INSERT.H

This file contains the API definition for **clsIP** (Insertion Pads).

clsIP inherits from **clsCustomLayout.**

Introduction

IPs provide a convenient and standard mechanism for getting handwritten input from a user. "IP" is an abbreviation for "Insertion Pad."

IPs support several different visual styles -- character boxes, ruled lines, or blank writing areas and different optional behaviors. IPs use a translator to recognize handwriting if necessary.

Typical Uses and Settings

This section describes the most common uses and settings for the various types of IPs.

Character Box IPs:

- Their new.ip.style.**displayType** is **ipsCharBox.**
- Character Box IPs are typically used to edit or insert simple strings of text such as a person's name or a document name.

Ruled Line IPs:

- Their new.ip.style.**displayType** is **ipsRuledLines.**
- Ruled Line IPs are typically used when the handwriting preference is Ruled.
- When the preference is Ruled/Boxed, then the IP's style.**ruledToBoxed** and style.**boxedToRuled** fields are used to control the transmogrification between styles. It is the responsibility of the IP user to examine the preferences and determine if these fields should be set.

Blank IPs:

- Blank IPs are typically used to collect and display simple scribbles (perhaps a signature).
- Their new.ip.style.**displayType** is **ipsBlank.** Their new.ip.style.**buttonType** is typically **ipsNoButton,** as they never do translation.
- They do not display ruled lines in the **sPaper** created by default, nor do they allow scribble editing (see spaper.h).
- They turn off borders when printing, allowing them to be robustly embedded inside a document.

Quick Start

A typical IP client does the following:

- The client creates an IP in one of three styles described above.
- The client then adds itself as an observer of the IP and handles **msgIPDataAvailable.**

- The **msgIPDataAvailable** handler uses **msgIPGetXlateString** to extract the string and then processes the string in some application specific manner.

The client should also handle either **msgIPCancelled** or **msgFreePending** so that the client can free any allocated data when the IP is destroyed.

IP Components

An IP is constructed from several pieces. Most clients and subclasses don't need to know anything about these details, but advanced clients and subclasses might.

The main writing area of an IP is either a field or an **sPaper**. An **ipsCharBox** IP contains a field (an instance of **clsField**); **ipsRuledLines** IP's contain **sPaper**, as do **ipsBlank/ipsSignature**. IP's which have style.**ruledToBoxed** or style.**boxedToRuled** set switch between a field and an **sPaper**. The IP is an observer of the **sPaper** or field. The **sPaper** or field has an associated translator.

If style.**buttonType** is **ipsBottomButtons** or **ipsTopButtons**, then the IP also contains a command bar with three buttons. The IP is the client of all of the buttons in the command bar.

Technically clients and subclasses can modify these components directly, but this is not recommended. If these components are modified directly, extreme care must be taken -- current and future implementations of IP may make assumptions which can be violated by making some types of changes to the components.

Client and Observers

There are two different paths for objects to receive "notification" messages from an IP.

If an IP's client is non-null, then the IP sends the following messages to the IP's client. If the client is null, then the IP sends the messages to the IP's observers. Self is the value of **pArgs** for all of these messages.

- msgIPCancelled
- msgIPClear
- msgIPDataAvailable
- msgIPCopied
- msgIPTransmogrified

IPs and Translators

The **sPaper** or field component of an IP (whichever exists) has a translator which performs handwriting recognition.

The creator of the IP may specify this translator in two ways:

- A translator object may be passed to **msgNew**. Do this by setting new.ip.style.**xlateType** to **ipXlateObject** and new.ip.xlate.translator to the translator object's uid.
- An (optionally null) translation template may be passed to **msgNew**. Do this by setting new.ip.style.**xlateType** to **ipXlateTemplate** and new.ip.xlate.**pTemplate** to the address of the template. If the template is non-null, the IP compiles the template. Then the IP creates a translator (of **clsXText**; see xtext.h). This translator is created with the passed-in template if the template is non-null.

An IP with style.**charOnly** sets the translator to recognize single characters.

The translation information (the translator object and the digested template) are destroyed when the IP handles **msgFree**.

See **msgIPSetTranslator** for additional information.

IP Destruction

As a convenience, an IP will optionally self destruct after providing its data or if the IP is cancelled. To get this behavior, set the IP's style.**freeAfter** to true.

The automatic destruction occurs during an IP's default response to the following messages:

- msgIPGetXlateData
- msgIPGetXlateString
- msgIPCancelled

Transmogrification

One of PenPoint's standard handwriting styles is called Ruled and Boxed.

When writing in this style, the following steps are taken: (1) the user writes into a ruled line (**sPaper**) IP and hits OK. (2) the handwriting is translated. (3) the ruled writing area is replaced by a combed field. (4) the user makes any corrections in the field and presses OK again. (5) the data is made available to the application and (6) either the IP is destroyed or the combed field is replaced with a ruled line **sPaper** ready for additional input.

The term "Transmogrification" describes the switching of writing area types and the moving of the data from the ruled lines to the field.

This transmogrification can happen in response to several messages, including **msgIPClear**, **msgIPGetXlateData** and **msgIPXlateCompleted**.

During transmogrification, the IP's style.**displayType** is changed. Also, the unnecessary components are destroyed and new ones created. The translator associated with the **sPaper** or field (whichever exists) is moved to the newly created **sPaper** or field (whichever didn't exist).

The **ruledToBoxed** and **boxedToRuled** fields in an IP's style determine when transmogrification happens:

ruledToBoxed

- If style.**ruledToBoxed** is true, then a **ipsRuledLines** IP transmogrifies into a **ipsCharBox** IP when translation occurs.
- Clients typically set style.**ruledToBoxed** to true if the **prInputPadStyle** preference is RuledAndBoxed.

boxedToRuled

- If style.**boxedToRuled** is true, then a **ipsCharBox** IPs transmogrifies into a **ipsRuledLines** IP when data is retrieved via **msgIPGetXlateData** or **msgIPGetXlateString**.
- Clients typically set style.**boxedToRuled** to true only if (1) the **prInputPadStyle** preference is RuledAndBoxed and (2) the IP is to be used multiple times before it is freed.

IPs and Preferences

This section describes the preferences that an IP considers and when it considers them. It also describes the preferences a client might consider when determining an IP's style. (See prefs.h for general information on preferences.)

When handling **msgNew**, **msgIPSetStyle**, and when transmogrifying, an IP uses the user's preferred value for Character Box Height, Character Box Width and Line Height. The IP does NOT observe these preferences so changes in their value won't affect an existing IP unless its style changes or the IP is transmogrified.

Clients may want to consider the following preferences when managing an IP and its translator. (A client may want to only check the preference when creating the IP. Alternatively, a client may want to observe **theSystemPreferences** and respond to changes.) Note that this is only one possibility -- many clients will (correctly) chose to ignore the preferences or map from the preferences to IP characteristics differently.

prInputPadStyle:

- If this is **prInputPadStyleRuledAndBoxed**, the client would set an IP's style.**displayType** to **ipsRuledLines** and style.**ruledToBoxed** to true and possibly style.**boxedToRuled** to true. This causes an IP to transmogrify between **ipsRuledLines** and **ipsCharBox** display types. (See the section "Transmogrification" for details.)
- If this is **prInputPadStyleRuled**, the client would set an IP's style.**displayType** to **ipsRuledLines** and style.**ruledToBoxed** and style.**boxedToRuled** to false.
- If this is **prInputPadStyleBoxed**, the client would set an IP's style.**diplayType** to **ipsCharBox** and style.**boxedToRuled** and style.**ruledToBoxed** to false.

prWritingStyle:

- Clients may want to let this preference affect the translation information they send with **msgNew** or the translator set with **msgIPSetTranslator**.

Single Character IPs

clsIP has specific support for single character IPs. Setting style.**charOnly** to true enables this support. Usually if **charOnly** is true, then style.**buttonType** is **ipsProxButton**, style.**takeGrab** is true, and the client floats the IP rather than embedding it.

Setting **charOnly** to true causes the IP to automatically set the number of rows and columns to 1. It also prepares the translator to expect only a single character.

Debugging Flags

IP's debugging flag set is 'h.' Defined flags are:

0001 Show general information about IP operations.

0002 Show information about IP translation operations.

0004 Show information about IP layout and size operations.

```
#ifndef INSERT_INCLUDED
#define INSERT_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
```

```
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef WIN_INCLUDED
#include <win.h>
#endif
#ifndef CLAYOUT_INCLUDED
#include <clayout.h>
#endif
// Next Up: 25  Recycled:   1, 2, 11, 12, 13
```

Common #defines and typedefs

```
typedef OBJECT IP;
```


Display Types

Use one of these values in an IP's style.**displayType**. This field defines the type of the IP.

See the section "Typical Uses and Settings" for more information.

```
#define ipsRuledLines       0   // standard ruled lines;  contains sPaper
#define ipsCharBox          1   // character box editing;  contains field
#define ipsBlank            3   // signature pad;  contains sPaper
#define ipsSignature        3   // same as ipsBlank
#define ipsCharBoxButtons   4   // Obsolete
```

ipsEditBox Obsolete

Translator types

Use one of these values in an IP's style.**xlateType**. This field defines whether new.ip.xlate contains a template or a translator object. See the section "IPs and Translators" for more information.

```
#define ipXlateObject       0   // pNew->xlate.translator is a translator
#define ipXlateTemplate     1   // pNew->xlate.pTemplate is an &XTEMPLATE
```

Space Collapse Rules

Use one of these values in an IP's style.**spaceCollapse**. For **ipsCharBox** IPs, this field defines how spaces are treated in text strings retrieved from an IP via **msgIPGetXlateData** or **msgIPGetXlateString**.

ipsSpaceSpace causes multiple spaces at the end of a line to be replaced with a single space. **ipsSpaceNewLine** causes an entire line's worth of spaces to be replaced with a single newline character. **ipsSpaceAsIs** causes spaces to be returned literally.

```
#define ipsSpaceAsIs    0   // WYSIWYG
#define ipsSpaceSpace   1   // Multiple spaces at end of line become 1 space
#define ipsSpaceNewLine 2   // Single line of spaces becomes a newline
```

Button Types

Use one of these values in an IP's style.**buttonType**. This field defines the type of buttons an IP contains.

ipsNoButton is typically used with **displayType** of **ipsBlank**. **ipsProxButton** is valid only with **ipsRuledLines**. This value cause translation to occur on out of proximity events. **ipsBottomButtons** and

ipsTopButtons create a command bar at the top or bottom containing an OK, Cancel, and Clear Button.

```
#define ipsNoButton          0   // No button
#define ipsProxButton        3   // Proximity translation for ipsRuledLines
#define ipsBottomButtons     6   // Command bar buttons on bottom
#define ipsTopButtons        7   // Command bar buttons on top
```

Modality Behavior

Use one of these values in an IP's style.modal. When style.**takeGrab** is true, style.modal defines the result of a pen tap outside of the IP. The term **takeGrab** is somewhat misleading. The IP actually creates a modal filter to handle input.

```
#define ipsNoMode            0   // Nothing happens on pen tap outside
#define ipsTranslateMode     1   // Translation happens on pen tap outside
#define ipsCancelMode        2   // Cancel happens if pen tap outside
```

IP Style

```
typedef struct IP_STYLE {
    U16 displayType:    3,  // display type
        buttonType:     3,  // button type
        freeAfter:      1,  // See the section "IP Destruction."
        clientReplace:  1,  // Unused
        xlateType:      1,  // See the section "IPs and Translators."
                            // Describes what pNew->ip.xlate contains.
        charOnly:       1,  // See the section "Single Character IPs."
        modal:          2,  // If style.takeGrab is true, describes modal
                            // IP's behavior.
        takeGrab:       1,  // Makes the IP modal. Modal behavior is
                            // defined by style.modal.
        reserved1:      1,  // Reserved
        takeFocus:      1,  // IP becomes the input target when created.
        delayed:        1;  // For ipsCharBox IPs, turns on the field
                            // component's delayed behavior.
    U16 spaceCollapse:  3,  // Rule for collapsing spaces when
                            // extracting information from ipsCharBox IP.
        embeddedLook:   1,  // Set to true to look good when embedded;
                            // false to look good when floating. Affects
                            // an IP's handling of msgNew and msgIPSetStyle.
        reserved2:      1,  // Reserved
        ruledToBoxed:   1,  // See the "Transmogrification" and "IPs and
                            // Preferences" sections.
        boxedToRuled:   1,  // See the "Transmogrification" and "IPs and
                            // Preferences" sections.
        clientIsThisApp:1,  // Private
        reserved:       8;  // Reserved
} IP_STYLE, *P_IP_STYLE;
```

Component Tags

The components of an IP have the following window tags. See the section "IP Components" for more information.

```
#define tagIPSPaper          MakeTag(clsIP, 1)   // ipsRuledLines and ipsBlank
                                                 // IP's sPaper
#define tagIPField           MakeTag(clsIP, 2)   // ipsCharBox IP's field
#define tagIPButton          MakeTag(clsIP, 3)   // "OK" button
#define tagIPButtonClear     MakeTag(clsIP, 4)   // "Clear" button
#define tagIPButtonCancel    MakeTag(clsIP, 5)   // "Cancel" button
#define tagIPCommandBar      MakeTag(clsIP, 6)   // command bar
```

Quick Help Tags

In most cases an IP component's window tag and quick help are identical. But **tagIPSignatureSPaper** is the quick help tag for **ipsBlank** IP's **sPaper** and **tagIPSingleChar** is the quick help tag of an IP with style.**charOnly** true.

```
#define tagIPSignatureSPaper    MakeTag(clsIP, 7)
#define tagIPSingleChar         MakeTag(clsIP, 8)
```

Messages

```
#ifndef NO_NEW
#ifndef ipNewFields
```

msgNew

Creates a new IP.

Takes IP_NEW, returns STATUS.

```
//
// Translation information. Notice that this is a union type. See the
// section "IPs and Translators" for more information.
//
```

Arguments

```
typedef union IP_XLATE {
    OBJECT      translator;     // xlateType = 0, clsXlate object
    P_UNKNOWN   pTemplate;      // xlateType = 1, P_XTEMPLATE
} IP_XLATE, *P_IP_XLATE;
typedef struct IP_NEW_ONLY {
    IP_STYLE    style;      // IP style
    IP_XLATE    xlate;      // See the section "IPs and Translators."
                            // Translation information for the IP.
    U16         lineHeight; // Unused
    OBJECT      client;     // Client for notification messages.
                            // See the section "Client and Observers."
    P_CHAR      pString;    // Initial string for ipsCharBox IP's field.
    U8          rows,cols;  // Number of rows and cols in IP. Can
                            // be zero if shrinkWrap is on.
    U16         lines;      // Unused
    U16         xIndex;     // Unused
    U32         reserved1;
    U16         maxLen;     // Max string length IP can return.
                            // 0 means no limit.
    U32         reserved;
} IP_NEW_ONLY, *P_IP_NEW_ONLY;
#define ipNewFields         \
    customLayoutNewFields   \
    IP_NEW_ONLY ip;
typedef struct IP_NEW {
    ipNewFields
} IP_NEW, *P_IP_NEW;
#endif // ipNewFields
#endif // NO_NEW
```

Comments

In response to **msgNew**, **clsIP** creates the necessary components for the IP. This may include an instance of **clsField**, **clsSPaper**, or **clsCommandBar**. The various components are initialized according to the new.ip.style settings.

The internal **sPaper** or field requires a translator. If **xlateType** is **ipXlateObject**, **pNew->**ip.xlate.translator is used as the translator object. If **xlateType** is **ipXlateTemplate**, then

pNew->ip.xlate.**pTemplate** is compiled and allocated at **msgNew**, and freed when the component is destroyed. See the section "IPs and Translators" for more information.

border.style.**bottomMargin** is always **bsMarginMedium**.

Finally, based on **embeddedLook**, **msgNew** changes the border style of the IP and the border and margin styles of the internal components to make the IP look good when embedded (**embeddedLook** true) or when floating (**embeddedLook** false).

Defaults changed if **embeddedLook** is false:

```
border.style.borderInk = bsInkGray66;
border.style.leftMargin = bsMarginMedium;
border.style.rightMargin = bsMarginMedium;
border.style.topMargin = bsMarginMedium;
border.style.backgroundInk = bsInkGray33;
border.style.shadow = bsShadowThickGray;
win.flags.style |= wsSaveUnder;
```

Defaults changed if **embeddedLook** is true:

```
border.style.borderInk = bsInkGray33;
border.style.leftMargin = bsMarginNone;
border.style.rightMargin = bsMarginNone;
border.style.topMargin = bsMarginNone;
border.style.backgroundInk = bsInkWhite;
border.style.shadow = bsShadowThickWhite;
win.flags.style &= ~wsSaveUnder;
```

msgNewDefaults

Initializes the IP_NEW structure to default values.

Takes P_IP_NEW, returns STATUS.

Message Arguments

```
typedef struct IP_NEW {
    ipNewFields
} IP_NEW, *P_IP_NEW;
```

Comments

When handling **msgNew**, certain border.style values are changed depending on the value of ip.**embeddedLook**. See **msgNew** for details.

Zeros out **pNew**->ip and sets:

```
ip.style.displayType = ipsRuledLines;
ip.style.buttonType = ipsBottomButtons;
ip.style.modal = ipsNoMode;
ip.style.delayed = true;
ip.maxLen = maxU16;

border.style.edge = bsEdgeAll;
border.style.resize = bsResizeCorner;
border.style.drag = bsDragDown;
border.style.top = bsTopDrag;

customLayout.style.limitToRootWin = true;
win.flags.input |=
        (inputTip | inputChar | inputMultiChar | inputAutoTerm | \
        inputInProx | inputEnter | inputMoveUp | inputMoveDelta);
win.flags.style |= wsSendGeometry;
embeddedWin.style.moveable = false;
embeddedWin.style.copyable = false;
```

msgIPGetStyle

Passes back the style of the IP.

Takes P_IP_STYLE, returns STATUS.

```
#define msgIPGetStyle           MakeMsg(clsIP, 5)
```

Message Arguments

```
typedef struct IP_STYLE {
    U16 displayType:    3,  // display type
        buttonType:     3,  // button type
        freeAfter:      1,  // See the section "IP Destruction."
        clientReplace:  1,  // Unused
        xlateType:      1,  // See the section "IPs and Translators."
                            // Describes what pNew->ip.xlate contains.
        charOnly:       1,  // See the section "Single Character IPs."
        modal:          2,  // If style.takeGrab is true, describes modal
                            // IP's behavior.
        takeGrab:       1,  // Makes the IP modal. Modal behavior is
                            // defined by style.modal.
        reserved1:      1,  // Reserved
        takeFocus:      1,  // IP becomes the input target when created.
        delayed:        1;  // For ipsCharBox IPs, turns on the field
                            // component's delayed behavior.
    U16 spaceCollapse:  3,  // Rule for collapsing spaces when
                            // extracting information from ipsCharBox IP.
        embeddedLook:   1,  // Set to true to look good when embedded;
                            // false to look good when floating. Affects
                            // an IP's handling of msgNew and msgIPSetStyle.
        reserved2:      1,  // Reserved
        ruledToBoxed:   1,  // See the "Transmogrification" and "IPs and
                            // Preferences" sections.
        boxedToRuled:   1,  // See the "Transmogrification" and "IPs and
                            // Preferences" sections.
        clientIsThisApp:1,  // Private
        reserved:       8;  // Reserved
} IP_STYLE, *P_IP_STYLE;
```

msgIPSetStyle

Changes the style of the IP.

Takes P_IP_STYLE, returns STATUS.

```
#define msgIPSetStyle           MakeMsg(clsIP, 6)
```

Message Arguments

```
typedef struct IP_STYLE {
    U16 displayType:    3,  // display type
        buttonType:     3,  // button type
        freeAfter:      1,  // See the section "IP Destruction."
        clientReplace:  1,  // Unused
        xlateType:      1,  // See the section "IPs and Translators."
                            // Describes what pNew->ip.xlate contains.
        charOnly:       1,  // See the section "Single Character IPs."
        modal:          2,  // If style.takeGrab is true, describes modal
                            // IP's behavior.
        takeGrab:       1,  // Makes the IP modal. Modal behavior is
                            // defined by style.modal.
        reserved1:      1,  // Reserved
        takeFocus:      1,  // IP becomes the input target when created.
        delayed:        1;  // For ipsCharBox IPs, turns on the field
                            // component's delayed behavior.
    U16 spaceCollapse:  3,  // Rule for collapsing spaces when
                            // extracting information from ipsCharBox IP.
        embeddedLook:   1,  // Set to true to look good when embedded;
```

```
                                // false to look good when floating. Affects
                                // an IP's handling of msgNew and msgIPSetStyle.
        reserved2:          1,  // Reserved
        ruledToBoxed:       1,  // See the "Transmogrification" and "IPs and
                                // Preferences" sections.
        boxedToRuled:       1,  // See the "Transmogrification" and "IPs and
                                // Preferences" sections.
        clientIsThisApp:1,      // Private
        reserved:           8;  // Reserved
} IP_STYLE, *P_IP_STYLE;
```

Comments

Clients use this message to change the style settings of an IP. Also, an IP self sends this message to perform transmogrification.

In response to this message, an IP destroys obsolete components and creates new necessary ones. For example, changing from **ipsCharBox** to **ipsRuledLines** destroys the field component and creates an **sPaper** component.

If an **sPaper** is being destroyed and a field being created, or vice versa, the IP extracts the translator information from the component about to be destroyed and moves it into the newly created one.

This message dirties the layout the IP.

This method does not change the IP's **embeddedLook**, **xlateType**, **takeGrab**, or **takeFocus**.

msgIPGetTranslator

Passes back the translator for the IP.

Takes P_OBJECT, returns STATUS.

```
#define msgIPGetTranslator      MakeMsg(clsIP, 7)
```

Comments

Passes back the translator for the IP, regardless of how it was created. An **ipsBlank** or **ipsRuledLines** IP passes back the translator used by the **sPaper** component. An **ipsCharBox** IP passes back the translator used by the field component.

See the section "IPs and Translators" for more information.

msgIPSetTranslator

Sets the translator for the IP.

Takes P_OBJECT, returns STATUS.

```
#define msgIPSetTranslator      MakeMsg(clsIP, 20)
```

Comments

Use this message to set an IP's translator.

In response to this message, a **ipsCharBox** IP sets its field's translator. Other IPs sets their **sPaper**'s translator. All IPs change their style.**xlateType** to **ipXlateObject**.

IMPORTANT: An IP does NOT free the current translation information in response to this message. The client must free this translation information. See the section "IPs and Translators" for more information.

msgIPGetClient

Passes back the IP's client object in *pArgs.

Takes P_OBJECT, returns STATUS.

```
#define msgIPGetClient          MakeMsg(clsIP, 14)
```

Comments See the section "Client and Observers" for more information.

See Also **msgIPSetClient**

msgIPSetClient

Makes **pArgs** the IP's client.

Takes P_OBJECT, returns STATUS.

```
#define msgIPSetClient          MakeMsg(clsIP, 15)
```

Comments See the section "Client and Observers" for more information.

See Also **msgIPGetClient**

msgIPSetString

Sets a **ipsCharBox** IP's string.

Takes P_CHAR, returns STATUS.

```
#define msgIPSetString          MakeMsg(clsIP, 10)
```

Comments Use this message to initialize or change the contents of a **ipsCharBox** IP.

For **ipsCharBox** IPs, the default response to this message is to set the field component's string and to re-layout the IP. For other types of IPs, the default response is to return **stsOK**.

See the section "IP Components" for more information.

msgIPTranslate

Translates scribbles in an IP.

Takes nothing, returns STATUS.

```
#define msgIPTranslate          MakeMsg(clsIP, 3)
```

Comments When pressed, the "OK" button of an IP's command bar sends this message to the IP. Also, a client can send this message to cause an IP to translate any scribbles. An IP also self sends this message (1) in response to **msgGWinForwardedKey** and (2) when a modal IP terminates the mode (style.**takeGrab** is true, style.modal is **ipsTranslateMode**, and the pen taps outside of the IP).

The IP's response to this message is as follows.

- ipsRuledLines and **ipsBlank** IPs send **msgSPaperComplete** to the IP's **sPaper** component. (The **sPaper** in turn sends **msgSPaperXlateCompleted** back to the IP; see the comments on **msgSPaperXlateCompleted** for IP's response.)
- ipsCharBox IPs with style.delayed false self send **msgIPDataAvailable**.
- ipsCharBox IPs with style.delayed true and untranslated scribbles in the field first translate the scribbles and then self send **msgIPCopied**.
- ipsCharBox IPs with style.delayed true and no untranslated scribbles in the field self send **msgIPDataAvailable**.

pArgs must be 0.

See Also **msgSPaperXlateCompleted**

msgIPCancelled

Cancels an IP. Also sent to notify observer/client about the cancel.

Takes OBJECT, returns STATUS.

```
#define msgIPCancelled          MakeMsg(clsIP, 18)
```

Comments

When pressed, the "Cancel" button of an IP's command bar sends this message to the IP. A client can also send this message to cause an IP to cancel itself. Also, **msgIPCancelled** is sent to an IP's observers/client to notify them about the cancelling.

msgIPCancelled is also self sent if a modal IP has a style.modal value of **ipsCancelMode** and the modal IP is terminated (probably by a pen tap outside the IP).

The IP's response to **msgIPCancelled** is a follows. First the IP clears the component (field or **sPaper**) of any data it contains. Next, if the IP's style.**freeAfter** is true, the IP extracts itself from the window hierarchy and posts **msgDestroy** to itself. Finally, it sends **msgIPCancelled** to observers/client to inform them of the cancellation.

See the sections "IP Destruction" and "Client and Observers" for additional information.

See Also

msgIPClear

msgIPClear

Clears an IP's contents. Also sent to notify observers/client about the clearing.

Takes OBJECT, returns STATUS.

```
#define msgIPClear              MakeMsg(clsIP, 23)
```

Comments

When pressed, the "Clear" button of an IP's command bar sends this message to the IP. A client can also send this message to cause an IP to clear its contents. Also, **msgIPClear** is sent to an IP's observers/client to notify them about the clearing.

An IP's response to **msgIPClear** is as follows. If the IP has an **sPaper** component (**ipsRuledLines** or **ipsBlank** IP), then **msgSPaperClear** is sent to the **sPaper**. If the IP has a field component, and style.**ruledToBoxed** is false, then **msgFieldClear** is sent to the field. If the IP has a field and style.**ruledToBoxed** is true, then the IP transmogrifies itself to have an **sPaper**. Finally, **msgIPClear** is sent to the IP's observers/client.

See the sections "IP Components," "Client and Observers" and "Transmogrification" for additional information.

See Also

msgIPCancelled (spaper.h)(field.h)

Observer/Client Messages

msgIPCopied

Notifies observer/client that newly translated data has been copied into a **ipsCharBox** IP's field.

Takes OBJECT, returns STATUS.

```
#define msgIPCopied             MakeMsg(clsIP, 19)
```

Comments

See the section "Client and Observers" for additional information.

msgIPDataAvailable

Notifies observers/client that the IP has translated data available.

Takes OBJECT, returns STATUS.

```
#define msgIPDataAvailable      MakeMsg(clsIP, 16)
```

Comments

Observers/clients can respond to this message by sending **msgIPGetXlateData** or **msgIPGetXlateString** to get the translated data.

See the section "Client and Observers" for additional information.

See Also

msgIPTranslate

msgIPTransmogrified

Notifies observers/client that the IP has been transmogrified.

Takes OBJECT, returns STATUS.

```
#define msgIPTransmogrified     MakeMsg(clsIP, 24)
```

Comments

See the sections "Transmogrification" and "Client and Observers" for additional information.

See Also

msgIPTranslate

Data Retrieval Messages

msgIPGetXlateData

Passes back translated data in xlist form.

Takes P_IP_XLATE_DATA, returns STATUS.

```
#define msgIPGetXlateData       MakeMsg(clsIP, 4)
```

Arguments

```
typedef struct IP_XLATE_DATA {
    OS_HEAP_ID heap;        // In:  heap for xlist allocation.
    P_UNKNOWN pXList;       // Out: pointer to resulting xlist.
} IP_XLATE_DATA, *P_IP_XLATE_DATA;
```

Comments

The default response to **msgIPGetXlateData** is as follows.

An xlist is created in **pArgs**->heap (or **osProcessHeapId** if **pArgs**->heap is null.) Then the xlist is filled in as follows.

- An **ipsCharBox** IP's xlist contains an **xtBounds** followed by an **xtText** element. The IP's field is cleared (using **msgFieldClear**; see field.h). (The bounds is artificially constructed.)
- An **ipsRuledLines** IP's xlist contains the xlist returned by sending **msgSPaperGetXlateData** (see spaper.h) to the **sPaper** component of the IP.
- This message should not be sent to a **ipsBlank** IP because no translation is ever performed by this type of IP.

If the IP's style.**freeAfter** is true, then the IP self destructs; see the section "IP Destruction" for details.

If self is a **ipsCharBox** IP and style.**boxedToRuled** is true, then the IP transmogrifies into a **ipsRuledLines** IP. See the "Transmogrification" section.

If self is a **ipsCharBox** IP, then the space collapse rules defined in style.**spaceCollapse** are applied to the **xtText** element in the xlist.

IMPORTANT: The sender of **msgIPGetXlateData** must free the returned xlist and elements in the xlist. (See xlist.h in general and XListFree() in particular.)

See Also **msgIPTransmogrified.h.h**

---

msgIPGetXlateString

Passes back translated data in string form.

Takes P_IP_STRING, returns STATUS.

Arguments

```
typedef struct IP_STRING {
    U16 len;            // In-Out: length of buffer pointed to by pString
    P_CHAR pString;     // In-Out: buffer pointer
} IP_STRING, *P_IP_STRING;
#define msgIPGetXlateString     MakeMsg(clsIP, 17)
```

Comments

In response to this message, an IP passes back its translated contents as a simple string form.

Clients should use this message rather **msgIPGetXlateData** if a simple string is needed. Clients should use **msgIPGetXlateData** if the additional information contained in an xlist is needed.

If **pArgs**->len is **maxU16**, the IP allocates the necessary string memory from the process heap. The sender of **msgIPGetXlateString** must free this memory.

The returned **pArgs**->pString is "clipped" to **pArgs**->maxLen. The actual number of characters returned is returned in **pArgs**->len.

Note: The handler of this message first self sends **msgIPGetXlateData** to get an xlist and then converts the data xlist to a string. See the comments regarding **msgIPGetXlateData** for information on the IP's self destruction and transmogrification.

See Also **msgIPGetXlateData**

Messages from Other Classes

---

msgFree

Defined in clsmgr.h.

Takes P_OBJ_KEY, returns STATUS.

Comments

The IP sends **msgFree** to its components. It then frees any translation information passed into **msgNew**.

See the section "IPs and Translators" for more information.

---

msgSave

Defined in clsmgr.h.

Takes P_OBJ_SAVE, returns STATUS.

Comments

The IP saves all necessary state and uses the window hierarchy filing mechanism to save any components.

If the IP's client is OSThisApp(), this is remembered. See **msgRestore** for more information.

msgRestore

Defined in clsmgr.h.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

clsIP restores self and uses the window hierarchy filing mechanism to restore any components. **clsIP** then re-establishes the necessary connections between self and each component.

If the IP's client was OSThisApp() when saved, then the IP's client becomes OSThisApp(); otherwise the client becomes to **objNull**.

See Also

win.h

msgSetOwner

Defined in clsmgr.h.

Takes P_OBJ_OWNER, returns STATUS.

Comments

An IP lets its superclasses respond to this message and then sends **msgSetOwner** to its components.

See the section "IP Components" for more information.

msgSPaperXlateCompleted

Defined in spaper.h.

Takes OBJECT, returns STATUS.

Comments

Only sophisticated subclasses might want to handle this message. An IP with an **sPaper** component (**ipsRuledLines** and **ipsBlank**) receives this message from the **sPaper** when the **sPaper** has completed translation.

If style.**ruledToBoxed** is false, this message simply self sends **msgIPDataAvailable**. Otherwise the IP tries to transmogrify itself, using the following steps:

- The translated string is extracted from the **sPaper** component.
- If the string is empty, the IP self sends **msgIPDataAvailable** and gives up the effort to transmogrify.
- The IP transmogrifies itself.

In both cases, the **sPaper** component (if it still exists) is cleared.

See the "Transmogrification" section.

See Also

msgIPTranslate

msgWinStartPage

Defined in win.h.

Takes nothing, returns STATUS.

Comments

Only sophisticated subclasses might want to handle this message. This message informs an IP that it exists on a printer and that printing is about to commence.

If the IP is not **ipsBlank**, an IP's default response is to return **stsOK**. Otherwise, the IP turns off all of its own margins and all of the borders and ruling lines for the **sPaper** component. This causes the IP to print only the scribbles, which is particularly appropriate when an IP has been used to capture and hold a signature.

msgGWinForwardedKey

Defined in gwin.h.

Takes P_INPUT_EVENT, returns STATUS.

Comments

Only sophisticated subclasses might want to handle this message. A child window may send this message when the child receives a keyboard input event that it doesn't want to handle.

If the key's **keyCode** is **uKeyReturn** (see key.h), the IP self sends **msgIPTranslate**. Otherwise it returns **stsRequestForward**.

Sent when a component (field) forwards a key. An IP containing a field component that forwards the Return key causes **msgIPTranslate** to be self sent, as if the "OK" button was pressed.

See Also

msgIPTranslate.h.h

msgInputTargetActivated

Defined in input.h.

Takes OBJECT, returns STATUS.

Comments

Only sophisticated subclasses might want to handle this message. The input system sends this message to an object to inform an object that it is no the input target.

In response to this message, an IP remembers the previous input target. If the IP is a **ipsCharBox** IP, it makes the IP's field the input target.

The IP restores the previous input target as part of its response to **msgWinExtracted**.

msgTrackProvideMetrics

Defined in track.h.

Takes P_TRACK_METRICS, returns STATUS.

Comments

Only sophisticated subclasses might want to handle this message.

clsIP is a descendant of **clsBorder**. Unless turned off by a subclass, an IP is resizeable by the user. When **clsBorder** creates a resize object and its associated tracker, it first self sends **msgTrackProvideMetrics** to allow itself to modify the parameters of the tracker.

In response to this message, an IP does the following:

- If the tracker is not a resizing tracker, the IP simply returns **stsOK**.
- The IP remembers the original client of the tracker so that the IP can forward tracker-related messages onto that original client. It then makes itself be the client of the tracker.
- If the IP has a command bar (style.**buttonType** is **ipsBottomButtons** or **ipsTopButtons**), then **pArgs**->style.draw is set to **tsDrawCmdBarRect** and **pArgs**->cmdBarH is set appropriately.
- The tracker's minimum size constraints are adjusted so that the IP can get no smaller than the scribbles that are in the IP's field or **sPaper**. This prevents scribbles from being covered.
- The IP the makes itself the client of the tracker so that the IP receives **msgTrackUpdate** and **msgTrackDone**.

See Also

msgTrackUpdate

msgTrackUpdate

Defined in track.h.

Takes P_TRACK_METRICS, returns STATUS.

Comments

Only sophisticated subclasses might want to handle this message.

The default response to this message is to forward the message to the tracker's original client, as remembered in **msgTrackProvideMetrics**.

See Also

msgTrackProvideMetrics

msgTrackDone

Defined in track.h.

Takes P_TRACK_METRICS, returns STATUS.

Comments

Only sophisticated subclasses might want to handle this message.

ipsBlank IPs can be resized to any size. Otherwise the default response to this message is to force the new size of the IP to fit nicely around whole rows and columns (in **ipsCharBox** IPs) or lines (in **ipsRuledLines** IPs). Then the message is forwarded to the tracker's original client, as remembered in **msgTrackProvideMetrics**.

See Also

msgTrackProvideMetrics

Obsolete

```
#define stsIPNotSupported   MakeStatus(clsIP, 1) // Obsolete
#define stsIPBadMode        MakeStatus(clsIP, 2) // Obsolete
```

KEY.H

This file contains the API definition for the keyboard driver.

clsKey inherits from **clsObject.**

The functions described in this file are contained in INPUT.LIB.

This file defines the data sent with keyboard event. Keyboard events are generated by both the real keyboard and the virtual keyboard.

Keyboard Events

When keyboard devices (physical or virtual) generate input events, the events are delivered via **msgInputEvent**. The following are the value of **pArgs**->devCode for **msgInputEvent**.

msgKeyDown sent when a key is depressed.

msgKeyUp sent when a key is released.

msgKeyChar contains an individual character code and is sent when a key is depressed.

msgKeyMulti contains multiple character codes that have accumulated since the last **msgKeyMulti** event was sent. This allows processing of multiple keys without the overhead of a separate message for each key. For all of these values, **pArgs**->eventData should be cast to P_KEY_DATA. (A **msgKeyMulti** event contains the same information as several **msgKeyChar** events.)

Input Flags

Keyboard events can be enabled or disabled using input flags. See input.h for more information. The relevant flags for keyboard events are:

```
input flag          enables
================    ======================
inputChar           msgKeyChar
inputMultiChar      msgKeyMulti
inputMakeBreak      msgKeyUp and msgKeyDown
```

Clients should still verify that the **devCode** is the particular message they are interested in.

Sample Code

You can verify that your **msgInputEvent** handler is handling a keyboard message by checking as follows:

```
if (ClsNum(pArgs->devCode) == ClsNum(clsKey)) {
    ...
}
```

You should further verify that the **devCode** is the particular message that you are interested in processing.

Once you've decided that you're looking at a key event, you can cast **pArgs**->eventData as follows:

```
P_KEY_DATA  pKeyData;
pKeyData = (P_KEY_DATA)(pArgs->eventData);
```

This example shows how you might handle **msgInputEvent** with a **devCode** of **msgKeyUp**, **msgKeyDown** or **msgKeyChar**:

```
for (i=0, i<pKeyData->repeatCount; i++) {
    HandleSingleKey(pKeyData->keyCode, pKeyData->shiftState);
}
```

This example shows how you might handle **msgInputEvent** with a **devCode** of **msgKeyMulti**:

```
P_KEY_MULTI pMulti = pKeyData->multi;
for (i=0, i<pKeyData->repeatCount; i++) {
    for (j=0; j<pMulti[i].repeatCount; j++) {
        HandleSingleKey(pMulti[i].keyCode, pKeyMulti[i].shiftState);
    }
}
```

```
#ifndef KEY_INCLUDED
#define KEY_INCLUDED

#ifndef GO_INCLUDED
#include <go.h>
#endif

#ifndef UID_INCLUDED
#include <uid.h>
#endif

#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif

#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
```

Keyboard Event Messages

```
#define msgKeyUp            MakeMsg(clsKey, 0)
#define msgKeyDown          MakeMsg(clsKey, 1)
#define msgKeyChar          MakeMsg(clsKey, 12)
#define msgKeyMulti         MakeMsg(clsKey, 13)
```

Common #defines and typedefs

Shift Flags

These are used in the **shiftState** field of KEY_MULTI and KEY_DATA. They indicate which modifier keys were down when the event was generated.

```
#define keyScrollLock       flag0
#define keyNumLock          flag1
#define keyCapsLock         flag2
#define keyShift            flag3
#define keyCtrl             flag4
#define keyAlt              flag5
#define keyLeftShift        flag6
#define keyRightShift       flag7
#define keyLeftCtrl         flag8
#define keyRightCtrl        flag9
#define keyLeftAlt          flag10
#define keyRightAlt         flag11
#define keyShiftLock        flag12
#define keyCtrlLock         flag13
#define keyAltLock          flag14
```

Key Codes

Special ASCII characters

```
#define uKeyBackSpace   0x08
#define uKeyTab         0x09
#define uKeyLineFeed    0x0a
#define uKeyReturn      0x0d
#define uKeyEscape      0x1b
```

Keys with no ASCII values; mapped into the user area of Unicode.

```
#define uKeyF1          0xf001
#define uKeyF2          0xf002
#define uKeyF3          0xf003
#define uKeyF4          0xf004
#define uKeyF5          0xf005
#define uKeyF6          0xf006
#define uKeyF7          0xf007
#define uKeyF8          0xf008
#define uKeyF9          0xf009
#define uKeyF10         0xf00a
#define uKeyF11         0xf00b
#define uKeyF12         0xf00c
#define uKeyInsert      0xf020
#define uKeyDelete      0xf021
#define uKeyHome        0xf022
#define uKeyEnd         0xf023
#define uKeyPageUp      0xf024
#define uKeyPageDown    0xf025
#define uKeyUp          0xf026
#define uKeyDown        0xf027
#define uKeyLeft        0xf028
#define uKeyRight       0xf029
#define uKeyCenter      0xf02a
#define uKeyPrintScreen 0xf02b
#define uKeyPause       0xf02c
#define uKeySysRq       0xf02d
#define uKeyBreak       0xf02e
#define uKeyBackTab     0xf02f
```

msgInputEvent Argument Types

KEY_MULTI holds the variable length data for **msgInputEvent** with a **devCode** of **msgKeyMulti**.

```
typedef struct KEY_MULTI {
    U16 keyCode;            // ASCII value
    U16 scanCode;           // keyboard scan code
    U16 shiftState;         // state of the shift, ctrl & alt keys
    U16 repeatCount;        // number of autorepeats to apply
    U8  reservedA[4];       // reserved for future use
} KEY_MULTI, *P_KEY_MULTI;
```

KEY_DATA is the "true" type of **msgInputEvent**'s **pArgs**->eventData for all keyboard event messages.

If **msgInputEvent**'s **pArgs**->devCode is **msgKeyMulti**, the **keyCode**, **scanCode** and **shiftState** fields of this struct are undefined. Each of these fields is defined in a KEY_MULTI struct.

```
typedef struct KEY_DATA {
    U16         keyCode;        // ASCII key translation
    U16         scanCode;       // keyboard scan code
    U16         shiftState;     // state of the shift, ctrl & alt keys
    U16         repeatCount;    // if not msgKeyMulti, the no. of identical
                                // keycodes received. If msgKeyMulti, the
                                // number of KEY_MULTI structs in multi.
    U8          reserved[24];
    KEY_MULTI   multi[1];       // if msgKeyMulti, an array of KEY_MULTIs
} KEY_DATA, *P_KEY_DATA;
```

KEYBOARD.H

Interface to the software keyboard class. Keyboards do NOT file.

clsKeyboard inherits from **clsKeyCap.**

Provides the standard keyboard look and interaction.

clsKeyboard inherits from **clsKeyCap** and provides keyboard-like

behavior. It directly supports the standard QWERTY keyboard and the PC 101 key keyboard layout and display. Other forms of keyboards can be generated by overriding the keycap layout table.

The make/break interface is implemented through a call-back procedure. This routine is setup in the new parameters and is called with the standard keyboard messages: **msgKeyMake**, **msgKeyBreak**, **msgKeyChar**, and **msgKeyMulti**.

The scan code mapping table is generally reusable for most keyboard layouts.

WARNING: These API's are not currently in a suitable state for developers.

```
#ifndef KEYBOARD_INCLUDED
#define KEYBOARD_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef KEY_INCLUDED
#include <key.h>
#endif
#ifndef KEYCAP_INCLUDED
#include <keycap.h>
#endif
#ifndef KEYSTATE_INCLUDED
#include <keystate.h>
#endif
```

Quick Help Ids

This is the quick help Id for keyboard objects.

```
#define tagKeyboard                MakeTag(clsKeyboard, 1)
```

Class Messages

msgNewDefaults

Initializes the default new arguments.

Takes P_KEYBOARD_NEW, returns STATUS.

Arguments

```
typedef struct KEYBOARD_NEW_ONLY {
    P_U16 pMap;                 // scan code to key map
    P_KEYSTATE_PROC pProc;      // proc for processing events
    P_UNKNOWN pUserData;        // user data for the proc
} KEYBOARD_NEW_ONLY, *P_KEYBOARD_NEW_ONLY;
#define keyboardNewFields           \
    keyCapNewFields                 \
    KEYBOARD_NEW_ONLY   keyboard;
typedef struct KEYBOARD_NEW {
    keyboardNewFields
} KEYBOARD_NEW, *P_KEYBOARD_NEW;
```

Comments

The default settings are:

pArgs->keyboard.pMap = PC 101 keyboard mapping

pArgs->keyboard.pProc = **pNull**;

pArgs->keyboard.pUserData = NULL;

msgNew

Creates a new keyboard object.

Takes P_KEYBOARD_NEW, returns STATUS.

Message Arguments

```
typedef struct KEYBOARD_NEW {
    keyboardNewFields
} KEYBOARD_NEW, *P_KEYBOARD_NEW;
```

msgKeyboardReturn

Handles completion of processing of a key event.

Takes P_KEYBOARD_RET, returns STATUS.

Arguments

```
typedef struct KEYBOARD_RET {
    MESSAGE msg;                // message
    P_KEY_DATA pKey;            // key information, see key.h
} KEYBOARD_RET, *P_KEYBOARD_RET;
#define msgKeyboardReturn       MakeMsg(clsKeyboard, 1)
```

Comments

This message is only needed by the virtual keyboard application.

Standard Keyboard Events

msgKeyMake

Self call & notification of make key.

Takes P_KEY_DATA, returns STATUS.

msgKeyBreak

Self call & notification of break key.

Takes P_KEY_DATA, returns STATUS.

msgKeyChar

Self call & notification of character event.

Takes P_KEY_DATA, returns STATUS.

msgKeyMulti

Self call & notification of multi-key event.

Takes P_KEY_DATA, returns STATUS.

KEYCAP.H

Interface for the KeyCap class.

clsKeyCap inherits from **clsWin.**

Provides an array of keycaps for keyboard emulations.

clsKeyCap inherits from **clsWin** which provides support for an array

of keyboard "caps" which can deliver a scan code and make/break events. Subclasses are expected to added the glyph which is displayed on the cap when the key is painted. This is accomplished by intercepting the self-call **msgKeyCapPaintCap**.

WARNING: These API's are not currently in a suitable state for developers.

```
#ifndef KEYCAP_INCLUDED
#define KEYCAP_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef WIN_INCLUDED
#include <win.h>
#endif
#define maxCaps  150                    // max for the KEYCAP_TABLE declaration
```

Cap Width Descriptors

A data table based mechanism is used to define the array of key caps. Each row is a fixed height (determined by dividing the window by the number of rows). Each cap can have one of five widths, small, medium, large, extra large and huge. A small cap is the basic unit of measure, all other cap sizes are multiples of this size. This size is determined by dividing the window width by the number of switch units. The cap sizes are: small = 1 unit, medium = 1.5 units, large = 2 units, extra large = 2.5 units, and huge = 7 units.

```
#define kcEND       (0x0000)        // end of row marker
#define kcS         (0x1000)        // small cap
#define kcM         (0x2000)        // medium cap
#define kcL         (0x3000)        // large cap
#define kcX         (0x4000)        // extra large cap
#define kcH         (0x5000)        // huge cap
typedef struct KEYCAP_TABLE {
    U16 rows;                       // number of rows
    U16 switches;                   // number of column units
    U16 capCodes[maxCaps];          // array of scan codes with
                                    //  cap width descriptor (high nibble)
                                    //  Each row must end with kcEnd and
                                    //  the table must end with two
                                    //  kcEnd tokens.
} KEYCAP_TABLE, *P_KEYCAP_TABLE;
```

Class Messages

msgNewDefaults

Initializes the new arguments.

Takes P_KEYCAP_NEW, returns STATUS.

Arguments

```
typedef struct KEYCAP_NEW_ONLY {
    P_KEYCAP_TABLE pTable;        // pointer to the keycap table
} KEYCAP_NEW_ONLY, *P_KEYCAP_NEW_ONLY;
#define keyCapNewFields          \
    OBJECT_NEW_ONLY object;      \
    WIN_NEW_ONLY    win;         \
    KEYCAP_NEW_ONLY keyCap;
typedef struct KEYCAP_NEW {
    keyCapNewFields
} KEYCAP_NEW, *P_KEYCAP_NEW;
```

Comments

The **pTable** field is initialized to **pNull** by default.

msgNew

Creates a new instance of the keycap object.

Takes P_KEYCAP_NEW, returns STATUS.

Message Arguments

```
typedef struct KEYCAP_NEW {
    keyCapNewFields
} KEYCAP_NEW, *P_KEYCAP_NEW;
```

Comments

If the **pTable** pointer is NULL, the standard QWERTY layout is used by default.

msgKeyCapPaintCap

Hook to allow painting on top of keycap.

Takes P_KEYCAP_INFO, returns STATUS.

Arguments

```
typedef struct KEYCAP_INFO {
    U16 scanCode;               // scan code for the keycap
    RECT32 rect;                // location of the keycap rect, LWC
    BOOLEAN hilite;             // TRUE for highlighted display
    OBJECT dc;                  // Drawing context
} KEYCAP_INFO, *P_KEYCAP_INFO;
#define msgKeyCapPaintCap       MakeMsg(clsKeyCap, 1)
```

Comments

This is the self-call hook which allows subclasses the ability to paint the glyph on the keycap. This call is made during the response to **msgWinRepaint** and is therefore already bracketed by **msgWinBeginRepaint**, **msgWinEndRepaint**.

msgKeyCapScan

Locates the keycap under a given x,y.

Takes P_KEYCAP_SCAN, returns STATUS.

Arguments

```
typedef struct KEYCAP_SCAN {
    XY32 xy;                // coordinates for search
    U16 scanCode;           // Out: scan code of keycap
    RECT32 rect;            // Out: keycap rect in LWC
} KEYCAP_SCAN, *P_KEYCAP_SCAN;
#define msgKeyCapScan           MakeMsg(clsKeyCap, 2)
```

Comments

This function returns the keycap which is under the Local Window Coordinates (LWC) xy.

msgKeyCapGetDc

Returns the DC used by the keycap.

Takes P_KEYCAP_GET_DC, returns STATUS.

Arguments

```
typedef struct KEYCAP_GET_DC {
    OBJECT dc;              // Out: keycap dc object
} KEYCAP_GET_DC, *P_KEYCAP_GET_DC;
#define msgKeyCapGetDc          MakeMsg(clsKeyCap, 3)
```

msgKeyCapRedisplay

Forces the display to be regenerated.

Takes nothing, returns STATUS.

```
#define msgKeyCapRedisplay      MakeMsg(clsKeyCap, 5)
```

msgKeyCapHilite

Hilites the key with the given scan code.

Takes P_KEYCAP_HILITE, returns STATUS.

Arguments

```
typedef struct KEYCAP_HILITE {
    U16 scan;                   // In: scan code to hilite
    BOOLEAN on;                 // In: true to display as hilite
} KEYCAP_HILITE, *P_KEYCAP_HILITE;
#define msgKeyCapHilite         MakeMsg(clsKeyCap, 6)
```

Comments

The key cap object tracks which keys (by scan code) are highlighted at any given time.

msgKeyCapMake

Subclass hook to indicate button press of keycap.

Takes P_KEYCAP_INFO, returns STATUS.

```
#define msgKeyCapMake           MakeMsg(clsKeyCap, 0x80)
```

Message Arguments

```
typedef struct KEYCAP_INFO {
    U16 scanCode;               // scan code for the keycap
    RECT32 rect;                // location of the keycap rect, LWC
    BOOLEAN hilite;             // TRUE for highlighted display
    OBJECT dc;                  // Drawing context
} KEYCAP_INFO, *P_KEYCAP_INFO;
```

Comments

This message is a self-call when the pen touches down on a keycap. Note that only one make/break event pair is generated for each **penDown**, **penUp** combination. Sliding off a key onto another is NOT considered a press on the new key.

msgKeyCapBreak

Subclass hook to indicate button release of keycap.

Takes P_KEYCAP_INFO, returns STATUS.

```
#define msgKeyCapBreak          MakeMsg(clsKeyCap, 0x81)
```

Message Arguments

```
typedef struct KEYCAP_INFO {
    U16 scanCode;               // scan code for the keycap
    RECT32 rect;                // location of the keycap rect, LWC
    BOOLEAN hilite;             // TRUE for highlighted display
    OBJECT dc;                  // Drawing context
} KEYCAP_INFO, *P_KEYCAP_INFO;
```

Comments

This message is a self-call when the pen is lifted up from the previous make event.

KEYSTATE.H

Interface for the hardware independent keyboard code interpreter

WARNING: These API calls are not currently in a state suitable for developer use.

```
#ifndef KEYSTATE_INCLUDED
#define KEYSTATE_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef KEY_INCLUDED
#include <key.h>
#endif
#define keyMultiMax      16  // max # multi-key buffered events
typedef void (PASCAL *P_KEYSTATE_PROC)(P_UNKNOWN, MESSAGE, P_KEY_DATA);
typedef struct KEYSTATE {       // keyboard decode state
    U16 state;                  // long-term state flags
    U16 lastScanned;            // last scan code processed
    U16 lastSent;               // last scan code sent
    U16 count;                  // count of repeated codes while on Hold
    S16 onHold;                 // number of character events to be processed
    S16 multi;                  // number of multi-char events   "
    P_U16 pMap;                 // pointer to the scan-to-char map
    S16 multiIndex;             // index into the multi-key array
    P_KEY_MULTI pBuffer;        // buffer for multi-key recording
    P_KEYSTATE_PROC pKeyEvent;  // proc. pointer for reporting keystate changes
    P_UNKNOWN pUserData;        // data for use by the user proc.
} KEYSTATE, *P_KEYSTATE;
```

KeyStateSetup

Initializes a state structure to quiesent values.

Returns nothing.

Function Prototype

```
void PASCAL KeyStateSetup(
    P_KEYSTATE pState
);
```

KeyStateProcess

Converts the scan code into the approriate action for shift keys and standard keys.

Returns nothing.

Function Prototype

```
void PASCAL KeyStateProcess(
    P_KEYSTATE pState,          // pointer to the keyboard state structure
    U16 scanCode                // scan code to process
);
```

KeyStateConvert

Converts a scan code to the appropriate character code, or sets up the appropriate shift state.

Returns nothing.

Function Prototype

```
void PASCAL KeyStateConvert(
    P_KEYSTATE pState,          // pointer to the keyboard state structure
    U16 scanCode,               // scan code to convert
    P_U16 pChar,                // character code
    P_U16 pDisplay              // display charactere code
);
```

KeyStateReturn

Process completion of the key event.

Returns nothing.

Function Prototype

```
void PASCAL KeyStateReturn(
    P_KEYSTATE pState,
    MESSAGE msg,
    P_KEY_DATA pKey
);
```

KeyStateFindScan

Returns the scan code for a shift state flag.

Returns nothing.

Arguments

```
typedef struct KEYSTATE_SCANS {
    U16 count;                  // In: max count, Out: actual count
    U16 scanCodes[4];           // can be variable number of entries
} KEYSTATE_SCANS, *P_KEYSTATE_SCANS;
```

Function Prototype

```
void PASCAL KeyStateFindScan(
    P_KEYSTATE pState,          // pointer to the keyboard state structure
    U16 state,                  // state flag for search
    P_KEYSTATE_SCANS pScanCode  // Out: scan code
);
```

KeyStateDisplay

Returns the set of display codes for the scan code.

Returns nothing.

Arguments

```
typedef struct KEYSTATE_CODES {
    U16 count;                  // In: max count, Out: actual count
    struct {
        U16 shift;
        U16 charCode;
    } data[4];                  // can be variable number of entries
} KEYSTATE_CODES, *P_KEYSTATE_CODES;
```

Function Prototype

```
void PASCAL KeyStateDisplay(
    P_KEYSTATE pState,          // pointer to the keyboard state structure
    U16 scanCode,               // scan code to be converted
    P_KEYSTATE_CODES pCodes     // Out: scan code
);
```

PEN.H

This file contains the API definition for the pen driver.

clsPen inherits from **clsObject.**

The functions described in this file are contained in INPUT.LIB.

This file contains information about pen-generated input events. See input.h for general information on PenPoint's input system and input events. You should probably read at least the "Road Map" section of input.h before trying to understand this file in detail.

Pen Events

When the pen generates input events, the events are delivered via **msgInputEvent**. The following values are the value of **pArgs**->devCode for **msgInputEvent**.

msgPenUp sent when the pen tip is lifted from the screen.

msgPenDown sent when the pen tip touches the screen.

msgPenMoveUp sent as the pen moves while above the screen and in proximity.

msgPenMoveDown sent as the pen moves while touching the screen.

msgPenEnterUp sent when the pen enters a window while above the screen and in proximity.

msgPenEnterDown sent when the pen enters into a window while touching the screen.

msgPenExitUp sent when the pen exits a window while above the screen and in proximity.

msgPenExitDown sent when the pen exits a window while touching the screen.

msgPenInProxUp sent when the pen comes into proximity. This message is also sent when certain timeouts occur; see the section "Proximity Timeout Events" for more information.

msgPenOutProxUp sent when the pen leaves proximity. This message is also sent when certain timeouts occur; see the section "Proximity Timeout Events" for more information.

msgPenStroke sent with the collected stroke data. See the "Stroke Events" section.

msgPenTap sent when taps are recognized by the driver. See the "Tap Events" section. The taps field of PEN_DATA contains the number of taps.

msgPenHoldTimeout sent after pen down and hold timeout. See the "Hold Timeout Events" section. The taps field of PEN_DATA contains the number of taps that occurred before the Hold.

[Terminology Note: the **msgPenInProxUp** and **msgPenOutProxUp** events can be thought of as **msgPenInProx** and **msgPenOutProx** since the pen tip is always up when these events are sent. The trailing "Up" is present for historical reasons only.]

Input Flags

Pen events can be screened out using input flags. See input.h for more information. The relevant flags for pen are:

input flag	enables	see section
inputTip	msgPenUp msgPenDown	
inputMoveUp	msgPenMoveUp	
inputMoveDown	msgPenMoveDown	
inputEnter	msgPenEnterUp msgPenEnterDown	
inputExit	msgPenExitUp msgPenExitDown	
inputInProx	msgPenInProxUp	
inputOutProx	msgPenOutProxUp	
inputStroke	msgPenStroke	
inputTap	msgPenTap	
inputHoldTimeout	msgPenHoldTimeout	"Hold Timeout Events"

Enter Exit Window Events

msgPenEnterUp, **msgPenEnterDown**, **msgPenExitUp** and **msgPenExitDown** are generated when the pen transits a window boundary. The window that the pen was previously in will receive **msgPenExitUp** or **msgPenExitDown** (if its input flags request them). The window that the pen is now in will receive **msgPenEnterUp** or **msgPenEnterDown** (if its input flags request them). Note that if the pen leaves proximity, the window will receive a **msgPenOutProxUp** and not **msgPenExitUp**. Similarly, if the pen enters proximity, the window will receive **msgPenInProxUp** and not **msgPenEnterUp**.

The timestamp, **strokeSeqNum** and **penXY** field of the PEN_DATA structure will be valid. All other fields will be 0.

Hold Timeout Events

msgPenHoldTimeout events are generated when the user puts the pen on the display and leaves it there for the "Hold" timeout duration. This message is also generated if the user taps 1 or more times before holding the pen down.

For example, **msgPenHoldTimeout** is the event that triggers PenPoint's move and copy, and is also used by some applications to trigger wipe-through area selection.

msgPenHoldTimeout events are sent if the window's input flags have the **inputHoldTimeout** flag set.

The **strokeSeqNum** field of the PEN_DATA structure will be the sequence number of the most recent pen down. The **penXY** field of the PEN_DATA structure will be the pen device coordinates of the first pen down.

will be valid. All other fields will be 0.

Proximity Timeout Events

The input system also has a proximity-related timeout. These are used if the user lifts the pen off the display but leaves the pen in proximity.

This timer is typically used to trigger translation because some users don't lift their pen tips out of proximity but still want translation to occur.

If this timer expires with the pen still in proximity, the input system sends **msgPenOutProxUp**, followed by **msgPenInProxUp**. In other words, the input system generates events to make it look like the user temporarily lifted the pen out of proximity.

[Note: the obsolete messages **msgPenTimeout** and **msgPenHWTimeout** are not sent.]

Stroke Events

Each time the pen goes down, moves, and comes up, the input system generates **msgInputEvent** with a **pArgs**->devCode of **msgPenStroke**. The **pArgs** also includes a compressed representation of the stroke.

One way to think about a stroke event is as a "summary" or "reprise" of **msgPenDown**, zero or more **msgPenMoveDowns**, and a **msgPenUp**.

Stroke events are delivered to the window in which the stroke started (if that window has the input flag **inputStroke** flag set), even if the stroke crosses that window's boundaries.

Stroke events are generated in addition to the other, lower level, messages that occur as the stroke event is being accumulated. Typical clients either handle **msgPenStroke** or the lower-level messages (**msgPenDown**, **msgPenMoveDown**, **msgPenUp**), but NOT both.

The input system assigns a sequence number to each stroke. Each pen event contains the stroke number that the event is a part of. This number is found in the "strokeSeqNum" field of PEN_DATA.

See the "Sample Code" section for an example of how to extract stroke information from the **pArgs** of a stroke event.

Tap Events

A **msgPenTap** is generated if there is a **msgPenDown** followed by a **msgPenUp** and (1) any pen motion between the Down and Up is below some threshold and (2) the Down and Up happen within a certain time interval and (3) the Down and Up occur over the same window and (4) no other input event (excepting an optional Out of Proximity) event happens within a certain time threshold of the Up.

msgPenTap is sent if the input flag **inputTap** is set.

If the pen is "tapped" repeatedly, a single **msgPenTap** is sent and the taps field of PEN_DATA contains the number of pen taps.

The **strokeSeqNum** field of the PEN_DATA structure will be the sequence number of the most recent pen down. The **penXY** field of the PEN_DATA structure will be the pen device coordinates of the first pen down.

Typical Sequences of Events

This sections illustrates some typical sequences of pen events. It does not include tap, timeout and stroke events. It also does not show forwarding up the window parent chain.

This table contains the flow of events if the pen comes down, moves around, and comes back up, all within a single window.

```
quantity    event
=========   ===============
1           msgPenInProxUp
0 or more   msgPenMoveUp
1           msgPenDown
0 or more   msgPenMoveDown
1           msgPenUp
0 or more   msgPenMoveUp
1           msgPenOutProxUp
```

This sequence is complicated if the pen crosses a window boundary while moving. When this happens, the input system generates Enter and Exit events to notify the windows being entered and exited. In the following example, assume that the window hierarchy isn't changing and that the pen crosses a window boundary between windows A and B while the pen is down.

```
quantity   events seen by A   events seen by B
=========   ================   ================
1           msgPenInProxUp
0 or more   msgPenMoveUp
1           msgPenDown
0 or more   msgPenMoveDown
1           msgPenExitDown
1                              msgPenEnterDown
1                              msgPenUp
0 or more                      msgPenMoveUp
1                              msgPenOutProxUp
```

If the pen goes down in window A and in response window A "pops up" a window B right where the pen is, and the user lifts the pen, the following sequence occurs:

```
quantity    events seen by A   events seen by B
=========   ================   ================
1           msgPenInProxUp
0 or more   msgPenMoveUp
1           msgPenDown
1           msgPenExitDown
1                              msgPenEnterDown
1                              msgPenUp
0 or more                      msgPenMoveUp
1                              msgPenOutProxUp
```

Sample Code

You can verify that your **msgInputEvent** handler is handling a pen message by checking as follows:

```
if (ClsNum(pArgs->devCode) == ClsNum(clsPen)) {
```

Once you've decided that you're looking at a pen event, you can cast **pArgs**->eventData as follows:

```
P_PEN_DATA  pPenData;
pPenData = (P_PEN_DATA)(pArgs->eventData);
```

If **pArgs**->devCode is **msgPenStroke**, you can get a pointer to the stroke data as follows:

```
P_PEN_STROKE    pStroke;
pStroke = (P_PEN_STROKE)((P_PEN_DATA)(pArgs->eventData))->data;
```

```
#ifndef PEN_INCLUDED
#define PEN_INCLUDED

#ifndef GO_INCLUDED
#include <go.h>
#endif

#ifndef GEO_INCLUDED
#include <geo.h>
#endif

#ifndef INPUT_INCLUDED
#include <input.h>
#endif
```

Pen Event Messages

```
#define msgPenUp            MakeMsg(clsPen, eventTipUp)
#define msgPenDown          MakeMsg(clsPen, eventTipDown)
#define msgPenMoveUp        MakeMsg(clsPen, eventMoveUp)
#define msgPenMoveDown      MakeMsg(clsPen, eventMoveDown)
#define msgPenEnterUp       MakeMsg(clsPen, eventEnterUp)
#define msgPenEnterDown     MakeMsg(clsPen, eventEnterDown)
#define msgPenExitUp        MakeMsg(clsPen, eventExitUp)
#define msgPenExitDown      MakeMsg(clsPen, eventExitDown)
#define msgPenInProxUp      MakeMsg(clsPen, eventInProxUp)
#define msgPenOutProxUp     MakeMsg(clsPen, eventOutProxUp)
#define msgPenStroke        MakeMsg(clsPen, eventStroke)
#define msgPenTap           MakeMsg(clsPen, eventTap)
#define msgPenHoldTimeout   MakeMsg(clsPen, eventHoldTimeout)
```

Common #defines and typedefs

All pen events report coordinates in standard pen resolution, which units of 0.1 mm.

```
#define penStdResolution    10000   //  lines per meter
```

Possible states of the pen tip.

```
typedef U16 PEN_TIP_STATE_FLAGS, *P_PEN_TIP_STATE_FLAGS;
#define penOutOfProximity   0
#define penInProximity      flag0
#define penTipDown          flag1
```

Possible states of the pen tip.

```
Enum16(PEN_TIP_STATE_TYPE) {
    penTipOutOfProxState = 0,
    penTipInProxState = 1,
    penTipDownState = 2
};
typedef U16 PEN_SUPPORTS_FLAGS, *P_PEN_SUPPORTS_FLAGS;
#define penSupportsProximity        flag0
#define penSupportsPressure         flag1       // For future use.
#define penSupportsZPosition        flag2       // For future use.
#define penSupportsZAngle           flag3       // For future use.
#define penSupportsXYAngle          flag4       // For future use.
#define penSupportsPenId            flag5       // For future use.
#define penSeparateFromScreen       flag6       // digitizer is not
                                                // integrated with display.
#define penDataIsStroke             flag7       // For future use.
#define penSupportsInk              flag12      // For future use.
#define penSupportsStrokes          flag13      // For future use.
```

msgInputEvent Argument Types

PEN_DATA is the "true" type of **msgInputEvent**'s **pArgs**->eventData for all pen event messages.

timeStamp time the event occurred, as defined by the pen driver. This may differ from **pArgs**->timeStamp, which is time the event was enqueued by the input system.

strokeSeqNum Number of the stroke that this event is in. See the section "Stroke Events" for more information.

taps if **pArgs**->devCode is **msgPenHoldTimeout** this field contains the number of taps that occurred before the hold. If **pArgs**->devCode is **msgPenTap**, this field contains the tap count.

data Variable length data. Contents depends on the **msgInputEvent**'s **pArgs**->devCode. For instance, if **pArgs**->devCode is **msgPenStroke**, then this field is the beginning of the event's stroke information.

```
typedef struct PEN_DATA {
    U32                 timestamp;
    P_UNKNOWN           reservedPointer;
    U32                 strokeSeqNum;
    XY16                penXY;              // in 0.1 mm pen units
    PEN_SUPPORTS_FLAGS  penSupportsFlags;
    S16                 pressure;           // For future use.
    S16                 zPosition;          // For future use.
    U16                 penId;              // For future use.
    S16                 xyAngle;            // For future use.
    S16                 zAngle;             // For future use.
    U16                 reserved[1];
    U8                  tipState;           // one of PEN_TIP_STATE_FLAGS
    U8                  taps;
    U8                  data[1];            // start of variable length data
} PEN_DATA, *P_PEN_DATA;
```

PEN_STROKE holds the variable length data for **msgInputEvent** with a **devCode** of **msgPenStroke**. See the section "Stroke Events" for more information. It holds the stroke data. It consists of header information followed by the compressed XY data.

The stroke data can be converted into other useful forms using the functions described in the section "Stroke Manipulation Functions."

```
typedef struct PEN_STROKE {
    RECT16              bounds;     // bounds in pen coordinates
    U16                 count;      // number of points
    U16                 id;         // stroke id when added to scribble
    struct
        {
        U16 len:15,                 // # bytes in the data field
            selected:1;             // used by scribble object
        }               info;
    U8                  data[1];    // byte array of compressed points
} PEN_STROKE, *P_PEN_STROKE;
```

Other Types

```
typedef struct CURRENT_STD_PEN_DATA {
    S16                 xPosition;          // in 0.1 mm pen units
    S16                 yPosition;          // in 0.1 mm pen units
    PEN_TIP_STATE_TYPE  penTipState;
    U16                 zPosition;          // For future use.
    U16                 pressure;           // For future use.
    U16                 penId;              // For future use.
    U16                 xyAngle;            // For future use.
    U16                 zAngle;             // For future use.
    XY32                positionAcetate;
} CURRENT_STD_PEN_DATA, *P_CURRENT_STD_PEN_DATA;
typedef struct PEN_METRICS {
    U32                 minResolution;          // lines per meter
    U32                 maxResolution;          // lines per meter
    U32                 currentResolution;      // lines per meter
    U32                 maxXPosition;           // using pen resolution
    U32                 maxYPosition;           // using pen resolution
    U32                 xPosition;              // using pen resolution
    U32                 yPosition;              // using pen resolution
    U32                 deviceFlags;
    U32                 reservedU32[2];
    PEN_TIP_STATE_FLAGS penTipState;
    PEN_SUPPORTS_FLAGS  penSupportsFlags;
```

```
    U16                 lowSampleRate;
    U16                 medSampleRate;
    U16                 highSampleRate;
    U16                 currentSampleRate;
    U16                 reportingThreshold;     // using pen resolution
    U16                 deviceId;
    U16                 reservedU16[4];
} PEN_METRICS, *P_PEN_METRICS;
```

Messages

msgPenMetrics

Sent to **thePen**. **thePen** passes back the current pen device metrics.

Takes P_PEN_METRICS, returns STATUS.

```
#define msgPenMetrics           MakeMsg(clsPen, 0xFE)
```

Message Arguments

```
typedef struct PEN_METRICS {
    U32                 minResolution;          // lines per meter
    U32                 maxResolution;          // lines per meter
    U32                 currentResolution;      // lines per meter
    U32                 maxXPosition;           // using pen resolution
    U32                 maxYPosition;           // using pen resolution
    U32                 xPosition;              // using pen resolution
    U32                 yPosition;              // using pen resolution
    U32                 deviceFlags;
    U32                 reservedU32[2];
    PEN_TIP_STATE_FLAGS penTipState;
    PEN_SUPPORTS_FLAGS  penSupportsFlags;
    U16                 lowSampleRate;
    U16                 medSampleRate;
    U16                 highSampleRate;
    U16                 currentSampleRate;
    U16                 reportingThreshold;     // using pen resolution
    U16                 deviceId;
    U16                 reservedU16[4];
} PEN_METRICS, *P_PEN_METRICS;
```

Stroke Manipulation Functions

PenExpander

Decompresses a point from the compressed stroke structure.

Returns S16.

Function Prototype

```
S16 PASCAL PenExpander(P_U8 pData, P_S16 pX, P_S16 pY);
```

Comments

pX and **pY** must point to the previous point value. (They must be set to the bounding box origin for the first point). The new point is passed back using the same pointers.

The return value is the number of bytes to advance **pData** to get to the next point.

PenStrokeRetrace

Iterates the points in a compressed stroke structure.

Returns S16.

```
typedef void (PASCAL * P_DRAW_PROC)(P_UNKNOWN, S16, S16);
```

Function Prototype

```
S16 PASCAL PenStrokeRetrace(
```

```
    P_PEN_STROKE    pStroke,    // ptr to the stroke structure
    P_DRAW_PROC     pProc,      // ptr to a function to process the points
    S16             xOff,       // x base offset
    S16             yOff,       // y base offset
    P_UNKNOWN       appData     // application specific data
);
```

PenStrokeUnpack16

Expands a compressed stroke to an array of XY16.

Returns STATUS.

Function Prototype

```
STATUS PASCAL PenStrokeUnpack16(
    P_PEN_STROKE    pStroke,    // compressed stroke
    P_XY32          pBase,      // stroke window offset
    P_XY16          pBuffer,    // point buffer
    BOOLEAN         toLWC       // true to transform points to LWC
);
```

PenStrokeUnpack32

Expands a compressed stroke to an array of XY32.

Returns STATUS.

Function Prototype

```
STATUS PASCAL PenStrokeUnpack32(
    P_PEN_STROKE    pStroke,        // compressed stroke
    P_XY32          pBase,          // stroke window offset
    P_XY32          pBuffer,        // point buffer
    BOOLEAN         toLWC           // true to transform points to LWC
);
```

XY16ToPenStroke

Converts an array of XY16 values to into a PEN_STROKE.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XY16ToPenStroke(
    XY16            pPointData[],   //  In: XY point data
    U16             numPoints,      //  In: number of points in pPointData
    OS_HEAP_ID      heapId,         //  In: heap to allocate stroke from
    P_PEN_STROKE    *ppNewPenStroke //  Out: pointer to new pen stroke
    );
```

Comments

The function allocates memory for the PEN_STROKE from **heapId**. If **pPointData** is null or **numPoints** is 0 then only the PEN_STROKE data structure is allocated.

PenCurrentStandardData

Fills in the most recent pen data in standard units.

Returns nothing.

Function Prototype

```
void PASCAL PenCurrentStandardData(P_CURRENT_STD_PEN_DATA   pPenStdData);
```

SCRIBBLE.H

This file contains the API definition for **clsScribble**.

clsScribble inherits from **clsObject**.

Instances of **clsScribble** (or scribbles for short) store pen strokes. Scribbles also interact with translators.

Introduction

An scribble is a collection of pen strokes. Clients can add strokes to (and remove strokes from) a scribble. Clients can use **msgScrRender** to render a scribble in a given drawing context.

A client typically adds strokes to a scribble during the client's response to **msgPenStroke** type input events.

clsScribble is a relatively low-level piece of PenPoint. Many clients can and should use **clsGWin** (gwin.h) or **clsSPaper** (spaper.h) rather than **clsScribble**.

Coordinates and the Base

A scribble's coordinates are in Pen Units. (See **msgDcUnitsPen** in sysgraf.h.)

Each scribble has a "base." By default, a scribble's base is the origin of the first stroke added to the scribble (via **msgScrAddStroke**). Whenever a stroke is added to a scribble, the scribble's base is subtracted from the origin of the stroke before the stroke is made part of the scribble. In other words, all strokes are stored relative to the scribble's base. This allows repositioning the entire scribble by adjusting the base. For instance, the client might do this in response to a window resize operation to keep the scribble in the "same" position relative to the upper left corner of a window.

This base is not transparent when extracting a stroke from a scribble. When using **msgScrStrokePtr** to get a pointer to a stroke in a scribble, it is necessary to add the scribble base back to the stroke origin in order to get the original stroke origin.

Adding Strokes to Scribbles

This example shows how strokes are added to a scribble by a window that is handling **msgInputEvent** when **pArgs**->devCode is **msgPenStroke**. Note that **pArgs**->base is set to the origin of the scribble.

```
// msgPenStroke's stroke data arrives in root window-relative device
// units. Convert the stroke data to be self-relative. Steps:
// (1) Compute the origin of self relative to the root window,
// (2) Convert that origin to pen units.
wm.parent = theRootWindow;
wm.child = NULL;
wm.bounds.origin.x = 0;
wm.bounds.origin.y = 0;
wm.bounds.size.h = 0;
wm.bounds.size.w = 0;
ObjectCall(msgWinTransformBounds, self, &wm);
ConvertOriginToPenCoordinates(&wm.bounds.origin);
```

```
// Now add the scribble to the stroke. Note that the scrAdd.base is
// the base (i.e., origin) of the STROKE, not the scribble.
scrAdd.base.x = pStroke->bounds.origin.x - wm.bounds.origin.x;
scrAdd.base.y = pStroke->bounds.origin.y - wm.bounds.origin.y;
ObjectCall(msgScrAddStroke, scribble, &scrAdd);
```

This code gives a rough idea of how a scribble adds a stroke in response to **msgScrAddStroke**. This is provided so that you can see how the base is used. Basically, the base of the scribble is subtracted from **pArgs**->base and used as the origin of the stroke.

```
// Make a local copy of the stroke. Then convert the stroke's origin
// to be relative to the scribble's base.
pNewStroke = <Copy of pArgs->pStroke>;
pNewStroke->bounds.origin.x = pArgs->base.x - scribble.base.x;
pNewStroke->bounds.origin.y = pArgs->base.y - scribble.base.y;
<add stroke to internal data structures>
```

Repositioning Scribbles

To reposition a scribble, (1) compute the delta by which you want to move the scribble, (2) get the scribble's current base using **msgScrGetBase**, (3) add the delta to the current base, and (4) set the base using **msgScrSetBase**. Be sure to use **msgScrSetBase** since it will readjust the bounds of the scribble.

Debugging Flags

clsScribble uses the debugging flag set 'h'. Defined flags are:

0100 General scribble debugging information

0800 Scribble save and restore debugging information

Limitations

Strokes in a scribble must be within ((2^15)-1) units of each other.

Memory for deleted strokes is only recovered upon **msgScrClear**. No other messages recover deleted stroke memory. Deleted strokes are saved and restored.

```
#ifndef SCRIBBLE_INCLUDED
#define SCRIBBLE_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef PEN_INCLUDED
#include <pen.h>
#endif
#ifndef DEBUG_INCLUDED
#include <debug.h>
#endif
// Next Up: 18  Recycled: 2, 7, 8,
```

Common #defines and typedefs

```
typedef OBJECT SCRIBBLE;
```

stsScrOutOfRange is returned from **msgScrAddStroke** if the coordinates for the base of the scribble are out of the allowable range for strokes.

```
#define stsScrOutOfRange        MakeStatus(clsScribble,1)
```

Messages Defined by Other Classes

msgNew

Creates and initializes a new scribble.

Takes P_SCR_NEW, returns STATUS. Category: class message.

msgNewDefaults

Sets the default values for the new arguments.

Takes P_SCR_NEW, returns STATUS.

Arguments

```
typedef struct SCR_NEW_ONLY {
    XY32 base;                  // initial base value, default (0,0)
    U32  reserved;              // reserved for future use
} SCR_NEW_ONLY;
#define scribbleNewFields       \
    OBJECT_NEW_ONLY object;     \
    SCR_NEW_ONLY    scribble;
typedef struct SCR_NEW {
    scribbleNewFields
} SCR_NEW, *P_SCR_NEW;
```

Comments

Zeros out **pNew**->scribble.

msgFree

Defined in clsmgr.h

Takes P_OBJ_KEY, returns STATUS.

Comments

The scribble frees all of its strokes.

msgSave

Defined in clsmgr.h.

Takes P_OBJ_SAVE, returns STATUS.

Comments

Saves all strokes to **pArgs**->file.

msgRestore

Defined in clsmgr.h.

Takes P_OBJ_RESTORE, returns STATUS.

Comments

Restores all strokes from **pArgs**->file.

msgPicSegPaintObject

Defined in picseg.h.

Takes P_PIC_SEG_OBJECT, returns STATUS.

Comments

In response to this message, a scribble paints itself. Any object which responds to **msgPicSegPaintObject** can be placed into a PicSeg (and instance of **clsPicSeg**).

Messages

msgScrSetBase

Sets the scribble's base.

Takes P_XY32, returns STATUS.

```
#define msgScrSetBase           MakeMsg(clsScribble,11)
```

Comments

Recomputes the bounds of the scribble to reflect the new base.

See the section "Coordinates and the Base" for more information.

msgScrGetBase

Passes back the base for the scribble.

Takes P_XY32, returns STATUS.

```
#define msgScrGetBase           MakeMsg(clsScribble, 10)
```

Comments

See the section "Coordinates and the Base" for more information.

msgScrGetBounds

Passes back the bounds of the scribble.

Takes P_RECT32, returns STATUS.

```
#define msgScrGetBounds         MakeMsg(clsScribble,12)
```

Comments

Passes back the bounding box that contains all the strokes in the scribble. The bounding box is in pen units.

msgScrCount

Passes back the number of strokes in the scribble.

Takes P_U16, returns STATUS.

```
#define msgScrCount             MakeMsg(clsScribble,1)
```

msgScrAddStroke

Adds a stroke to the scribble.

Takes P_SCR_ADD_STROKE, returns STATUS.

```
#define msgScrAddStroke         MakeMsg(clsScribble,3)
```

Arguments

```
typedef struct SCR_ADD_STROKE {
    XY32            base;           // In: origin of the stroke.
    P_PEN_STROKE    pStroke;        // In: pointer to stroke data
    U16             index;          // Out: index of the newly added stroke
} SCR_ADD_STROKE, * P_SCR_ADD_STROKE;
```

Comments In response to this message, the scribble makes a copy of the stroke data and adds the stroke to itself. Observers are notified with **msgScrAddedStroke**. Note the SCR_ADD_STROKE base is the base (i.e., origin) of the STROKE.

If this is the first stroke to be added to the scribble, the scribble's base is set to **pArgs**->base. Otherwise the base of the stroke is shifted by the scribble base as follows:

```
stroke.bounds.origin = pArgs->base - scribble.base;
```

Return Value **stsScrOutOfRange** The computed base for the stroke was out of the allowable range.

msgScrDeleteStroke

Deletes the stroke from the scribble.

Takes U16, returns STATUS.

```
#define msgScrDeleteStroke      MakeMsg(clsScribble,4)
```

Comments In response to this message, the scribble marks as deleted the stroke with the index value of **pArgs**. Observers receive **msgScrRemovedStroke**.

Note: this does not actually free any memory, the scribble is just marked as deleted.

See Also **msgScrRemovedStroke**

msgScrDeleteStrokeArea

Deletes all of the strokes in the scribble which intersect **pArgs**->rect.

Takes P_SCR_DELETE_STROKE_AREA, returns STATUS.

```
#define msgScrDeleteStrokeArea  MakeMsg(clsScribble, 2)
```

Arguments

```
typedef struct SCR_DELETE_STROKE_AREA {
    RECT32      rect;       // Rectangle of area to delete strokes from.
                            // In pen units.
    OBJECT      window;     // Window to dirty
    U32         spare;      // Reserved.
} SCR_DELETE_STROKE_AREA, *P_SCR_DELETE_STROKE_AREA;
```

Comments The scribble uses **msgScrHit** and **msgScrDeleteStroke** to do the deletions. Observers receive one **msgScrRemovedStroke** for each intersecting stroke.

If **pArgs**->window is non-null, the scribble dirties the appropriate rectangle in the window.

See Also **msgScrHit**

msgScrCat

Adds (concatenates) the strokes from another scribble to self.

Takes SCRIBBLE, returns STATUS.

```
#define msgScrCat               MakeMsg(clsScribble,6)
```

Comments The receiving scribble makes copies of all of the strokes in the **pArgs** scribble and adds them to itself by self sending **msgScrAddStroke**.

See Also **msgScrAddStroke**

msgScrComplete

Sent to a scribble to indicate completion.

Takes void, returns STATUS.

```
#define msgScrComplete          MakeMsg(clsScribble, 5)
```

Comments

Clients send this message to a scribble to tell the scribble that it is "complete." The client is responsible for determining when a scribble is complete. (For instance, the client might decide that a scribble is complete when the client receives an out-of-proximity pen event, or when a certain amount of time has elapsed since the last input event.)

A scribble does nothing in response to this message except to send **msgScrCompleted** to all observers.

A translator is a typical observer of a scribble. See xlate.h for information about how a translator responds to **msgScrCompleted**.

See Also

msgScrCompleted

msgScrStrokePtr

Passes back the pointer to the stroke identified by **pArgs**->index.

Takes P_SCR_STROKE_PTR, returns STATUS.

```
#define msgScrStrokePtr         MakeMsg(clsScribble,9)
```

Arguments

```
typedef struct SCR_STROKE_PTR {
    U16             index;      // In: index to the stroke
    P_PEN_STROKE    pStroke;    // Out: pointer to the index'th stroke, or
                                // pNull if no such stroke exists.
} SCR_STROKE_PTR, *P_SCR_STROKE_PTR;
```

Comments

Be Careful! **pArgs**->pStroke is a pointer to internal data, not a copy.

Strokes retrieved from scribbles are relative to the scribble's base. The stroke's origin is NOT the same as was passed to **msgScrAddStroke** -- you need to add the scribble's base back. Note that this may still not be the same as the original stroke origin if the scribble base has been adjusted.

msgScrClear

Deletes all the strokes in the scribble.

Takes void, returns STATUS.

```
#define msgScrClear             MakeMsg(clsScribble,15)
```

Comments

In response to this message, the scribble sets its stroke count to zero. scribble's stroke count to 0. It also frees all allocated memory.

Important: Observers are not notified!

msgScrRender

Renders a scribble in a window through a DC.

Takes P_SCR_RENDER, returns STATUS.

```
#define msgScrRender            MakeMsg(clsScribble,13)
```

Arguments

```
typedef struct SCR_RENDER {
    U16     start;          // stroke start index (0 for first)
    U16     stop;           // stroke stop index (maxU16 for last)
    XY32    base;           // unused
    OBJECT  dc;             // dc for rendering the stroke
    RECT32  rect;           // dirty rect
} SCR_RENDER, *P_SCR_RENDER;
```

Comments

Draws the strokes in the scribble using **pArgs**->dc. The start and stop indices describe the inclusive range of strokes to be rendered. Only strokes intersecting **pArgs**->rect are rendered. **pArgs**->rect must be in window device coordinates. **pArgs**->dc must be set up to draw in pen coordinates (using **msgDcUnitsPen** as described in sysgraf.h).

msgScrHit

Passes back the next stroke which intersects **pArgs**->rect.

Takes P_SCR_HIT, returns STATUS.

```
#define msgScrHit               MakeMsg(clsScribble,14)
```

Arguments

```
typedef struct SCR_HIT {
    RECT32  rect;           // In: rect to test against, in pen coordinates.
    U16     index;          // In: For the first send, should be 0. Do
                            // not disturb between sends. Out: if
                            // pArgs->hi is true, the index of the next
                            // stroke that intersects pArgs->rect.
    BOOLEAN hit;            // Out: true if another stroke intersect
                            // pArgs->rect; false when no more strokes
                            // intersect.
} SCR_HIT, *P_SCR_HIT;
```

Comments

This message is typically sent multiple times to find all strokes that intersect **pArgs**->rect. The hit-test is quite simple -- a stroke "intersects" if the stroke's bounding box intersects **pArgs**->rect.

Clients should set **pArgs**->index to 0 before first sending this message and then not disturb that field between sends.

If a hit is found, **pArgs**->hit is true and **pArgs**->index is the stroke index. Otherwise **pArgs**->hit is false.

Example:

```
P_SCR_HIT hit;
hit.rect = <rect to check>
hit.index = 0;
hit.hit = TRUE;
while (hit.hit) {
    ObjectCall(msgScrHit, scribble, &hit);
    if (hit.hit) {
        // hit.index now equals the first stroke that intersected
    }
}
```

Notifications Sent to Observers

msgScrCompleted

Notifies observers that scribble input has been completed.

Takes NULL, returns STATUS.

```
#define msgScrCompleted         MakeMsg(clsScribble, 0x80)
```

Comments

This notification is sent as part of a scribble's response to **msgScrComplete**.

Typical use: Translators that are observing the scribble may perform their translation in response to this message. (See xlate.h for more information.)

msgScrAddedStroke

Notifies observers that a stroke has been added to the scribble.

Takes P_SCR_ADDED_STROKE, returns STATUS.

```
#define msgScrAddedStroke       MakeMsg(clsScribble, 0x81)
```

Arguments

```
typedef struct SCR_ADDED_STROKE {
    U16             index;      // index of the added stroke
    P_PEN_STROKE    pStroke;    // pointer to the stroke data structure
} SCR_ADDED_STROKE, *P_SCR_ADDED_STROKE;
```

Comments

This notification sent as part of a scribble's response to **msgScrAddStroke**.

msgScrRemovedStroke

Notifies observers that a stroke has been removed from the scribble.

Takes P_SCR_REMOVED_STROKE, returns STATUS.

```
#define msgScrRemovedStroke     MakeMsg(clsScribble, 0x82)
```

Arguments

```
typedef struct SCR_REMOVED_STROKE {
    U16     index;          // index of the removed stroke
    U16     id;             // stroke identifier
    RECT32  bounds;         // bounds of the removed stroke (in pen units)
} SCR_REMOVED_STROKE, *P_SCR_REMOVED_STROKE;
```

Comments

This notification is sent as part of a scribble's response to **msgScrDeleteStroke**.

SPAPER.H

This file contains the API definition for **clsSPaper**.

clsSPaper inherits from **clsView.**

An instance of **clsSPaper** (or **sPaper**, for short) provides stroke redisplay, very simple stroke editing, and translation.

Road Map

A typical **sPaper** client simply creates an **sPaper** with self as the listener. The client than handles the **msgSPaperXlateCompleted** notification and uses **msgSPaperGetXlateData** to extract the resulting data.

Clients or subclasses who wish to get involved in the **sPaper**'s management of strokes might use:

- msgSPaperClear
- msgSPaperAddStroke
- msgSPaperDeleteStrokes

Clients or subclasses who wish to be involved in controlling when translation is triggered might use:

- msgSPaperComplete
- msgSPaperAbort

If a client only needs translation, the client may not need to use **sPaper** at all. The client may be able to use translators (xlate.h) and scribbles (scribble.h) directly.

SPaper Components

An **sPaper** manages a translator and a scribble. The **sPaper** observes the the translator and the translator observes the scribble.

The **sPaper** has a listener which is specified when the **sPaper** is created. An **sPaper** makes the listener an observer of the **sPaper**. As a result, the listener receives **sPaper** notifications.

Typical Scenario

The usual scenario for an spaper follows. The spaper is created and inserted onto the screen. The spaper receives pen strokes which it passes on to its scribble which in turn passes them on to a translator. At some point, the spaper is "complete" either via an external notification or optionally when an out of proximity event is received. The spaper notifies the scribble and the scribble notifies the translator. When the translator is complete, it notifies the spaper which in turn notifies its listener. The listener then asks the spaper for the translated data and the spaper gets the data from the translator.

Here's a typical flow of messages between the **sPaper**, its scribble, its translator and the **sPaper**'s listener. (This scenario uses messages defined in input.h, pen.h, xlate.h and scribble.h)

When the **sPaper** receives a **msgInputEvent** that contains a stroke (see pen.h) it self sends **msgSPaperAddStroke**, which sends **msgScrAddStroke** to the scribble.

```
input system    --> msgInputEvent       --> sPaper
sPaper          --> msgScrAddStroke     --> scribble
```

The scribble then sends **msgScrAddStroke** to its observers. One of the scribble's observers is the **sPaper**'s translator.

```
scribble        --> msgScrAddStroke     --> translator
```

Eventually **sPaper** receives **msgSPaperComplete**. (A client may send **msgSPaperComplete** to the **sPaper**. Alternatively, depending on the **sPaper**'s flags, the **sPaper** may self send **msgSPaperComplete**. For example, see the description of the **spProx** flag elsewhere in this file.) In response to **msgSPaperComplete**, the **sPaper** sends **msgScrComplete** to the scribble. In turn, the scribble notifies its observers (including the translator) with **msgScrCompleted**.

```
sPaper          --> msgScrComplete      --> scribble
scribble        --> msgScrCompleted     --> translator
```

The translator responds to **msgScrCompleted** by sending **msgXlateCompleted** to its observers, which include the **sPaper**. The **sPaper** responds to **msgXlateCompleted** by sending **msgSPaperXlateCompleted** to its observers, which include the listener.

```
translator      --> msgXlateCompleted       --> sPaper
sPaper          --> msgSPaperXlateCompleted --> listener
```

The listener typically sends **msgSPaperGetXlateData** to the **sPaper** to retrieve the translated data. In response to **msgSPaperGetXlateData**, the **sPaper** sends **msgXlateData** to the translator.

```
listener        --> msgSPaperGetXlateData   --> sPaper
sPaper          --> msgXlateData            --> translator
```

Debugging Flags

clsSPaper uses the debugging flag set 'h'. Defined flags are:

0010 General **sPaper** debugging information

0020 sPaper translation debugging information

0080 sPaper save and restore debugging information

Relationship to clsGWin

Although **sPaper** is a descendent of **clsGWin**, it inherits little of **clsGWin**'s behavior. All input and translation behavior is overridden.

```
#ifndef SPAPER_INCLUDED
#define SPAPER_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef WIN_INCLUDED
#include <win.h>
#endif
```

```
#ifndef VIEW_INCLUDED
#include <view.h>
#endif
// Next Up: 24  Recycled: 1, 5, 9, 12   Used:   128
```

Common #defines and typedefs

```
typedef OBJECT SPAPER;
```

Flags

These flags are set in **pNew**->sPaper.flags field, and can be manipulated using **msgSPaperSetFlags** and **msgSPaperGetFlags**.

- spCapture. If false, the **sPaper** destroys an existing scribble and creates a new one when the first stroke since the last translation is received. If true, the scribble is preserved between translations. See the "SPaper Components" section for more information.
- spProx. If true, the **sPaper** self sends **msgSPaperComplete** when **msgPenOutProxUp** is received. In effect, setting this flag causes the **sPaper** to spontaneously translate when an "out of proximity" event occurs.
- spFixedPos. If true, the **sPaper** keeps the top-left corner of its scribble fixed distance from the top-left corner of self during a resize operation.
- spPenCoords. If true, xlists returned by the **sPaper** have pen coordinate rather than LWC coordinates.
- spGrab. If true, the **sPaper** grabs input in response to **msgPenDown** and releases the grab in response to **msgSPaperAbort** or **msgSPaperComplete**.
- spScribbleEdit. If true (the default), allows the user to delete scribbles via scratch out. **sPaper** implements a VERY rudimentary "scratch out" gesture. If **spScribbleEdit** is true and the user draws just the right "scratch out" gesture the strokes under the gesture are deleted. This does NOT use PenPoint's general gesture translation facilities.
- spRedisplay. If true (the default), the **sPaper** redisplays its scribble's strokes whenever anything changes.
- spSuppressMarks. If true, the following flags are treated as false: **spRuling**, **spVRuling**, **spGrid**, **spTick**, and **spBaseLine**.
- spRuling. If true (the default), horizontal ruling lines are drawn.
- spVRuling. If true, vertical ruling lines are drawn.
- spGrid. If true, grid lines are drawn.
- spTick. If true, tick marks are drawn.
- spBaseLine. If true, and **spRuling** is also true, the horizontal ruling lines are drawn as a baseline.
- spDataMoveable. If true, then the **sPaper**'s scribble is moveable.
- spDataCopyable. If true, then the **sPaper**'s scribble is copyable.

```
#define spCapture       flag0
#define spProx          flag4
#define spFixedPos      flag5
#define spPenCoords     flag6
#define spGrab          flag8
#define spScribbleEdit  flag11
```

```
#define spRedisplay     flag7
#define spSuppressMarks flag12
#define spRuling        flag1
#define spVRuling       flag13
#define spGrid          flag9
#define spBaseLine      flag14
#define spTick          flag10
#define spDataMoveable  flag2
#define spDataCopyable  flag3
```

Messages

msgNew

Creates an **sPaper** object.

Takes P_SPAPER_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct SPAPER_NEW_ONLY {
    U16     flags;
    U16     lineHeight;         // Cell height (in points)
    OBJECT  translator;         // Translation object
    OBJECT  listener;           // This object is made an observer of the
                                // sPaper.
    U16     rows;               // Rows for shrink wrap layout
    U16     cols;               // Cols for shrink wrap layout
    U16     charWidth;          // Cell width (in points)
    U32     reserved;
} SPAPER_NEW_ONLY;

#define sPaperNewFields             \
    viewNewFields                   \
    SPAPER_NEW_ONLY     sPaper;

typedef struct SPAPER_NEW {
   sPaperNewFields
} SPAPER_NEW, *P_SPAPER_NEW;
```

msgNewDefaults

Initializes the NEW structure to default values.

Takes P_SPAPER_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct SPAPER_NEW {
   sPaperNewFields
} SPAPER_NEW, *P_SPAPER_NEW;

    pArgs->win.flags.input              = (inputOutProx | inputTip |
                                           inputStroke | inputInk |
                                           inputNoBusy | inputHWTimeout |
                                           inputAutoTerm | inputTimeout |
                                           inputHoldTimeout);
    pArgs->win.flags.style              |= wsSendGeometry;

    pArgs->view.dataObject              = NULL;
    pArgs->view.createDataObject        = TRUE;

    pArgs->sPaper.flags                 = (spRuling | spRedisplay |
                                           spScribbleEdit);
    pArgs->sPaper.translator            = NULL;
    pArgs->sPaper.rows                  = 0;
    pArgs->sPaper.cols                  = 0;
    pArgs->sPaper.reserved              = 0;
    pArgs->sPaper.listener              = NULL;
```

```
 pArgs->sPaper.lineHeight            = 25;   // In case read fails.
read.resId = tagPrLineHeight;
read.heap = 0;
read.pData = &pArgs->sPaper.lineHeight;
read.length = SizeOf(U16);
ObjCallRet(msgResReadData, theSystemPreferences, &read, s);

// convert line height from hundredths of inches to points.
pArgs->sPaper.lineHeight = (pArgs->sPaper.lineHeight * 72) / 100;
pArgs->sPaper.charWidth = pArgs->sPaper.lineHeight;
```

msgSPaperGetFlags

Passes back the **sPaper**'s flags.

Takes P_U16, returns STATUS.

```
#define msgSPaperGetFlags       MakeMsg(clsSPaper,19)
```

msgSPaperSetFlags

Sets the **sPaper**'s flags.

Takes P_U16, returns STATUS.

```
#define msgSPaperSetFlags       MakeMsg(clsSPaper,20)
```

Comments

In addition to setting the flags, the scribble self sends **msgWinDirtyRect** to force itself to redraw with the new flags.

msgSPaperGetTranslator

Passes back the **sPaper**'s translator object (may be NULL).

Takes P_OBJECT, returns STATUS.

```
#define msgSPaperGetTranslator  MakeMsg(clsSPaper,16)
```

msgSPaperSetTranslator

Replaces the **sPaper**'s translator passes back the old translator.

Takes P_OBJECT, returns STATUS.

```
#define msgSPaperSetTranslator  MakeMsg(clsSPaper,17)
```

Comments

Important: the old translator is not destroyed. The client is responsible for eventually destroying it.

In response to this message, the **sPaper** replaces it translator. (The old translator is passed back.) The **sPaper** adds itself as an observer of the new translator and adds the translator as the translator as an observer of the **sPaper**'s scribble (if one exists).

msgSPaperGetScribble

Passes back the **sPaper** scribble object (may be NULL).

Takes P_OBJECT, returns STATUS.

```
#define msgSPaperGetScribble    MakeMsg(clsSPaper,14)
```

Comments

See the section "SPaper Components" for more information.

msgSPaperSetScribble

Replaces the **sPaper**'s scribble and passes back the old scribble.

Takes P_OBJECT, returns STATUS.

```
#define msgSPaperSetScribble    MakeMsg(clsSPaper,15)
```

Comments

Important: the old scribble is not destroyed. The client is responsible for eventually destroying it.

In response to this message, the **sPaper** replaces its scribble. (The old scribble is passed back.) The **sPaper** makes its translator (if one exists) an observer of the new scribble. This causes all strokes in the new scribble to be sent to the existing translator.

msgSPaperGetCellMetrics

Passes back some of **sPaper**'s metrics.

Takes P_SPAPER_CELL_METRICS, returns STATUS.

```
#define msgSPaperGetCellMetrics MakeMsg(clsSPaper,11)
```

Arguments

```
typedef struct SPAPER_CELL_METRICS {
    RECT32  cellRect;       // centered writing area of the sPaper
    SIZE32  cellSize;       // size of an individual cell based on
                            // lineHeight and charWidth
    U16     rows;           // number of rows displayed
    U16     cols;           // number of columns displayed
} SPAPER_CELL_METRICS, *P_SPAPER_CELL_METRICS;
```

Comments

In response, **sPaper** passes back **pArgs**->cellRect, **pArgs**->cellSize, **pArgs**->rows and **pArgs**->cols.

Note that **pArgs**->rows and **pArgs**->cols are not the values passed to **msgNew**. (The values passed to **msgNew** are used for shrink wrap layout.)

See Also

msgSPaperGetSizes

msgSPaperSetCellMetrics

Sets the **sPaper**'s cell metrics. Resizes and lays out window.

Takes P_SPAPER_CELL_METRICS, returns STATUS.

```
#define msgSPaperSetCellMetrics MakeMsg(clsSPaper,13)
```

Message Arguments

```
typedef struct SPAPER_CELL_METRICS {
    RECT32  cellRect;       // centered writing area of the sPaper
    SIZE32  cellSize;       // size of an individual cell based on
                            // lineHeight and charWidth
    U16     rows;           // number of rows displayed
    U16     cols;           // number of columns displayed
} SPAPER_CELL_METRICS, *P_SPAPER_CELL_METRICS;
```

Comments

In response, **sPaper** uses the new values of **pArgs**->cellSize, **pArgs**->rows and **pArgs**->cols to compute its new window size. It then self sends **msgWinLayout** to resize and re-layout self. The new value of the **sPaper**'s **cellRect** is passed back in **pArgs**->cellRect.

msgSPaperGetSizes

Passes back the **sPaper**'s line height and character width sizes, in points.

Takes P_SIZE16, returns STATUS.

```
#define msgSPaperGetSizes       MakeMsg(clsSPaper,21)
```

Comments The response to this message is similar to the response to **msgSPaperGetCellMetrics** except that fewer values are returned and the values are in points.

See Also **msgSPaperGetCellMetrics**

msgSPaperSetSizes

Sets the **sPaper**'s line height and character width sizes, in points.

Takes P_SIZE16, returns STATUS.

```
#define msgSPaperSetSizes        MakeMsg(clsSPaper,22)
```

Comments In response, the **sPaper** sets its **lineHeight** and **charWidth**. It recomputes other sizes that depend on those values, and repaints itself if necessary.

See Also **msgSPaperSetCellMetrics**

msgSPaperClear

Destroys the **sPaper**'s scribble.

Takes NULL, returns STATUS.

```
#define msgSPaperClear           MakeMsg(clsSPaper,4)
```

Comments In response, the **sPaper** destroys its scribble, if it has one.

Stroke Processing Messages

msgSPaperAddStroke

Adds a stroke to the **sPaper**'s scribble.

Takes P_INPUT_EVENT, returns STATUS.

```
#define msgSPaperAddStroke       MakeMsg(clsSPaper,2)
```

Comments In response to **msgPenStroke**, the **sPaper** self sends this message to add a stroke to its scribble. If the **sPaper** does not have a scribble, one is created. If the **sPaper** is not capturing input (**spCapture** flag is false), and this is the first stroke added since the last translation, then any existing scribble is destroyed and a new one is created.

The **sPaper** self sends **msgSPaperLocate** before adding the stroke to the scribble to allow subclasses to process the stroke.

msgSPaperLocate

Allows subclasses to process the stroke before it is added to the scribble.

Takes P_SPAPER_LOCATE, returns STATUS.

```
#define msgSPaperLocate          MakeMsg(clsSPaper,6)
```

Arguments

```
typedef struct SPAPER_LOCATE {
    XY32        start;          // origin of stroke
    P_UNKNOWN   pStroke;        // new stroke
} SPAPER_LOCATE, *P_SPAPER_LOCATE;
```

Comments An **sPaper**'s default response to this message is to return **stsOK**.

See Also **msgSPaperAddStroke**

msgSPaperDeleteStrokes

Deletes strokes in the **sPaper**'s scribble that intersect *pArgs.

Takes P_RECT32, returns STATUS.

```
#define msgSPaperDeleteStrokes  MakeMsg(clsSPaper,18)
```

Comments

In response to this message, the **sPaper** sends **msgScrDeleteStrokeArea** to its scribble (after the rectangle is converted to the appropriate coordinate system).

If the **spRedisplay** flag is true, then **sPaper** also dirties the specified rectangle in itself to cause repainting to occur.

msgSPaperComplete

Tells the **sPaper** that the current stroke is complete.

Takes nothing, returns STATUS.

```
#define msgSPaperComplete       MakeMsg(clsSPaper,3)
```

Comments

See the "Typical Scenario" section for a description of why and when this message is sent.

sPaper responds as follows. If the **sPaper** has a scribble, it sends **msgScrComplete** to the scribble. If there is no scribble, the **sPaper** self sends **msgSPaperXlateCompleted** to "complete" the translation, even though the resulting translation will be empty.

If this message is received while the **sPaper** is handling **msgInputEvent**, the status returned from **msgInputEvent** will cause any grab to be released.

See Also

msgSPaperXlateCompleted

msgSPaperAbort

Tells the **sPaper** to abort the entry of the current stroke.

Takes nothing, returns STATUS.

```
#define msgSPaperAbort          MakeMsg(clsSPaper, 23)
```

Comments

In response to this message, **sPaper** sends **msgSPaperClear** to self.

If this message is received while the **sPaper** is handling **msgInputEvent**, the status returned from **msgInputEvent** will cause any grab to be released.

Data Notification and Retrieval Messages

msgSPaperXlateCompleted

Notifies observers that data is available from the **sPaper**.

Takes OBJECT, returns STATUS.

```
#define msgSPaperXlateCompleted MakeMsg(clsSPaper,128)
```

Comments

This message has two roles.

Role 1: This notification is sent to the **sPaper**'s observers (including the listener) when the **sPaper** decides that translation is complete. Note that the resulting "translation" might be empty.

Role 2: **sPaper** self sends this message when **msgSPaperComplete** has been received and there is nothing to translate. In response to this message, **sPaper** sends the same message to its observers, as described in Role 1 above.

msgSPaperGetXlateData

Passes back translated data.

Takes P_XLATE_DATA, returns STATUS.

```
#define msgSPaperGetXlateData   MakeMsg(clsSPaper,7)
```

Comments

The **sPaper**'s observers typically send this message in response to the **sPaper**'s **msgSPaperCompleted** notification. See the "Typical Scenario" section for more information.

If there is no translator, or no scribbles to be translated, the **sPaper** passes back an empty xlist.

Otherwise, the **sPaper** extracts the xlist from its translator. If the **sPaper**'s **spPenCoords** flag is true, the **sPaper** converts the xlist's coordinates to pen coordinates; otherwise it converts the xlist's coordinates to local window coordinates. Finally, the **sPaper** passes back the xlist.

The client must free the passed back xlist.

See Also

msgSPaperGetXlateDataAndStrokes.h.h.h

msgSPaperGetXlateDataAndStrokes

Passes back translated data and its associated strokes.

Takes P_SPAPER_XDATA, returns STATUS.

Arguments

```
typedef struct SPAPER_XDATA {
    OS_HEAP_ID  heap;           // In: Heap to allocate space for stroke data
                                // (Null means to use osProcessHeapId.)
    P_UNKNOWN   pXList;         // Out: pointer to xlist
    BOOLEAN     toLWC;          // In: true to convert strokes to LWC
                                // coordinates
} SPAPER_XDATA, *P_SPAPER_XDATA;
#define msgSPaperGetXlateDataAndStrokes MakeMsg(clsSPaper,8)
```

Comments

The **sPaper**'s observers typically send this message (or **msgSPaperGetXlateData**) in response to the **sPaper**'s **msgSPaperCompleted** notification. See the "Typical Scenario" section for more information.

This message is very similar in function to **msgSPaperGetXlateData**. In fact the first two fields of **pArgs** for this message are the same as the fields of **pArgs** for **msgSPaperGetXlateData**

The only difference between the two messages is that **msgSPaperGetXlateDataAndStrokes** also passes back the stroke information used to produce the translation. The strokes are appended to the xlist as elements of type **xtStroke16**.

If **pArgs**->toLWC is true, then the coordinate information in the strokes is converted to Local Window Coordinates (see win.h) before being passed back.

The client must free the passed back xlist.

See Also

msgSPaperGetXlateData

Messages Defined by Other Classes

msgFree

Defined in clsmgr.h

Takes P_OBJ_KEY, returns STATUS.

Comments If the **sPaper** contains a scribble, it first removes the translator (if it exists) as an observer of the scribble. It then sends **msgDestroy** to the scribble.

If the **sPaper** contains a translator, it first remove self as an observer of the translator and then send **msgDestroy** to the translator.

msgSave

Defined in clsmgr.h.

Takes P_OBJ_SAVE, returns STATUS.

Comments An **sPaper** responds by sending **msgResPutObject** to its scribble and translator. (If the scribble and/or translator is null, this effectively writes the "null object" id into the resource file.)

msgRestore

Defined in clsmgr.h.

Takes P_OBJ_RESTORE, returns STATUS.

Comments An **sPaper** responds by sending **msgResGetObject** to **pArgs**->file to restore its scribble and translator that were saved while handling **msgSave**.

If the restored translator is non-null, the **sPaper** makes itself an observer of the of the translator. If both the translator and scribble are non-null, the **sPaper** makes the translator an observer of the scribble.

msgSetOwner

Defined in clsmgr.h.

Takes P_OBJ_OWNER, returns STATUS.

Comments In response, an **sPaper** sends this message to its translator and scribble (if they are non-null). The **sPaper** then lets its ancestor (**clsObject**) set the **sPaper**'s ownership.

msgXlateCompleted

Defined in xlate.h.

Takes nothing, returns STATUS.

Comments An **sPaper** receives this message because it is observing its translator. The translator uses this message to indicate that translation has been complete and that data is available.

In response to this message the **sPaper** self sends **msgSPaperXlateCompleted**, which results in **msgSPaperXlateCompleted** being sent to all the **sPaper**'s observers.

See Also **msgSPaperXlateCompleted**

msgWinRepaint

Defined in win.h.

Takes nothing, returns STATUS.

Comments

An **sPaper** responds by (1) drawing any necessary grid lines in the window, and (2) if **spRedisplay** is true, sending **msgScrRender** to its scribble

msgWinSized

Defined in win.h.

Takes P_WIN_METRICS, returns STATUS.

Comments

If the window being resized is self, and a change in height has occurred, and the **spFixedPos** flag is true, then the **sPaper**'s scribble's base is adjusted by the change in height. This causes the scribble to remain at a fixed position relative to the upper left corner of the window. As a result of handling this message, **msgSPaperGetCellMetrics** and **msgSPaperGetSizes** will return different values.

See Also

scribble.h

msgWinLayoutSelf

Defined in win.h.

Takes P_WIN_METRICS, returns STATUS.

Comments

If **wsLayoutResize** is on in **pArgs**->options, the **sPaper** picks a width of

```
(cols * cellWidth) + self's borderSize.w
```

and a height of

```
(rows * lineHeight) + self's borderSize.h
```

msgInputEvent

Defined in input.h.

Takes P_INPUT_EVENT, returns STATUS.

Comments

sPaper handles **msgPenUp**, **msgPenDown**, **msgPenStroke** and **msgPenOutProxUp** events.

An **sPaper** grabs input by returning **stsInputGrabTerminate** in response to **msgPenDown**.

If flags.**spGrab** is false, the **sPaper** relinquishes the grab by returning **stsInputTerminate** in response to **msgPenUp**.

If flags.**spGrab** is true, the **sPaper** releases the grab by returning **stsInputTerminate** in response to **msgPenOutProxUp**. **msgPenOutProxUp** also cause a self send of **msgSPaperComplete** if flags.**spProx** is set.

msgPenStroke causes a self send of **msgSPaperAddStroke**.

All other **msgInputEvent** events return **stsInputGrabIgnored** or **stsInputIgnored** depending on the grab state the **sPaper** is in.

Return Value

stsInputTerminate

See Also

msgSPaperComplete

msgSelDelete

Defined in sel.h.

Takes U32, returns STATUS.

Comments

In response to this message, the **sPaper** self sends **msgSPaperClear**.

msgSelMoveSelection

Defined in sel.h.

Takes P_XY32, returns STATUS.

Comments

In response to this message, the **sPaper** first checks to see if the selection owner can "speak" the **xferScribbleObject** data transfer type. If it cannot, then the **sPaper** lets its ancestor process the message.

If it can, and the selection owner is not self, then the **sPaper** gets the scribble from the selection owner, positions it as specified in **pArgs**, self sends **msgSPaperSetScribble**, and finally sends **msgSelDelete** to the selection owner.

msgSelCopySelection

Defined in sel.h.

Takes P_XY32, returns STATUS.

Comments

An **sPaper**'s response to this message is identical to its response to **msgSelMoveSelection** except that the **sPaper** does not send **msgSelDelete** to the selection owner.

See Also

msgSelMoveSelection

msgSelBeginMove

Defined in sel.h.

Takes P_XY32, returns STATUS.

Comments

In response to this message, the **sPaper** first verifies that it has a scribble and that flags.**spDataMoveable** is true. If either of these fail, the **sPaper** lets its ancestor process the message.

Otherwise the **sPaper** computes the bounding box of the scribble and self sends **msgEmbeddedWinBeginMove**.

msgSelBeginCopy

Defined in sel.h.

Takes P_XY32, returns STATUS.

Comments

In response to this message, the **sPaper** first verifies that it has a scribble and that flags.**spDataCopyable** is true. If either of these fail, the **sPaper** lets its ancestor process the message.

Otherwise the **sPaper** computes the bounding box of the scribble and self sends **msgEmbeddedWinBeginCopy**.

msgXferGet

Defined in xfer.h.

Takes P_UNKNOWN, returns STATUS.

Comments

If **pArgs**->id is **xferScribbleObject**, the **sPaper** creates a copy of its scribble and returns the copy in **pArgs**->uid.

msgXferList

Defined in xfer.h.

Takes OBJECT, returns STATUS.

Comments

In response to this message, the **sPaper** adds the data transfer type **xferScribbleObject** to the list of data transfer types.

msgTrackProvideMetrics

Defined in track.h.

Takes P_TRACK_METRICS, returns STATUS.

Comments

If **pArgs**->tag is **tagMoveCopyIconTrack**, the **sPaper** snaps the pen to the center-left of the move/copy icon.

XGESTURE.H

Interface file for **clsXGesture**

clsXGesture inherits from **clsXtract.**

```
#ifndef XGESTURE_INCLUDED
#define XGESTURE_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
```

Common #defines and typedefs

Gesture Definitions

These tags define the codes returned for a recognized gesture. Wherever a "gesture id" is called for, one of these codes is expected.

Certain of these gesture codes are OBSOLETE. That is, the shapes that they denote were experimental and are no longer recognized by the gesture recognizer. All such obsolete codes are indicated by the comment "not generated" at the end of the definition.

```
#define xgsNull             MakeTag(clsXGesture, 0xff)  // 255
// selection
#define xgsLeftParens       MakeTag(clsXGesture, '(')   //  40
#define xgsRightParens      MakeTag(clsXGesture, ')')   //  41
#define xgsPlus             MakeTag(clsXGesture, '+')   //  43
#define xgs1Tap             MakeTag(clsXGesture, '.')   //  46
#define xgs2Tap             MakeTag(clsXGesture, 0x80)  // 128
#define xgs3Tap             MakeTag(clsXGesture, 0x81)  // 129
#define xgs4Tap             MakeTag(clsXGesture, 0x82)  // 130
//  Removed xgsNTapDrag
#define xgsPlusTap          MakeTag(clsXGesture, 0x87)  // 135 not generated
#define xgsCheckTap         MakeTag(clsXGesture, 0x88)  // 136
#define xgsTapHold          MakeTag(clsXGesture, 0x89)  // 137
#define xgsPressHold        MakeTag(clsXGesture, 0x8a)  // 138
// deletion
#define xgsCross            MakeTag(clsXGesture, 'X')   //  88 == xgsXGesture
#define xgsPigtailHorz      MakeTag(clsXGesture, 0x8b)  // 139 not generated
#define xgsScratchOut       MakeTag(clsXGesture, 0x8c)  // 140
#define xgsPigtailVert      MakeTag(clsXGesture, 0x8d)  // 141
```

```
// insert/replace
#define xgsCircle           MakeTag(clsXGesture, 'O')   //  79 == xgsOGesture
#define xgsCircleTap        MakeTag(clsXGesture, 0x8e)  // 142
#define xgsUpCaret          MakeTag(clsXGesture, 0x8f)  // 143
#define xgsRightCaret       MakeTag(clsXGesture, 0x90)  // 144 not generated
#define xgsCircleDblTap     MakeTag(clsXGesture, 0x91)  // 145 not generated
#define xgsCircleLine       MakeTag(clsXGesture, 0x92)  // 146
#define xgsCircleFlickUp    MakeTag(clsXGesture, 0x93)  // 147
#define xgsCircleFlickDown  MakeTag(clsXGesture, 0x94)  // 148
#define xgsUpCaretDot       MakeTag(clsXGesture, 0x95)  // 149
#define xgsUpCaretDblDot    MakeTag(clsXGesture, 0x96)  // 150 not generated
#define xgsDblArrow         MakeTag(clsXGesture, 0x97)  // 151 not generated
#define xgsDblCircle        MakeTag(clsXGesture, 0x98)  // 152
// move/copy
#define xgsUpArrow          MakeTag(clsXGesture, 0x99)  // 153
#define xgsUp2Arrow         MakeTag(clsXGesture, 0x9a)  // 154
#define xgsDownArrow        MakeTag(clsXGesture, 0x9b)  // 155
#define xgsDown2Arrow       MakeTag(clsXGesture, 0x9c)  // 156
#define xgsLeftArrow        MakeTag(clsXGesture, 0x9d)  // 157
#define xgsLeft2Arrow       MakeTag(clsXGesture, 0x9e)  // 158
#define xgsRightArrow       MakeTag(clsXGesture, 0x9f)  // 159
#define xgsRight2Arrow      MakeTag(clsXGesture, 0xa0)  // 160
#define xgsDblUpCaret       MakeTag(clsXGesture, 0xa1)  // 161
#define xgsDblDownCaret     MakeTag(clsXGesture, 0xa2)  // 162 not generated
#define xgsUpTriangle       MakeTag(clsXGesture, 0xa3)  // 163 not generated
#define xgsDownTriangle     MakeTag(clsXGesture, 0xa4)  // 164 not generated
#define xgsRightUp          MakeTag(clsXGesture, 0xa5)  // 165
#define xgsRightUpFlick     MakeTag(clsXGesture, 0xa6)  // 166
#define xgsRightDown        MakeTag(clsXGesture, 0xa7)  // 167
// white space
#define xgsCGesture         MakeTag(clsXGesture, 'C')   //  67
#define xgsLLCorner         MakeTag(clsXGesture, 'L')   //  76 "DownRight","LGesture"
#define xgsLLCornerFlick    MakeTag(clsXGesture, 0xa8)  // 168 "DownRightFlick"
#define xgsLRCorner         MakeTag(clsXGesture, 0xa9)  // 169 "DownLeft"
#define xgsLRCornerFlick    MakeTag(clsXGesture, 0xaa)  // 170 "DownLeftFlick"
#define xgsParagraph        MakeTag(clsXGesture, 0xab)  // 171
#define xgsLeftCaret        MakeTag(clsXGesture, 0xac)  // 172 not generated
#define xgsULCorner         MakeTag(clsXGesture, 0xad)  // 173 "UpRight"
// scroll
#define xgsFlickUp          MakeTag(clsXGesture, 0xae)  // 174
#define xgsFlickDown        MakeTag(clsXGesture, 0xaf)  // 175
#define xgsFlickLeft        MakeTag(clsXGesture, 0xb0)  // 176
#define xgsFlickRight       MakeTag(clsXGesture, 0xb1)  // 177
#define xgsDblFlickUp       MakeTag(clsXGesture, 0xb2)  // 178
#define xgsDblFlickDown     MakeTag(clsXGesture, 0xb3)  // 179
#define xgsDblFlickLeft     MakeTag(clsXGesture, 0xb4)  // 180
#define xgsDblFlickRight    MakeTag(clsXGesture, 0xb5)  // 181
#define xgsFlickTapUp       MakeTag(clsXGesture, 0xb6)  // 182 not generated
#define xgsFlickTapDown     MakeTag(clsXGesture, 0xb7)  // 183 not generated
#define xgsFlickTapLeft     MakeTag(clsXGesture, 0xb8)  // 184 not generated
#define xgsFlickTapRight    MakeTag(clsXGesture, 0xb9)  // 185 not generated
#define xgsTrplFlickUp      MakeTag(clsXGesture, 0xba)  // 186
#define xgsTrplFlickDown    MakeTag(clsXGesture, 0xbb)  // 187
#define xgsTrplFlickLeft    MakeTag(clsXGesture, 0xbc)  // 188
#define xgsTrplFlickRight   MakeTag(clsXGesture, 0xbd)  // 189
#define xgsQuadFlickUp      MakeTag(clsXGesture, 0xbe)  // 190
#define xgsQuadFlickDown    MakeTag(clsXGesture, 0xbf)  // 191
#define xgsQuadFlickLeft    MakeTag(clsXGesture, 0xc0)  // 192
#define xgsQuadFlickRight   MakeTag(clsXGesture, 0xc1)  // 193
// misc
#define xgsLineCaretRight   MakeTag(clsXGesture, 0xc2)  // 194 not generated
#define xgsLineCaretLeft    MakeTag(clsXGesture, 0xc3)  // 195 not generated
#define xgsLineDblCaret     MakeTag(clsXGesture, 0xc4)  // 196 not generated
```

```
// User-defineable
#define xgsLeftDown         MakeTag(clsXGesture, 0xc5)  // 197
#define xgsLeftUp           MakeTag(clsXGesture, 0xc6)  // 198
#define xgsUpLeft           MakeTag(clsXGesture, 0xc7)  // 199
// Undo
#define xgsVertCounterFlick MakeTag(clsXGesture, 0xc8)  // 200
#define xgsHorzCounterFlick MakeTag(clsXGesture, 0xc9)  // 201
#define xgsInfinity         MakeTag(clsXGesture, 0xca)  // 202 not generated
#define xgsCircleCrossOut   MakeTag(clsXGesture, 0xcb)  // 203
// Borders On
#define xgsBordersOn        MakeTag(clsXGesture, 0xcc)  // 204
#define xgsAsterisk         MakeTag(clsXGesture, '*')   // not generated
// Capital letters gestures
#define xgsAGesture         MakeTag(clsXGesture, 'A')   //  65
#define xgsBGesture         MakeTag(clsXGesture, 'B')   //  66
// for xgsCGesture see above                               67
#define xgsDGesture         MakeTag(clsXGesture, 'D')   //  68
#define xgsEGesture         MakeTag(clsXGesture, 'E')   //  69
#define xgsFGesture         MakeTag(clsXGesture, 'F')   //  70
#define xgsGGesture         MakeTag(clsXGesture, 'G')   //  71
#define xgsHGesture         MakeTag(clsXGesture, 'H')   //  72
#define xgsIGesture         MakeTag(clsXGesture, 'I')   //  73
#define xgsJGesture         MakeTag(clsXGesture, 'J')   //  74
#define xgsKGesture         MakeTag(clsXGesture, 'K')   //  75
// for xgsLGesture see xgsLLCorner, above                  76
#define xgsMGesture         MakeTag(clsXGesture, 'M')   //  77
#define xgsNGesture         MakeTag(clsXGesture, 'N')   //  78
#define xgsOGesture         MakeTag(clsXGesture, 'O')   //  79 == xgsCircle
#define xgsPGesture         MakeTag(clsXGesture, 'P')   //  80
#define xgsQGesture         MakeTag(clsXGesture, 'Q')   //  81
#define xgsRGesture         MakeTag(clsXGesture, 'R')   //  82
#define xgsSGesture         MakeTag(clsXGesture, 'S')   //  83
#define xgsTGesture         MakeTag(clsXGesture, 'T')   //  84
#define xgsUGesture         MakeTag(clsXGesture, 'U')   //  85
#define xgsCheck            MakeTag(clsXGesture, 'V')   //  86 == xgsVGesture
#define xgsVGesture         MakeTag(clsXGesture, 'V')   //  86 == xgsCheck
#define xgsWGesture         MakeTag(clsXGesture, 'W')   //  87
#define xgsXGesture         MakeTag(clsXGesture, 'X')   //  88 == xgsCross
#define xgsYGesture         MakeTag(clsXGesture, 'Y')   //  89
#define xgsZGesture         MakeTag(clsXGesture, 'Z')   //  90
#define xgsQuestion         MakeTag(clsXGesture, '?')   //  63
// graphic gestures in geo.ptc - currently not implemented
#define xgsRect             MakeTag(clsXGesture, 0xf0)  // 240 not generated
#define xgsRoundRect        MakeTag(clsXGesture, 0xf1)  // 241 not generated
#define xgsSpline           MakeTag(clsXGesture, 0xf2)  // 242 not generated
#define xgsPolyline         MakeTag(clsXGesture, 0xf3)  // 243 not generated
#define xgs0TapHold         xgsPressHold
#define xgs1TapHold         xgsTapHold
#define xgs2TapHold         MakeTag(clsXGesture, 0xf4)  // 244
#define xgs3TapHold         MakeTag(clsXGesture, 0xf5)  // 245
#define xgs4TapHold         MakeTag(clsXGesture, 0xf6)  // 246
```

Output Data Structure

Information returned in an xlist.

```
typedef struct XLATE_GDATA {
    U32 gType;      // gesture code (one of the 32-bit values defined above)
    XY32 hotPoint;  // target point in window coordinates
} XLATE_GDATA, *P_XLATE_GDATA;
```

Messages

msgNewDefaults:

Sets default values in XLATE_NEW structure for a gesture recognizer

Takes P_XLATE_NEW, returns STATUS.

Comments

Sets

```
pArgs->xlate.metrics.charCount = 1;
pArgs->xlate.metrics.lineCount = 1;
```

and all other values to 0

msgNew:

Creates a new Gesture translation object.

Takes P_XLATE_NEW, returns STATUS.

Comments

Note: sets the XLATE_NEW.mode to **xlGesture**, regardless of the value passed in via **pArgs**.

Notification Messages

msgXGestureComplete:

Hook for subclasses to postprocess the results of gesture recognition.

Takes NULL, returns STATUS.

```
#define msgXGestureComplete          MakeTag(clsXGesture, 64)
#endif
```

Comments

Not implemented.

XLATE.H

This file contains part of the API definition for **clsXtract**. For the remainder see xtract.h.

clsXtract inherits from **clsObject.**

Implements basic translation functions for converting pen input, in the form of strokes, to gestures or text characters.

Translators are objects that use pattern recognition techniques to convert pen input to gestures or text characters. There are three stages to the translation process: initialization, control (stroke collection and recognition), and notification (data output).

Since the translation object may preprocess input data as it is received, initialization messages should be sent before any strokes are added to the object. Initialization messages establish the rules for translation.

Control messages are used by the client to communicate specific information regarding the state of the translation as it pertains to the input stroke stream.

Notification messages are used by the translation object to notify the client as to the current state of the translation process.

For historical reasons messages and data types relating to translation are defined in terms of two class names: **clsXlate** and **clsXtract**. Conceptually, **clsXlate** is an abstract class (a class with no default behavior, i.e. no methods) and **clsXtract** is a subclass of **clsXlate** which implements methods for a large number of messages. As implemented, however, there is no such class as **clsXlate** in PenPoint 1.0. When PenPoint boots, **clsXlate** is not installed in the class hierarchy, and **clsXtract** is installed as a subclass of **clsObject**.

The **clsXtract/clsXlate** does not implement enough behavior to be used directly as a translator. Rather translation objects should be created as instances of one of the following subclasses:

clsXGesture for gestures

clsXText for letters with minimal language support

clsXWord for letters as part of normal American English

clsXTeach for letters when the application is to train therecognition engine. (It is not possible to train gestures)

See Also xtract.h, xgesture.h, xtext.h, xword.h, xteach.h

```
#ifndef XLATE_INCLUDED
#define XLATE_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef XLIST_INCLUDED
#include <xlist.h>
#endif
#ifndef SPELL_INCLUDED
#include <spell.h>
#endif
```

Common #defines and typedefs

Internal Constants

The following are used globally by the translation object.

```
#define xltCharWordTerminator ('\0')  // standard string terminator
#define xltCharSpace           (' ')  // character code for space
#define xltCharDotlessI       (0x80)  // character code for dotless i (private)
#define xltCharDotlessJ       (0x81)  // character code for dotless j (private)
#define xltCharUnknownDefault (0x15)  // default "meatball" for unrecognized char
#define xltMaxWordLength        (32)    // buffer size for word translations
typedef struct POINT {
   S16 x, y;
} POINT, * P_POINT; // internal representation of a digitizer point
```

Status Values

The translation object may return the following status values.

```
#define stsXlateBufferOverflow  MakeStatus(clsXlate, 1)
#define stsXlateBadProtoFile    MakeStatus(clsXlate, 2)
#define stsXlateBadTransFile    MakeStatus(clsXlate, 3)
#define stsXlateBadTrigramFile  MakeStatus(clsXlate, 4)
#define stsXlateInputTruncated  MakeNonErr(clsXlate, 1)
```

Creation Messages

Characteristics of the insertion pad.

```
typedef struct XLATE_METRICS {
    U16 lineCount;      // number of lines (0 = indeterminate)
    U16 charCount;      // number of character columns (0 = indeterminate)
    SIZE32 charBox;     // size of character box (height and width)
    S32 baselineOffset; // baseline offset to bottom of char box (if charCount != 0)
    XY32 origin;        // origin of insertion pad in digitizer coordinates
} XLATE_METRICS, *P_XLATE_METRICS;
```

When "case smarts" are turned on (i.e. **xltSmartCaseDisable** hwx flag is OFF), the translation object will ignore the case in which the user wrote the input and will instead figure out the correct capitalization based on the settings in XLATE_CASE_METRICS. XLATE_CASE_TYPE tells the type of capitalization rules which the translation string should be made to obey. "No rules" means make everything lower case.

```
typedef enum XLATE_CASE_TYPE {
    xcmNone,    // Don't capitalize anything, force it all to lower case
    xcmSentence,// Capitalize first letter of each sentence, etc
    xcmField    // Capitalize as per XLATE_CASE_METRICS.context.field
} XLATE_CASE_TYPE, * P_XLATE_CASE_TYPE;
```

If the writer is a mixed case writer, then he/she is presumed to write both upper case and lower case shapes. An AllCapsWriter, on the other hand, will only write upper case shapes, never lower case shapes. This knowledge can help the shape recognizer by limiting the number of alternatives it has to choose from. This does not mean, however, that the translation will be all upper case, for it is the job of "case smarts" to convert the translation to the correct case.

```
typedef enum XLATE_CASE_WRITER {
    xcmMixedCaseWriter,     // Writer writes both upper and lower case shapes
    xcmAllCapsWriter,       // Writer writes in all upper case shapes
} XLATE_CASE_WRITER, * P_XLATE_CASE_WRITER;
```

```
typedef enum XLATE_CASE_FIELD {
    xcmOneInitialCapField,  // capitalize first letter in the field
    xcmAllInitialCapsField, // capitalize first letter in each 'word'
    xcmAllCapsField,        // captialize all letters in the field
} XLATE_CASE_FIELD, * P_XLATE_CASE_FIELD;
typedef struct XLATE_CASE_METRICS {
    XLATE_CASE_TYPE     type;       // type of rule to use
    XLATE_CASE_WRITER   writer;     // type of input to expect
    union {
        SPELL_CASE_CONTEXT sentence;// specific rules if type is xcmSentence
        XLATE_CASE_FIELD field;     // specific rules if type is xcmField
    } context;
} XLATE_CASE_METRICS, * P_XLATE_CASE_METRICS;
typedef struct XLATE_NEW_ONLY {
    U32                 hwxFlags;           // xlate rules (see msgXlateSetFlags)
    U16                 charConstraints;    // constrained char set flags
    XLATE_METRICS       metrics;            // insertion pad parameters
    P_UNKNOWN           pTemplate;          // compiled XTemplate; pNull if none.
    XLATE_CASE_METRICS  xlateCaseMetrics;   // case post-processing controls.
} XLATE_NEW_ONLY, *P_XLATE_NEW_ONLY;
typedef struct XLATE_NEW {
    OBJECT_NEW_ONLY     object;
    XLATE_NEW_ONLY      xlate;
} XLATE_NEW, *P_XLATE_NEW;
```


msgNewDefaults:

Initializes the XLATE_NEW structure to default values.

Takes P_XLATE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct XLATE_NEW {
    OBJECT_NEW_ONLY     object;
    XLATE_NEW_ONLY      xlate;
} XLATE_NEW, *P_XLATE_NEW;
```

Comments

The default values are 0 for everything.

This message should, of course, be sent to one of the subclasses of **clsXtract**, not to **clsXlate**, since **clsXlate** is a fiction, and not to **clsXtract**, since **clsXtract** does not implement the complete behavior needed to do translation.

msgNew:

Creates a new translation object.

Takes P_XLATE_NEW, returns STATUS. Category: class message.

Message Arguments

```
typedef struct XLATE_NEW {
    OBJECT_NEW_ONLY     object;
    XLATE_NEW_ONLY      xlate;
} XLATE_NEW, *P_XLATE_NEW;
```

Comments

This message should, of course, be sent to one of the subclasses of **clsXtract**, not to **clsXlate**, since **clsXlate** is a fiction, and not to **clsXtract**, since **clsXtract** does not implement the complete behavior needed to do translation.

msgFree:

Destroys a translation object.

Takes P_NULL, returns STATUS.

Comments

This message should be sent to the object you wish to destroy.

Initialization Messages

The following messages control various settings and modes which govern the way translation is carried out. These messages must all be received by the translator BEFORE any strokes are received by it, since translators are allowed to begin translating "in the background", (i.e. before the input is complete).

msgXlateModeSet:

Sets the mode (i.e. character/code type) of a translation object.

Takes XLATE_MODE, returns STATUS.

```
#define msgXlateModeSet                 MakeMsg(clsXlate, 5)
```

Arguments

```
typedef enum {
    xlCharacter,    // obsolete
    xlText,         // use default text rules (ASCII)
    xlNumber,       // obsolete
    xlGesture,      // use default gesture rules
    xlGeometric     // obsolete
} XLATE_MODE, *P_XLATE_MODE;
```

Comments

The translation object can be configured to processes a variety of character/code types. The mode flag determines the type of character set and default behavior for the object.

msgXlateModeGet:

Gets the mode of a translation object.

Takes P_XLATE_MODE, returns STATUS.

```
#define msgXlateModeGet                 MakeMsg(clsXlate, 10)
```

Message Arguments

```
typedef enum {
    xlCharacter,    // obsolete
    xlText,         // use default text rules (ASCII)
    xlNumber,       // obsolete
    xlGesture,      // use default gesture rules
    xlGeometric     // obsolete
} XLATE_MODE, *P_XLATE_MODE;
```

Comments

The mode was set either at **msgNew** time or by **msgXlateModeSet**.

msgXlateMetricsSet:

Tells translator the dimensions and layout of the writing area.

Takes P_XLATE_METRICS, returns STATUS.

```
#define msgXlateMetricsSet              MakeMsg(clsXlate, 8)
```

Message Arguments

```
typedef struct XLATE_METRICS {
    U16 lineCount;      // number of lines (0 = indeterminate)
    U16 charCount;      // number of character columns (0 = indeterminate)
    SIZE32 charBox;     // size of character box (height and width)
    S32 baselineOffset; // baseline offset to bottom of char box (if charCount != 0)
    XY32 origin;        // origin of insertion pad in digitizer coordinates
} XLATE_METRICS, *P_XLATE_METRICS;
```

Comments

In order to assist the writer and the recognition system, an insertion pad can display guidelines, or "character boxes", that direct the writer in targeting. When character boxes are used, the XLATE_METRICS are used to communicate the physical box information to the translation object. The translator can use this information (when available) to decide how to group the strokes into characters.

Most internal processes key off the **charCount** field. If **charCount** is 0, the translation object assumes that there are no boxes. In that case it will default to a heuristic algorithm that combines information from the shape matching and context processing to estimate the writing baseline and character spacing.

(As an aside, the translation object does not use baseline information when **charCount** is 0. I.e. **lineCount** is ignored in that case.)

If **charCount** > 0, the translation object uses **lineCount** and **charCount** to calculate the number of boxes in the insertion pad. A combination of the **charBox** height and width and the x and y coordinates of the origin are used to define the physical bounds of each box. The translation object then uses this to determine character segmentation.

msgXlateMetricsGet:

Gets metrics of a translation object.

Takes P_XLATE_METRICS, returns STATUS.

```
#define msgXlateMetricsGet              MakeMsg(clsXlate, 16)
```

Message Arguments

```
typedef struct XLATE_METRICS {
    U16 lineCount;      // number of lines (0 = indeterminate)
    U16 charCount;      // number of character columns (0 = indeterminate)
    SIZE32 charBox;     // size of character box (height and width)
    S32 baselineOffset; // baseline offset to bottom of char box (if charCount != 0)
    XY32 origin;        // origin of insertion pad in digitizer coordinates
} XLATE_METRICS, *P_XLATE_METRICS;
```

Comments

The metrics were set in response to either **msgNew** or **msgXlateMetricsSet**.

msgXlateStringSet:

Sets the current textual context for a translation object.

Takes P_XLATE_STRING, returns STATUS.

```
#define msgXlateStringSet               MakeMsg(clsXlate, 12)
```

Arguments

```
typedef struct XLATE_STRING {
    P_CHAR pCurrentText;    // pointer to current text string
    U16 length;             // string length
    S16 startIndex;         // index of first editable character
    S16 endIndex;           // index of last editable character
} XLATE_STRING, *P_XLATE_STRING;
```

Comments

The following structure is used to communicate currently displayed text in the insertion pad. It is only applicable when using boxed insertion pads. The existing textual information must be registered if the translation object is using any string-based knowledge source (such as the dictionary or a template) where positional information within the string is crucial for proper recognition.

It is possible to allow only a portion of the displayed string to be in the insertion pad (and hence, editable). To allow for this, **startIndex** represents the first editable character's position in the string, and **endIndex** represents the last editable characters's position in the string. If the entire string is editable, set **startIndex** = 0 and **endIndex** = string length.

msgXlateSetFlags:

Sets the translation flags.

Takes U32, returns STATUS.

```
#define msgXlateSetFlags                MakeMsg(clsXlate, 14)
// Built-in Rules
#define xltSegmentVeto          flag0   // allow one and only one char per box
#define xltCaseEnable           flag8   // prefer standard rules of capitalization
#define xltAlphaNumericEnable   flag9   // prefer standard grouping of letters and digits
#define xltPunctuationEnable    flag10  // prefer standard use of punctuation
#define xltVerticalEnable       flag14  // take height and vertical position of chars into
account
#define xltSpaceDisable     flag15  // ignore spaces (translate as one string)
#define xltConnectedEnable      flag1   // currently not implemented
// Knowledge Source Controls
#define xltSpellingEnable       flag2   // use dictionary, prefer dictionary words
#define xltSpellingVeto     flag3   // disallow non-dictionary words
#define xltSpellingPropose      flag4   // propose from dictionary when stuck
#define xTemplateEnable     flag5   // use xTemplate, prefer template words
#define xTemplateVeto       flag6   // disallow words not matching template
#define xTemplatePropose    flag7   // propose from template when stuck
// Post-processing Rules
#define xltProofEnable          flag11  // currently not implemented
#define xltAbbrEnable           flag12  // currently not implemented
#define xltExpansionEnable      flag13  // currently not implemented
#define xltSmartCaseDisable    flag16   // DON'T correct the capitalization
// Not currently implemented
#define hwxGeoPolylines     flag24  // currently not implemented
#define hwxGeoSingleLines   flag25  // currently not implemented
#define hwxGeoLinesAlways   flag26  // currently not implemented
```

Comments

The translation flags (**hwxFlags**) govern which of the various scoring rules will be applied in choosing the best translation. They include built-in language rules, choice of assisting knowledge sources (speller, templates), and postprocessing rules, such as sentence-level case correction.

Built-in Rules: The translation object can be directed to use various default language rules to assist recognition. When a flag is turned on, the translator will show a preference for translations which obey the rule associated with that flag. For example if **xltCaseEnable** is on, the translator will show a preference for words that are either all lower case, all upper case or all lower case except the first letter.

Knowledge Source Controls: The translation object can be directed to use spelling and/or template information in order to assist recognition. Each of these knowledge sources, when it is turned on, has a choice of four modes of operation:

Enable, Enable+Veto, Enable+Propose and Enable+Veto+Propose.

The Enable flag must be ON in all four cases. This enables the use of the knowledge source and causes the translator to show a preference for words which conform to the source (i.e. are in the dictionary or match the template). If the Veto flag is also on, then the translator will ONLY consider translations which conform to the source and will reject all translations which do not. If the Propose flag is also on, it allows the translator to change some letters if it will result in a translation which conforms to the knowledge source even if the raw shape matcher did not suggest those letters.

Post-processing Rules: The translation object can apply post-processing rules to assist error-checking and proofing (spell correction). The only processing that is currently implemented is the "smart case" capability. This capability calls for the translator to use linguistic rules to correct the capitalization of the translation. This correction is always applied unless it is disabled by turning the **smartCaseDisable** flag on.

msgXlateGetFlags:

Gets the translation flags of an object.

Takes P_U32, returns STATUS.

```
#define msgXlateGetFlags                MakeMsg(clsXlate, 17)
```

Comments

The translation flags are also called the **hwxFlags**.

msgXlateFlagsClear:

Clears the given set of translation flags.

Takes U32, returns STATUS.

```
#define msgXlateFlagsClear              MakeMsg(clsXlate, 15)
```

Comments

Performs the operation

```
hwxFlags &= ~pArgs;
```

thus turning OFF all flags which are ON in **pArgs** and leaving unchanged those flags which are OFF in pArgs.

msgXlateCharConstrainsSet:

Sets the character constraints of a translation object.

Takes P_U16, returns STATUS.

```
#define msgXlateCharConstraintsSet      MakeMsg(clsXlate, 11)
#define xltDisableUpperCase flag0   // disallow A thru Z
#define xltDisableLowerCase flag1   // disallow a thru z
#define xltDisableNumerals      flag2   // disallow 0 thru 9
#define xltDisableCommonPunct   flag3   // disallow .,'!?;:%$#+-*()"=/
#define xltDisableOtherPunct    flag4   // disallow all other punctuation
```

Comments

Character constraints impose limits on the shapes that the writer is allowed to write. Setting the flag when appropriate may improve translation accuracy or performance since the shape matcher will know that it does not need to consider certain shapes as possibilities.

For example, a numeric-only translator can be constructed by setting all of the disable flags except for **xltDisableNumerals**.

Note that character constraints do not restrict the case of the translation string if "case smarts" are on. For example, case smarts may force the translation to be all lower case letters even if the **xltDisableLowerCase charConstraint** flag is set.

msgXlateCharConstrainsGet:

Gets the character constraints of a translation object.

Takes P_U16, returns STATUS.

```
#define msgXlateCharConstraintsGet      MakeMsg(clsXlate, 18)
```

Comments

The **charConstraints** were set in response to either **msgNew** or **msgXlateCharConstraintsSet**

msgXlateTemplateGet:

Gets the template for a translation object.

Takes PP_UNKNOWN, returns STATUS.

```
#define msgXlateTemplateGet             MakeMsg(clsXlate, 13)
```

Comments Will return in *pArgs a pointer to the compiled template currently in effect for the translator.

msgXlateTemplateSet:

Sets the template for a translation object.

Takes P_UNKNOWN, returns STATUS.

```
#define msgXlateTemplateSet             MakeMsg(clsXlate, 9)
```

Comments The **pArg** should be a pointer to the "compiled" template created by calling the function XTemplateCompile() defined in xtemplt.h

msgXlateCharMemorySet:

Sets the current Character memory for character box mode.

Takes P_CHARACTER_MEMORY, returns STATUS.

```
#define msgXlateCharMemorySet           MakeMsg(clsXlate, 22)
```

Arguments

```
typedef struct CHARACTER_MEMORY {
    U16 position;                       // position in the string
    P_CHAR usedCharacters;          // list of characters already used
} CHARACTER_MEMORY, *P_CHARACTER_MEMORY;
```

Comments In "boxed" mode (which typically is used when editing a short string), the translation object can accept a list of characters already attempted in this position. This is used to allow ambiguous character shapes to be translated differently on overwrite.

For example, a writer attempting to enter a lower case "L" may want to avoid repeatedly entering a straight vertical stroke and receiving a numeral "1" as the translation. The character memory feature allows a client that keeps track of previously overwritten text to pass this information to the translation object. The translation object will then disallow any character in the "already tried" string.

This feature is implemented only for single character entries. The Position field refers to the position of the character in the XLATE_STRING **pCurrentText** string. Setting character memory for more than one position for a single translation will result in the character memory being ignored in all positions.

msgXlateCharMemoryGet:

Gets the current Character memory for character box mode.

Takes P_CHARACTER_MEMORY, returns STATUS.

```
#define msgXlateCharMemoryGet           MakeMsg(clsXlate, 27)
```

Message Arguments

```
typedef struct CHARACTER_MEMORY {
    U16 position;                       // position in the string
    P_CHAR usedCharacters;          // list of characters already used
} CHARACTER_MEMORY, *P_CHARACTER_MEMORY;
```

Comments This message is intended for use by subclasses.

msgXlateSetXlateCaseMetrics:

Sets the "smart case" metrics.

Takes P_XLATE_CASE_METRICS, returns STATUS.

```
#define msgXlateSetXlateCaseMetrics     MakeMsg(clsXlate, 26)
```

Message Arguments

```
typedef struct XLATE_CASE_METRICS {
    XLATE_CASE_TYPE     type;       // type of rule to use
    XLATE_CASE_WRITER   writer;     // type of input to expect
    union {
        SPELL_CASE_CONTEXT sentence;// specific rules if type is xcmSentence
        XLATE_CASE_FIELD field;     // specific rules if type is xcmField
    } context;
} XLATE_CASE_METRICS, * P_XLATE_CASE_METRICS;
```

Comments

The translation object can be directed to use Case (capitalization) heuristics above and beyond the basic **xltCaseEnable** heuristics set in the xlate flags. These rules are communicated via the XLATE_CASE_METRICS structure. They are applied in a post-processing pass by the translator, whereas the **hwxFlags** are applied during the initial search for a good translation.

These rules set expectations for input (writer style) as well as output format. The writer (CASE_WRITER) field prepares the system for the type of input, allowing either mixed case or all upper case input. The type (CASE_TYPE) field sets the style of heuristics. The context field sets the specific rules to implement.

See spell.h for definitions for SPELL_CASE_CONTEXT.

msgXlateGetXlateCaseMetrics:

Gets the "smart case" metrics.

Takes P_XLATE_CASE_METRICS, returns STATUS.

```
#define msgXlateGetXlateCaseMetrics     MakeMsg(clsXlate, 25)
```

Message Arguments

```
typedef struct XLATE_CASE_METRICS {
    XLATE_CASE_TYPE     type;       // type of rule to use
    XLATE_CASE_WRITER   writer;     // type of input to expect
    union {
        SPELL_CASE_CONTEXT sentence;// specific rules if type is xcmSentence
        XLATE_CASE_FIELD field;     // specific rules if type is xcmField
    } context;
} XLATE_CASE_METRICS, * P_XLATE_CASE_METRICS;
```

Comments

Returns the values that were set either at **msgNew** time or by **msgXlateSetXlateCaseMetrics**.

msgXlateGetHistoryTemplate:

Gets the current alternate Translation Template.

Takes PP_UNKNOWN, returns STATUS.

```
#define msgXlateGetHistoryTemplate      MakeMsg(clsXlate, 23)
```

Comments

There is no behavior of class xlate associated with the history template other than to respond to the Set and Get messages. It may used by the client to implement a "history" or cache mechanism, allowing the system to "remember" things previously translated.

msgXlateSetHistoryTemplate:

Sets the current alternate Translation Template.

Takes P_UNKNOWN, returns STATUS.

```
#define msgXlateSetHistoryTemplate      MakeMsg(clsXlate, 24)
```

Control Messages

msgXlateComplete:

Initiates completion of translation after input is complete.

Takes NULL, returns STATUS.

```
#define msgXlateComplete                MakeMsg(clsXlate, 3)
```

Comments

Obsolete. See **msgXtractComplete** in xtract.h.

Not to be confused with **msgXlateCompleted** (see below).

Other control messages are defined in xtract.h. In general, the client does not need to play an active role in sending or receiving control messages.

Notification Messages

msgXlateData:

Allows a client to read the results from a translation object.

Takes P_XLATE_DATA, returns STATUS.

```
#define msgXlateData                    MakeMsg(clsXlate, 2)
```

Arguments

```
typedef struct XLATE_DATA {
    OS_HEAP_ID heap;        // In: heap to allocate structures
    struct XLIST *pXList;   // Out: pointer to return info
} XLATE_DATA, *P_XLATE_DATA;
typedef struct XLATE_BDATA {        //
    RECT32  box;                    // bounding information
    S32     baseline;               // baseline offset
} XLATE_BDATA, *P_XLATE_BDATA;
typedef struct WORD_ENTRY {         // structure for a word
   S16  score;                      // confidence factor
   CHAR string[xltMaxWordLength];       // word
} WORD_ENTRY, *P_WORD_ENTRY;
typedef struct WORD_LIST {          // structure for a list of words
   RECT32       bound;              // bounding information
   U16          count;              // number of words in list
   WORD_ENTRY   word[1];            // variable length array of words
} WORD_LIST, *P_WORD_LIST;
```

Comments

The client reads the translation results from the translation object via this message.

The translation object fills in the clients xlist data with the output data. The specific xlist type is dependent upon the specific translation class. Please refer to xlist.h for the information on each translation class.

The output data is only available upon completion of the translation process. Partial data cannot be read before the client has received the completion notification message (**msgXlateCompleted**) from the translation object (see below).

The output data is a read-once function. That is, you cannot send **msgXlateData** twice to the same translator. All translation object internal resources pertaining to the translated data are freed during the reading process.

This message must be sent to an instance of one of the subclasses of **clsXtract**, such as **clsXText** or **clsXGesture**. The **clsXtract** itself does not implement any behavior for this message.

msgXlateCompleted:

Notification to client that the translation has been completed.

Takes OBJECT, returns STATUS.

```
#define msgXlateCompleted                MakeMsg(clsXlate, 128)
```

Comments

This notification is sent by the translation object to its observers to inform them that translation is completed. Upon receiving this message the client should send **msgXlateData** (see above) back to the translator to read the output.

The **pArgs** is the id of the translator.

XLFILTER.H

This file contains the API definition for some of the xlist filters. xlist filters provide a mechanism to alter the contents of an xlist.

Xlists are a dynamic list of dynamic items. Their API is defined in the file xlist.h. This file simply defines a filter function to operate on the xlist. This function should have probably been included in the file xlist.h.

See Also xlist.h

```
#ifndef XLFILTER_INCLUDED
#define XLFILTER_INCLUDED
#ifndef XLIST_INCLUDED
#include <xlist.h>
#endif
```

XList2Text

Converts a translator xlist to lines of **xtText** & **xtBounds**.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XList2Text(
    P_XLIST pXList);
```

Comments

Converts xlist of the form:

[xtBounds **xtTextWord** [xtTextWord]] **xtTextListEnd**

into:

[xtBounds **xtText**]

where **xtText** is the space delimited **xtTextWords**.

Sets the **xlfXList2Text** flag in the xlist to indicate that the filter has been executed on this list. A subsequent invocation of XList2Text with this flag set will return **stsOK** without processing any data. Turning this flag off will cause another pass over the data. This will have no side affects.

See Also xlist.h

XLIST.H

This file contains the API definition for xlist. Xlists provide a set of dynamic list routines used by translators.

The functions described in this file are contained in XLIST.LIB.

An xlist is a set of routines for manipulating a list of items of data type P_XLIST_ELEMENT. These items are allocated from a heap passed into the xlist when it is created. Elements have some flag settings, a data type, and a pointer. The pointer points to data defined by the data type, whose allocation is dependent on the flag settings.

Elements in the list are indexed from 0 to entries-1. A series of functions are provide to create and destroy lists, traverse lists, access and set list elements, insert new elements, and delete elements.

In addition, functions are provided to "filter" data from the xlist. These filters either extract useful data from the xlist in the form of a data structure, or actually "mutates" the xlist into an xlist of a different format. These filters are defined in this file and in xlfilter.h.

Xlists of various types are used throughout the system. Primarily, they are used to pass translation information between the hwx system and the client. See xlate.h for example uses in the hwx engine; and gwin.h, spaper.h, or insert.h for example uses inside the UI toolkit.

Typical users create xlists (XListNew), add and delete items (XListInsert, XListDelete), access the value of items (via filters or XListGet), traverse (XListTraverse) and free them (XListFree). Other functions, while useful, are rarely used.

Xlists have associated with them a heap with which use to allocate the memory needed to store the elements (P_XLIST__ELEMENT). They can also use this heap to allocate space for the data pointer field of an element, when the corresponding elements flag setting is **xfHeapAlloc**. In this situation, the element data pointer will be freed when the xlist is freed, or when XListFreeData is called. Allocating other memory off the xlist heap, although not recommended, is possible. It would be the clients responsibility to free this data. However, typically the user of an xlist will allocate space for the data pointer off of the heap using XListAlloc, insert an element into the xlist with the data, and allow the xlist to manage and free the memory.

```
#ifndef XLIST_INCLUDED
#define XLIST_INCLUDED

#ifndef GO_INCLUDED
#include <go.h>
#endif

#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif

#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif

#ifndef GEO_INCLUDED
#include <geo.h>
#endif
```

Common #defines and typedefs

Xlist Data Structure

A pointer to an xlist is a pointer to a private data structure. This pointer is passed to the xlist function to create, destroy, and manipulate xlists.

```
typedef P_UNKNOWN P_XLIST;
```

Xlist Flags

These flags are stored in the xlist. They are useful to store xlist specific data. flag0 through flag15 are reserved for GO internal use, while flag16 through flag31 is for client use. The only flag currently used indicates that XList2Text has been run on the xlist. This optimizes successive calls to this xlist filter, allowing it to return without running the filter. Running the filter a second time, because the flag is clear, is harmless.

```
#define xflXList2Text   flag0
```

Element Types

These are the data types for elements of an xlist. An element contains a type, a data pointer and flags. For each data type, the data pointer varies.

```
Enum16(XTYPE) {
    xtNull,          // pData = null = 0
    xtBounds,        // pData = P_BDATA (clsXGesture, clsXText)
    xtGesture,       // pData = P_GDATA (clsXGesture)
    xtText,          // pData = P_STRING (clsXText, XList2Text)
    xtObject,        // pData = OBJECT
    xtBoundsX,       // pData = P_BDATA (screen relative)
    xtCharAttrs,     // pData = P_XLIST_CHAR_ATTRS (txtxlist.h)
    xtParaAttrs,     // pData = P_XLIST_PARA_ATTRS (txtxlist.h)
    xtTabs,          // pData = P_XLIST_TABS (txtxlist.h)
    xtCharPos,       // pData = TEXT_INDEX
    xtTextList,      // pData = P_WORD_LIST (hwx)
    xtSpare1,        // pData =
    xtSpare2,        // pData =
    xtSpare3,        // pData =
    xtSpare4,        // pData =
    xtGeometric,     // pData = P_XGEO_DATA unused
    xtTextListEnd,   // pData = NULL (sPaper)
    xtTextWord,      // pData = P_XTEXT_WORD (xtext) (clsXtext, sPaper)
    xtStroke16,      // pData = P_SPAPER_STROKE_DATA (spaper)
    xtSpace,         // pData = U32 unused
    xtTeachData,     // pData = P_XTEACH_DATA (xteach)
    xtUID,           // pData = UID of the gesture object
    xtEmbedObject,   // pData = P_TEXT_EMBED_OBJECT (txtdata.h)
    xtExtended,      // pData = UID,client data
    xtLastEntry      // last entry in the xtList
};
```

Xlist Element

This data structure defines an element in an xlist. An xlist element contains some flags, a data type, and a pointer to some data. The allocation and type of data depend on both the flags and the data type of the element.

```
typedef struct XLIST_ELEMENT {
    U16 flags;              // Element flags. Mostly allocation information.
    XTYPE type;             // Type of data in pData
    P_UNKNOWN pData;        // Pointer to data of element
} XLIST_ELEMENT,  *P_XLIST_ELEMENT;
```

Element Flags

These flags are stored in the XLIST_ELEMENT flags, and indicate information about the elements. They can be changed dynamically simply by accessing the xlist element. Other flags not used are reserved for future use.

Allocation flags

These flags indicate how to treat memory for the element. They indicate how the element will be freed when the xlist is freed, and how to allocate space for the element when duplicated via XListDup (cannot duplicate **xfObject**). Setting more than one of these flags will have unpredictable results, as these are mutually exclusive flags.

```
#define xfHeapAlloc     flag0       // Allocated from the xlist heap
#define xfObject        flag1       // Element is an object. Cannot duplicate
#define xfXList         flag14      // Element is a P_XLIST
```

This flag indicates that the elements data is used elsewhere, and should not be freed when freeing the xlist. It will be the clients responsibility to free the data if he sets this flag.

```
#define xfExtracted     flag15      // Set if the data is used elsewhere
```

Traversal function

This callback function is used to as a function template called on elements of the xlist when traversing the xlist. See XListTraverse for more details. This function takes an xlist, an xlist element, and a user defined data pointer.

Function Prototype

```
typedef STATUS FunctionPtr(P_XPROC) (
    P_XLIST pXlist,
    P_XLIST_ELEMENT pElement,
    P_UNKNOWN pUserData);
```

Public Functions

XListNew

Creates a new xlist.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListNew(
    OS_HEAP_ID heap,            // In: heap to allocate the xlist
    P_XLIST *ppXList);          // Out: Pointer to the P_XLIST
```

Comments

Creates and allocates an xlist from the specified heap, using the heap to allocate space for the P_XLIST_ELEMENT entries in the list, and for XListAlloc.

XListFree

Frees an xlist and all its data.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListFree(
    P_XLIST pXList);        // In: xlist to free
```

Comments

Traverses the xlist elements and frees the data (unless the element has **xfExtracted** set). For each element, frees the memory appropriately by traversing the xlist with function XListFreeData.

See Also

XListFreeData

XListGetFlags

Passes back the XList flags for the xlist.

Returns STATUS.

Function Prototype
```
STATUS  PASCAL XListGetFlags(
    P_XLIST pXList,         // In: xlist to get the flags from
    P_U32   pFlags);        // Out: pointer to the flags
```

Comments

flag0 through flag15 are reserved for GO internal use. flag16 through flag31 are for client use.

XListSetFlags

Sets the XList Flags.

Returns STATUS.

Function Prototype
```
STATUS  PASCAL XListSetFlags(
    P_XLIST pXList,         // In: xlist to set the flags from
    U32 flags);             // In: new flags to set
```

Comments

Sets the flags associated with the xlist. flag0 through flag15 are reserved for GO internal use. flag16 through flag31 are for client use.

XListMetrics

Passes back the number of entries and heap Id.

Returns STATUS.

Arguments
```
typedef struct XLIST_METRICS {
    OS_HEAP_ID heap;
    U16 entries;
} XLIST_METRICS,  *P_XLIST_METRICS;
```

Function Prototype
```
STATUS  PASCAL XListMetrics(
    P_XLIST pXList,             // In: xlist to get the metrics from
    P_XLIST_METRICS pMetrics);  // Out: metrics of the xlist
```

Comments

Passes back the number of entries in the xlist, and the heap used to allocate xlist memory. Note that there is no corresponding 'set' metrics function, as dynamically changing the heap or count would have drastic side affects.

XListInsert

Creates a new element at the index'th location.

Returns STATUS.

Function Prototype
```
STATUS  PASCAL XListInsert(
    P_XLIST pXList,         // In: xlist to insert item into
    U16 index,              // In: index of location to insert at
    P_XLIST_ELEMENT pElem); // In: element to insert
```

Comments

Allocates space for and creates a P_XLIST_ELEMENT in the xlist at the specified location. If index >= entries, the element is appended to the end of the list. The element data pointer allocation and storage depends on the type of the element. The following example shows a client inserting a 7 character string into an xlist. The element type is **xtText** and the insertion at the beginning of the xlist:

```
XLIST_ELEMENT elem;
elem.type = xtText;
elem.flags = xfHeapAlloc;
```

```
XListAlloc(pXList, 7, &elem.pData);
strcpy(elem.pData, "String");
XListInsert(pXList, 0, &elem);
```

XListDelete

Delete the element at the index'th location.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListDelete(
    P_XLIST pXList,     // In: xlist to delete item from
    U16 index);         // In: index of item to delete
```

Comments Delete the element at the specified location. This calls XListFreeData to free any memory taken by the element data pointer. Frees memory associated with storing the P_XLIST_ELEMENT in the xlist.

See Also XListFreeData

XListTraverse

Iterates across the list of elements.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListTraverse(
    P_XLIST pXList,         // In: xlist to traverse
    P_XPROC pProc,          // In: call back function to call for each element
    P_UNKNOWN pUserData);   // In/Out: User defined data pointer
```

Comments Iterates across the elements in the xlist. A callback function (**pProc**) is handed to this function, and is called for each element passing in the element and a client pointer as defined in P_XPROC. If any call to **pProc** returns anything but **stsOK**, the traversal is terminated and the status code returned. Nested traversals are allowed and supported.

See Also XListIndex

XListIndex

Passes back the current traversal index.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListIndex(
    P_XLIST pXList,         // In: pointer to xlist
    P_U16 pIndex);          // Out: current index
```

Comments Passes back the index for the current traversal. If no traversal is taking place, returns 0. Note that if nested traversals are taking place, the index of the current traversal will be returned. Once the sub-traversal is completed, the parent traversals index is restored and returned appropriately via calls to XListIndex.

See Also XListTraverse

XListSet

Stores the copy of the index'th element.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListSet(
    P_XLIST pXList,         // In: xlist pointer
    U16 index,              // In: index of element
    P_XLIST_ELEMENT pPtr);  // In: new element to store at location
```

Comments

Stores the passed in element as the element in the specified location. If index is > number of entries, will store in the last item in the list. Care should be taken, as the old item stored in that location is not freed and is the clients responsibility. Useful only if changing an entire item in the xlist. Rarely used.

XListGet

Passes back a copy of the index'th element.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListGet(
    P_XLIST pXList,          // In: xlist pointer
    U16 index,               // In: index of element
    P_XLIST_ELEMENT pPtr);   // Out: Copy of element data.
```

Comments

Passes back a copy of the index'th element. The element, data type, and data pointer will be copied. Hence the data pointer is a direct pointer to the data.

XListGetPtr

Passes back a pointer to the index'th element.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListGetPtr(
    P_XLIST pXList,
    U16 index,
    P_XLIST_ELEMENT *ppPtr);
```

Comments

Passes back a pointer to the index'th element in the xlist. Extreme care should be taken when accessing this pointer, as it is the pointer stored in the xlist. Useful only if the client wishes to change some information about an existing item in the xlist. Rarely used. Note that the data pointer field is the same returned by XListGet.

See Also

XListGet

XListAlloc

Allocate some memory from the XList heap.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListAlloc(
    P_XLIST pXList,          // In: xlist pointer
    SIZEOF size,             // In: size of the requested allocation
    P_UNKNOWN pMem);         // Out: pointer to the allocated memory
```

Comments

Allocates memory off of the xlist heap. Typically used to allocate space for the data pointer of an element that has **xfHeapAlloc** set. Space for such an element data pointer will be freed in XListFreeData, called when the xlist is freed via XListFree, or when the item is deleted via XListDelete. Other memory can be allocated using this function, although it is the clients responsibility to ensure that it is freed.

See Also

XListFreeData

XListFreeData

Releases the data with the given entry.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListFreeData(
    P_XLIST pXList,          // In: xlist pointer
    P_XLIST_ELEMENT pElem,   // In: element to free
    P_UNKNOWN pUserData);    // In: User defined data structure
```

Comments Frees data associated with the passed in element. Returns **stsOK** if **xfExtracted** is set on the element. Frees the memory appropriately if **xfHeapAlloc** is set. Sends **msgFree** to the object if **xfObject** is set. Calls XListFree if **xfXList** is set. Called from XListFree for each element in the xlist, and called from XListDelete when an item is deleted from the xlist.

See Also XListFree

XListDup

Duplicates the contents of one xlist into another.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListDup(
    P_XLIST pSrcXList,       // In: source xlist
    P_XLIST pDestXList);     // In/Out: destination xlist
```

Comments Traverses the source xlist and calls XListDupElement for each item in the source xlist with the destination xlist. If XListDupElement returns a non-stsOK return code for an element in the xlist, the xlist to the point of the return code is copied and the duplication terminated at that point.

See Also XListDupElement

Return Value **stsBadParam** the xlist duplication terminated before completion

XListDupElement

Duplicate the source element, append to the destination.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XListDupElement(
    P_XLIST pXList,
    P_XLIST_ELEMENT pElem,
    P_XLIST pDestXList);
```

Comments Duplicates the element and appends it to the end of the destination xlist. When the element is **xfHeapAlloc**, allocates space for the element from the destination xlist heap, and memcpy's the contents. When the element is **xfXList**, creates a new xlist using the passed in xlist's heap, and duplicates all elements in the xlist. Any other element data type (**xfObject**) is not copy-able and will return **stsBadParam**.

Return Value **stsBadParam** The element type could not be duplicated.

See Also XListDup

Xlist Filters

XList2Gesture

Extracts the gestural information from an xlist.

Returns STATUS.

Arguments

```
typedef struct X2GESTURE {
    U32  msg;               // gesture type
    RECT32  bounds;         // gesture bounding box
    XY32    hotPoint;       // gesture hot point
} X2GESTURE,  *P_X2GESTURE;
```

Function Prototype

```
STATUS  PASCAL XList2Gesture(
    P_XLIST pXList,         // In: xlist to run filter on
    P_X2GESTURE pData);     // Out: converted data structure
```

Comments

Given an xlist containing **xtBounds** followed by **xtGesture**, (the xlist typically returned by the **clsXGesture** translator after completed translation), this function extracts the useful information and stores in a standard c data structure. This function is used internally in **gWin** to convert the gesture translator data structure into a more useful form.

See Also

gwin.h.h.h

XList2StringLength

Passes back the length of the string that XList2String will need.

Returns STATUS.

Function Prototype

```
STATUS  PASCAL XList2StringLength(
    P_XLIST pXList,
    P_U16 pLength);
```

Comments

Computes the necessary length of a string that XList2String will need to copy a string. Includes space for the terminating null character.

XList2String

Extracts the text information from an xlist.

Returns STATUS.

Arguments

```
typedef struct X2STRING {
    U16  count;             // In: buffer size
    P_CHAR pString;     // In: pointer to the buffer
} X2STRING,  *P_X2STRING;
```

Function Prototype

```
STATUS  PASCAL XList2String(
    P_XLIST pXList,         // In: xlist to process
    P_X2STRING pData);      // In: X2String data structure pointer
```

Comments

Converts an **xtBounds/xtText** xlist into a string. Clips the returned string at the passed in count. This string includes a null terminating character. The function takes an xlist of the form:

[xtBounds [xtText]]

and converts it into a string. As an example, suppose the xlist contains:

xtBounds1 xtText1 xtText2 xtText3 xtBounds2 xtText4 xtText5.

This is converted into:

xtText1xtText2xtText3\nxtText4xtText5

More typically, this function called on an xlist that has had adjacent **xtText** entries merged by XList2Text. Typical usage is during processing of an xlist returned from **msgXlateGetData**. Here the client simply wants to know the string returned, so he will call XList2Text, XList2StringLength (unless he knows how big the string will be), and XList2String to get the string.

See Also

XList2Text.h

Debugging Functions

XListDump

Debugging interface for displaying an xlist in the debug log.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XListDump(
    P_XLIST pXList);        // In: array header
```

Comments

When called on an xlist, traverses the elements and displays useful information about the xlist in the debug log. It displays this information by calling a display routine that is dependent on the type of the element. A display routine can be registered for an element type using XListDumpSetup. If no display routine has been provided for an element type, it will display the generic information for the element consisting of the type, the flags, and the element data pointer.

See Also

XListDumpSetup

XListDumpSetup

Sets the xlist debug log display routine by type.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XListDumpSetup(
    XTYPE   type,       // In: xtype to bind this procedure to
    P_XPROC pProc,      // In: function to be called when dumping
    U32  data);         // In: type specific data passed to pProc in traversal
```

Comments

Called to register display routines for xlist element types with the xlist. This display routine will be called when the particular element type traversed when calling XListDump.

See Also

XListDump

XSHAPE.H

This file contains the API for **clsXShape**, a skeletal class designed to be subclassed by particular shape recognition engines. In particular, the GOWrite shape recognizer, **clsCTShape**, is a subclass of clsXShape.

clsXShape inherits from clsOpenServiceObject.

```
#ifndef XSHAPE_INCLUDED
#define XSHAPE_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
#ifndef OSHEAP_INCLUDED
#include <osheap.h>
#endif
#ifndef OPENSERV_INCLUDED
#include <openserv.h>
#endif
```

Terminology change

```
//      NEW NAME (use these)        OLD NAME (avoid using these, from uid.h)
#define theShapeEngines             theHWXEngines
#define theInstalledShapeProfiles   theInstalledHWXProtos
#define clsShapeEngineService       clsHWXEngineService
#define clsShapeProfileInstallMgr   clsHWXProtoInstallMgr
#define msgShapeSvcCurrentChanged   msgHWXSvcCurrentChanged
#define SHAPE_SVC_CURRENT_CHANGED   HWX_SVC_CURRENT_CHANGED
#define P_SHAPE_SVC_CURRENT_CHANGED P_HWX_SVC_CURRENT_CHANGED
```

Common #defines and typedefs

```
#define xsMaxCharList   20  // largest allowable matchArraySize for msgXShapeRecognize
#define xsMaxPath        4  // most strokes allowable to send to msgXShapeRecognize
#define xsMinMatchScore minS16  // worst possible score for translation
#define xsDigitizerResolution 254 // temporary hack. Eventually variable
```

The basic types of shape profile ("resource") data stored in files. This refers to the "alphabet" which the resource is able to recognize, not the use to which the recognized value will be put. In particular a text resource may be used as part of the process of recognizing gestures, since some gestures are upper case letters.

```
Enum16(XS_RESOURCE_TYPE) {
    xsResText       = 0,  // alphabetic (ascii)
    xsResReserved   = 1,  // reserved for use by GO
    xsResGesture    = 2   // gestures
};
```

The types of data structure used to return information from **msgXShapeRecognize**.

```
Enum16(XS_MATCH_TYPE) {
    xsMatchAscii = 1,     // uses XS_ASCII_MATCH data structure
    xsMatchGesture = 2,   // uses XS_GESTURE_MATCH data structure
    xsMatchInternal = 3,  // uses subclass-specific data structure
    xsMatchInternal2 = 4, // uses alternate subclass-specific data structure
};
```

Eight principal compass directions for straight lines.

```
Enum16(XS_DIRECTION) {
    xsRight = 0,
    xsUpRight = 1,
    xsUp = 2,
    xsUpLeft = 3,
    xsLeft = 4,
    xsDownLeft = 5,
    xsDown = 6,
    xsDownRight = 7,
    // Special indicators
    xsAllDirections = 8,  // used internally
    xsDirEndMark = 9      // marks end of array of directions
};
#define xsNumDirections  (8)
#define XSNextDirectionCCW(d) (((d) + 1) & 7)
#define XSNextDirectionCW(d) (((d) - 1) & 7)
#define XSOppositeDirection(d) ((d) ^ 4)
#define XSDeltaDirection(start, end) (((end) - (start)) & 7)
#define XSDeltaDirectionAdd(start, delta) (((start) + (delta)) & 7)
```

The following structures capture basic information about strokes (a stroke being a sequence of points passed through by the pen). See **msgXShapeStrokePreview** for further details.

```
typedef struct XS_OCTAGON {
   S16 limit[xsNumDirections]; // max projection in each direction
} XS_OCTAGON, * P_XS_OCTAGON;
```

Data structure for returning information about recognition of an ascii character from **msgXShapeRecognize**.

```
typedef struct XS_ASCII_MATCH {
    S16 score;       // "penalty" for the match
    U8 character;    // ascii code of proposed translation
    U8 segmentOffset;// reserved for GO. msgXShapeRecognize should set to 0
} XS_ASCII_MATCH, *P_XS_ASCII_MATCH;
```

Data structure for returning information about recognition of a gesture from **msgXShapeRecognize**.

```
typedef struct XS_GESTURE_MATCH {
    S16 score;       // "penalty" for the match
    U32 gestureId;   // proposed translation (id codes defined in xgesture.h)
    POINT hotPoint;  // coordinates of target point of the gesture
} XS_GESTURE_MATCH, *P_XS_GESTURE_MATCH;
```

Data structure for returning information about recognition of a straight line or a dot. Used by the GO context level processing to aid in segmentation. These scores are calculated by the GO context engine; they should not be calculated or used by 3rd party shape engine developers.

```
typedef struct XS_LD_MATCH {
    S16 dotScore;    // Score for a dot.
    S16 lineScore02; // Score for horiz/vert line
    S16 lineScore13; // Score for forw/backw slanted line
} XS_LD_MATCH, *P_XS_LD_MATCH;
```

The XS_STROKE record holds information pertinent to a single stroke. PenPoint computes all fields of this structure except **pData** and **numData**. The latter two are (optionally) computed by the shape matching engine. They are intended to hold whatever information the shape matcher wishes to extract from a single individual stroke.

```
typedef struct XS_STROKE {
    struct XS_STROKE *pNextStroke;// pointer to next stroke
    struct XS_STROKE *pPrevStroke;// pointer to previous stroke
    U16 strokeId;          // a unique identifier of this stroke
    struct POINT *pPoint; // arr of digitizer points (pendown to penup)
    U16 numPoints;         // number of digitizer points (excl. end marker)
    XS_OCTAGON bound;         // bounds of this stroke
    P_UNKNOWN pData;       // subclass-specific data extracted from stroke
    U16 numData;           // subclass-specific counter for pData
    XS_ASCII_MATCH
        asciiMatch[xsMaxCharList];// cached results of single stroke recog.
    XS_LD_MATCH ldMatch;           // scores for line and dot matches
} XS_STROKE, *P_XS_STROKE;
```


Initialization Messages

msgNewDefaults:

Initializes the XSHAPE_NEW structure to default values.

Takes P_XSHAPE_NEW, returns STATUS. Category: class message.

Comments

Zeros out **pArgs**->xshape and sets

```
pArgs->xshape.resType = xsResText;
pArgs->xshape.resolution = xsDigitizerResolution;
```

msgNew:

Creates a new shape matching object.

Takes P_XSHAPE_NEW, returns STATUS. Category: class message.

Arguments

```
typedef struct XSHAPE_NEW_ONLY {
    P_UNKNOWN pProfile;    // ptr to data in subclass specific format
    U16 numProfile;        // how many records (e.g. if pProfile pts to array)
    XS_RESOURCE_TYPE resType; // type of profile:  xsResText, resGesture
    OBJECT profDirHandle;  // handle to directory where profile resides
    S16 resolution;        // digitizer granularity (dots per inch)
    S16 charConstraints;   // flags to set restricted character sets
    S16 reserved16;        // pad for now
    U32 reserved[9];       // may be used in future
} XSHAPE_NEW_ONLY, *P_XSHAPE_NEW_ONLY;
typedef struct XSHAPE_NEW {
    openServiceObjectNewFields \
    XSHAPE_NEW_ONLY     xshape;
} XSHAPE_NEW, *P_XSHAPE_NEW;
```

Comments

This message is sent to the xshape subclass by the service manager when someone has requested a new shape matching engine. The service manager has filled in all of the xshape fields. In responding to this message it is merely necessary to copy the fields of xshape_new data into the new object's private instance data.

msgFree:

Destroys the object, releasing any memory associated with the translation.

Takes **pNull**, returns STATUS.

Comments

If any heaps were created in response to **msgNew**, this is the time to destroy them. NOTE: This is NOT the place to free memory occupied by the data pointed to by **pProfile**. That memory was allocated by your service class in response to **msgXShapeSvcCurrentChanged** and should only be free in response to the next occurrence of the same message.

Control Messages

msgXShapeStrokePreview:

Computes and stores data relating to a single stroke

Takes P_XSHAPE_STROKE_PREVIEW, returns STATUS.

```
#define msgXShapeStrokePreview                  MakeMsg(clsXShape, 3)
```

Arguments

```
typedef struct XSHAPE_STROKE_PREVIEW {
    P_XS_STROKE pFirstStroke;     // IN: pointer to stroke record
} XSHAPE_STROKE_PREVIEW, *P_XSHAPE_STROKE_PREVIEW;
```

Comments

This msg gives the class the opportunity to extract and store information that applies to an individual stroke, not to the combined set of strokes that form a character. (The latter extraction should occur entirely within the method for **msgXShapeRecognize.**)

This message is sent by the input system as part of its background processing of strokes as they are entered by the user. Background processing allows the system to produce the final translation more quickly after the user taps the translate button.

Furthermore, a single stroke may be submitted more than once to the shape engine for recognition, as the context engine tries out different combinations of strokes searching for the best segmentation. Thus the stroke will be "previewed" only once, but may appear in several different combinations of strokes submitted for recognition.

The subclass is responsible for defining the format and managing the memory that contains the information extracted in the preview process. The pointer **pData** in the XS_STROKE record should be set to point to this data. The field **numData** of the XS_STROKE record is available to record the number of records pointed to by **pData** (if it's an array).

Memory for *pData should be allocated from a local heap whose **heapId** has been stored in the instance data for the object. The heap should be created in response to **msgNew** and destroyed in response to **msgFree**.

The method for **msgXShapeStrokePreview** may assume that the following fields of the XS_STROKE record have already been calculated:

strokeId

bound

pPoint

numPoints

All other fields should be ignored.

The **strokeId** uniquely identifies the stroke (as far as this object is concerned).

The bound implicitly defines the bounding octagon for the stroke by recording for each of the 8 directions the maximum of the projections of all points in the stroke in that direction. Given a point P and a direction d, the projection of P in direction d is defined to be the x-coordinate of P in a coordinate system which is rotated d*45 degrees counterclockwise from the base coordinate system. Computationally this works out to:

```
  x          if d==0  (xsRight)
( x+y)/r     if d==1  (xsUpRight)
   y         if d==2  (xsUp)
(-x+y)/r     if d==3  (xsUpLeft)
 -x          if d==4  (xsLeft)
(-x-y)/r     if d==5  (xsDownLeft)
  -y         if d==6  (xsDown)
( x-y)/r     if d==7  (xsDownRight)
```

where r is sqrt(2). Division by r is simulated in integer arithmetic as multiplication by 5 followed by (integer) division by 7.

From the bound the method can calculate other quantities as needed using the following formulas:

```
baseline = - bound.limit[xsDown];
// because  -max{-y} = min{y}
height   = bound.limit[xsUp] + bound.limit[xsDown];
// because max{y} + max{-y} = max{y} - min{y}
width    = bound.limit[xsRight] + bound.limit[xsLeft];
// because max{x} + max{-x} = max{x} - min{x}
```

pPoints points to an array of digitizer points, terminated with a record with coordinates (**minS16**, **minS16**). **numPoints** tells how many points are in the array, EXCLUDING the terminating record. (So **numPoints** can also be taken as the index of the terminating record.) The 0th record corresponds to **penDown**, the (**numPoints**-1)th record to **penUp**.

msgXShapeRecognize:

Provide possible translations for a set of strokes.

Takes P_XSHAPE_RECOGNIZE, returns STATUS.

```
#define msgXShapeRecognize                    MakeMsg(clsXShape, 5)
```

Arguments

```
typedef struct XSHAPE_RECOGNIZE {
    P_XS_STROKE pFirstStroke;// IN: linked list of (at most xsMaxPath) strokes
    XS_MATCH_TYPE matchType;     // IN: type of record in output array (matchAscii
                                    // for XS_ASCII_MATCH, xsMatchGesture for XS_GESTURE_MATCH)
    U16 matchArraySize;      // IN: number of records in output array (at
                                    //     most xsMaxCharList)
    P_UNKNOWN pMatchResults;// IN: ptr to output array
} XSHAPE_RECOGNIZE, *P_XSHAPE_RECOGNIZE;
```

Comments

The set of strokes (given as a linked list) is a combination which the context level is testing to see if it represents a single character or gesture. The job of the shape engine is to return an array of the most likely translations (or "matches") together with a weight (or "score") for each of them. If the strokes do not match any of the forms which the shape engine is designed to recognize, it should return an empty array (i.e. the first record should be marked with score **xsMinMatchScore**).

Scores are 0 or negative, with 0 representing the best possible match. Scores below 0 represent progressively worse matches. The range is open ended below, but generally the scores for the most unlikely but still remotely possible translations should fall in the -80 to -120 range, or very occasionally below -120.

Different recognition technologies may have radically different approaches for arriving at scores and correspondingly different models of what the scores mean. One technology may assign scores as a measure of the amount of deviation from an ideal form, a kind of Euclidean distance function. Another technology may arrive at scores through a process of statistical tests, so the score would represent the amount of statistical evidence there is against a particular translation. Yet another technology may compute probabilities.

In order to deal uniformly with a variety of different shape recognition technologies, the context level processor requires that the scores reported by the shape engine be scaled or calibrated according to the following guidelines:

1. "Reasonable" scores should fall roughly in the range 0 to -100.

2. "SCORES SHOULD BE SCALED LOGARITHMICALLY," with every 10 point drop in score representing roughly a 50% reduction in confidence/probability/proximity etc. Thus for example a translation with a score of -50 is 1/8 as "good" (or 1/8 as "likely" or 8 times as "far" from being perfect) as a translation with a score of -20.

3. The score for each translation should reflect the confidence in that translation only. It should NOT be influenced by the confidence in any other translation. In particular, a high score for one translation does not preclude a high score for another translation. For example 'o' and 'O' may both score high (even perfect). In this way, scores need not behave like probabilities: they do not represent slices from a fixed pie.

4. Similarly, there is no requirement that the scores "add up" to a fixed total. For a particular sample, all of the scores may be poor, or the recognizer may even send back no translations. The context engine is depending on this fact in order to be able to use the shape engine to help it choose the correct character segmentation.

5. Scores should not be "tainted" by knowledge of character frequency in English or any other linguistic considerations. It is the job of the context level processing to take linguistic information into account. The shape engine must consider all characters as a priori equally likely, otherwise the bias for common characters in text will be duplicated at both levels, resulting in unwanted effects.

msgXShapeShapeCompatible:

Checks the possibility of translating the strokes as the char

Takes P_XSHAPE_COMPATIBLE, returns STATUS.

```
#define msgXShapeShapeCompatible                    MakeMsg(clsXShape, 6)
```

Arguments

```
typedef struct XSHAPE_COMPATIBLE {
    P_XS_STROKE pFirstStroke;// IN: linked list of strokes
    U8 character;            // IN: desired translation for the strokes
    U8 strokeCount;          // IN: how many strokes in the linked list
    BOOLEAN compatible;      // OUT: is translation a priori possible
} XSHAPE_COMPATIBLE, *P_XSHAPE_COMPATIBLE;
```

Comments

Sees if there is anything about the strokes that absolutely rules out the letter as a translation. For example, some shape matchers may rule out certain translations based on the number of strokes in the list.

This message is sent by the context level only when it has been instructed to allow the dictionary (spelling) or a template to propose characters when the shape level is stuck. The context level makes this check just be sure that there is some remote possibility that the strokes do represent the proposed character before allowing the dictionary or template to propose it.

Training Messages

msgXShapeShapeEvaluate:

Checks how well the shape matcher translates the character.

Takes P_XTEACH_DATA, returns STATUS.

```
#define msgXShapeShapeEvaluate                MakeMsg(clsXShape, 7)
```

Comments — Reports back how well the current engine translates the strokes, knowing what the correct translation is. Does NOT cause the engine to learn the new shape if it is translated poorly.

msgXShapeShapeLearn:

Forces shape matcher to learn new shape.

Takes P_XTEACH_DATA, returns STATUS.

```
#define msgXShapeShapeLearn                   MakeMsg(clsXShape, 8)
```

Comments — Usually invoked based on the results from **msgXShapeShapeEvaluate**.

XTEACH.H

Interface file for **clsXTeach**

clsXTeach inherits from **clsXtract.**

```
#ifndef XTEACH_INCLUDED
#define XTEACH_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef GEO_INCLUDED
#include <geo.h>
#endif
```

Common #defines and typedefs

```
typedef enum {
    // evaluation results
    xteachNoMatch,          // no matches
    xteachSingular,         // matches only the correct character
    xteachSuperior,         // matches the correct character best
    xteachEquivalent,       // matches the correct character and an
                            //   incorrect character equally well
    xteachSecondary,        // matches an incorrect character best,
                            //   but also matches the correct character
    xteachInferior,         // same as secondary, except that the best
                            //   match is marginal
    xteachNotProposed,      // matches only incorrect characters marginally
    xteachMisRecognized,    // matches an incorrect character with a good score
    xteachEvaluateFailed,
    // execute results
    xteachOK,
    xteachGeometricUpdated,
    xteachPrototypeAdded,
    xteachOutOfMem,
    xteachPrototypeRemoved,
    xteachPrototypeDowngraded,
    xteachAbort,
    xteachExecuteFailed
} TEACH_STATUS, *P_TEACH_STATUS;
#define xteachMaxConflict       (64)
#define xteachMaxCharConflict   (8)
typedef struct XTEACH_DATA {
    U32 id;                                 // character/symbol id
    TEACH_STATUS status;                    // evaluation results
    U16 conflictCount;                      // number of conflicting protos
    CHAR conflicts [xteachMaxConflict];      // conflicting characters
    U32 conflictId [8];                     // indices of conflicting protos
    S16 conflictPenalty;                    // penalty to assess
    P_UNKNOWN pFirstStroke;                 // pointer to first stroke
    P_UNKNOWN pContext;                     // pointer to HWX context
    XY32 target;                            // coordinate of hot point target
    CHAR hotPointPath;                      //
    CHAR hotPointExtrema;                    //
} XTEACH_DATA, * P_XTEACH_DATA;
```

Messages

msgNewDefaults:

Sets default values for a new Teach translation object.

Takes P_XLATE_NEW, returns STATUS..

msgNew:

Creates a new Teach translation object.

Takes P_XLATE_NEW, returns STATUS..

msgXlateData:

Returns Teach results.

Takes P_XLATE_DATA, returns STATUS..

Arguments

```
typedef struct TEACH_DATA {
    TEACH_STATUS status;                // required action
    CHAR charConflicts [xteachMaxCharConflict]; // conflicting characters
} TEACH_DATA, *P_TEACH_DATA;
```

msgXTeachSetId:

Establishes expected translation results.

Takes P_CHAR, returns STATUS.

```
#define msgXTeachSetId                  MakeMsg(clsXTeach, 0x01)
```

msgXTeachExecute:

Executes teaching per TEACH_STATUS.

Takes P_XLIST, returns STATUS.

```
#define msgXTeachExecute                MakeMsg(clsXTeach, 0x02)
```

msgXTeachEvaluationGet:

Reads evaluation data.

Takes P_XLATE_DATA, returns STATUS.

```
#define msgXTeachEvaluationGet          MakeMsg(clsXTeach, 0x03)
```

msgXTeachSetTarget:

Sets the target coordinates for the hot point.

Takes P_XY32, returns STATUS.

```
#define msgXTeachSetTarget              MakeMsg(clsXTeach, 0x05)
```

Notification Messages

msgXTeachCompleted:

Signals completion of training.

Takes P_XLIST, returns STATUS.

```
#define msgXTeachCompleted                    MakeMsg(clsXTeach, 0x04)
```

Comments This message is sent to all observers of the translation object following successful completion of the method for **msgXTeachExecute**.

XTEMPLT.H

Translation Template Specifications for input fields

```
#ifndef XTEMPLT_INCLUDED
#define XTEMPLT_INCLUDED
```

/DS0010 Compilation: print ASCII input and hex-address of result.
/DS0020 Choices: print Hex address and ASCII list of choices plus count.

```
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef OS_INCLUDED
#include <os.h>
#endif
#ifndef XLATE_INCLUDED
#include <xlate.h>
#endif
```

Definitions

maxXTemplateXlateChoices is the number of different symbols thatbe in a CharList template.
maxXtmPictureLength is the longest atemplate may be.

```
#define maxXTemplateXlateChoices    128 // Alphabet Size
#define maxXtmPictureLength         128 // Picture string length limit
```

Common Typedefs

Template Types

Templates are used to constrain handwritten input in order totranslation accuracy. For example, if a field can onlydigits, constraining the input for that field to only digitsthat the letters 'O', 'l', and 'Z', are never seen for the'0', '1', and '2'. There are several different ways toinput, each of which corresponds to a different template

```
Enum16(XTEMPLATE_TYPE) {
    xtmTypeNone,        // no constraints
    xtmTypeGesture,     // limited to known gestures
    xtmTypeShape,       // limited to known shapes (NOT IMPLEMENTED)
    xtmTypeCharList,    // limited to a set of characters
    xtmTypeWordList,    // limited to a set of words
    xtmTypePicture,     // described by a picture language
    xtmTypeRegEx,       // described by a regular expresssion (NOT IMPLEMENTED)
    xtmTypeTrie,        // precompiled
};
```

Template Modes

A template may be interpreted in a variety of special modes. In general,modes describe circumstances under which incomplete input will bethe same as complete input.

```
Enum16(XTEMPLATE_MODE) {
    xtmModeDefault    = 0,      // No special modes
    xtmModePrefixOK   = flag0,  // input matching a prefix of the template is
                                // considered to match the template.
    xtmModeLoopBackOK = flag1,  // the template is considered to repeat over
                                // and over
    xtmModeCoerced    = flag2,  // Input should be coerced to match the
                                // template, even if it doesn't match exactly
                                // Only meaningful for xtmTypeWordList templates.
};
```

Template Header

Every template is a single allocated block of memory containing nopointers. The template header contains information abouttemplate, including what's needed to file a template.

```
typedef struct XTEMPLATE_TRIE_HEADER {
    U16             xtmTrieLength;
    U16             xtmTrieRevision;
    XTEMPLATE_TYPE  xtmTrieType;
    XTEMPLATE_MODE  xtmTrieMode;
} XTEMPLATE_TRIE_HEADER, * P_XTEMPLATE_TRIE_HEADER,
    * * PP_XTEMPLATE_TRIE_HEADER;
```

Template Metrics Structure

This structure is returned via the XTemplateGetMetrics subroutine,below. The major uses of this structure are to get ato the template header in order to get the template length socan be filed, and to get access to the original template string.

```
typedef struct XTEMPLATE_METRICS {
    P_XTEMPLATE_TRIE_HEADER pXtmHeader; // Template len, rev, etc.
    P_CHAR      pXtmString;             // Original string, NULL for word
                                        // list or gesture
    P_UNKNOWN   pXtmTrieBase;           // Base of compressed TRIE structure
    U16         xtmTrieBaseLen;         // Size of the compressed region
} XTEMPLATE_METRICS, * P_XTEMPLATE_METRICS;
```

Functions

XTemplateCompile

Given a type and an ASCII template representation, build a template structure.

Returns STATUS.

Arguments

```
typedef struct XTM_ARGS {
     XTEMPLATE_TYPE xtmType;        // What kind of template?
     XTEMPLATE_MODE xtmMode;        // What special modes?
     P_UNKNOWN      pXtmData;       // ascii template
} XTM_ARGS, *P_XTM_ARGS;
```

Function Prototype

```
STATUS EXPORTED XTemplateCompile(
    P_XTM_ARGS      pXtmArgs,       // Xtemplate Arguments
    OS_HEAP_ID      heap,           // heap to use
    PP_UNKNOWN      ppXtmDigested   // Out: compiled template
);
```

The currently implemented types have the following meanings:

xtmTypeNone pXtmData is unused. This is the same as having no template at all.

xtmTypeGesture pXtmData points to an XTEMPLATE_GESTURE_LIST.

xtmTypeCharList pXtmData contains a list of valid characters.

xtmTypeWordList pXtmData contains a list of all the different words that are legal in this field. This should be a PP_STRING pointing to a list of pointers to the words. Each word is a normal null-terminated string and the pointer list must be terminated with a Nil(P_STRING).

xtmTypePicture pXtmData contains a list of all the picture strings that are valid in this field. A picture string contains any of the following characters:

9: input must be a digit (0-9)
a: input must be alphabetic
A: input must be upper-case alphabetic
n: input must be alphanumeric
N: input must be upper-case alphanumeric
x: input may be anything
[: introduces a list of characters, Unix-style.[abc] is a single character position which must contain 'a', 'b', or 'c'. [a-m] matches any letter 'a' through 'm'. [a\-m] matches any of 'a', '-', or 'm'.
\: literal escape. Input must match next character. (Only needed to escape the above special characters).

For example, a modern California licence plate looks like this:

#AAA###

To include older forms of California plates, we might use:

#AAA###
###AAA
AAA###

either \n or tab separated. N.B. Multiple picture strings will not be supported in the first release.

A Social Security Number (with mandatory hyphens) would be coded like this:

###-##-####

Pictures currently can't be used for variable length data.

This special structure is used for **xtmTypeGesture** templates.

```
typedef struct XTEMPLATE_GESTURE_LIST {
   U32         count;      // number of gestures in the list
   P_MESSAGE   pGestures;  // pointer to array of allowed gestures
} XTEMPLATE_GESTURE_LIST, * P_XTEMPLATE_GESTURE_LIST;
```

Space is allocated as required.

Basic Xtemplate Arguments

XTemplateGetMetrics

Given a pointer to a translation template, extract various salient facts about it and return them.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XTemplateGetMetrics(
    P_UNKNOWN           pXTemplate, // Template to extract the metrics of
    P_XTEMPLATE_METRICS pXtmMetrics // Out: metrics of the template
);
```

Can fail if the template version is too far out of date.

XTemplateSetMode

Change the mode in an already-created XTemplate.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XTemplateSetMode(
    P_UNKNOWN      pXTemplate,  // Compressed Template
    XTEMPLATE_MODE xtmMode      // New mode
);
```

Changing **xtmPrefixOK** or **xtmLoopBackOK** may have no effect.

XTemplateFree

Free an existing Template.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XTemplateFree(
     P_UNKNOWN      pXtmDigested    // compiled template ptr.
);
```

Checks for **pNull** and just returns **stsOK**

XTemplateWordListSort

Given a pointer to a list of pointers to strings, sort the list of pointers so the strings appear in alphabatical order.

Returns void.

Function Prototype

```
void EXPORTED XTemplateWordListSort(
    PP_CHAR ppStringBase    // compiled template
);
```

Last pointer in list must be Nil(P_STRING)

XTemplateCheckWord

Check if a word is in a template.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED XTemplateCheckWord(
    P_UNKNOWN     pXtmData,         // compiled template
    P_CHAR   pWord              // Word to check
);
```

XTemplateCheckGesture

Check if a gesture is in a template.

Returns BOOLEAN.

Function Prototype

```
BOOLEAN EXPORTED XTemplateCheckGesture(
    P_UNKNOWN     pXtmData,         // compiled template
    MESSAGE       gesture           // gesture to test
);
```

XTemplateAddWord

Add a word to a wordlist template.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XTemplateAddWord(
    PP_UNKNOWN      ppXtmData,      // In/Out: compiled template
    P_CHAR          pWord,          // Word to add
    OS_HEAP_ID      heap             // heap to use
);
```

XTemplateDeleteWord

Delete a word from a wordlist template.

Returns STATUS.

Function Prototype

```
STATUS EXPORTED XTemplateDeleteWord(
    PP_UNKNOWN     ppXtmData,       // In/Out: compiled template
    P_CHAR          pWord,          // Word to add
    OS_HEAP_ID     heap          // heap to use
);
```

XTempltInit

DLL Initialization routine.

Returns STATUS.

```
STATUS EXPORTED XTempltInit(void);
```

Included for compatibility; not to be called by developers.

XTEXT.H

Defines the API for **clsXText**

clsXText inherits from **clsXtract.**

```
#ifndef XTEXT_INCLUDED
#define XTEXT_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
#ifndef XLATE_INCLUDED
#include <xlate.h>
#endif
```

Common #defines and typedefs

```
typedef struct XTEXT_WORD {     // xtTextWord data
    RECT32      bounds;         // bounding box
    CHAR str[1];                // text string, 0 terminated
} XTEXT_WORD, *P_XTEXT_WORD;
```

Messages

msgNewDefaults:

Fills in default values to XLATE_NEW structure.

Takes P_XLATE_NEW, returns STATUS..

Comments

All fields are set to 0 except the following **hwxFlags** which are turned ON:

alphaNumericEnable

punctuationEnable

verticalEnable

caseEnable

In most cases

smartCaseDisable

is also on (i.e. there will be NO "smart case" postprocessing to correct the capitalization of letters). The exception is that if the writer is an all caps writer (as determined by the global preference setting) then the default setting is OFF (i.e. there WILL be smart case postprocessing).

msgNew:

Creates a new Text translation object.

Takes P_XLATE_NEW, returns STATUS..

msgXTextGetXList:

Convert data to XList.

Takes P_XLATE_DATA, returns STATUS.

```
#define msgXTextGetXList          MakeMsg(clsXText, 0x01)
```

msgXTextWordList:

subclass opportunity to alter word list/disambig Called during the disambiguation extraction pass.

Takes P_WORD_LIST, returns STATUS.

```
#define msgXTextWordList          MakeMsg(clsXText, 0x02)
```

msgXTextComplete:

Hook for subclasses to postprocess translation results from **clsXText**

Takes P_XLIST, returns STATUS.

```
#define msgXTextComplete          MakeMsg(clsXText, 0x81)
```

Comments

clsXtext responds to **msgXlateComplete** by completing the translation and then self-sending this message (**msgXTextComplete**) to allow its subclasses to post-process the translation results.

msgXTextNewLine:

Indicates the start of a new line to subclasses.

Takes P_UNKNOWN, returns STATUS.

```
#define msgXTextNewLine           MakeMsg(clsXText, 0x82)
```

msgXTextModLine:

Indicates a modification of a line to subclasses.

Takes P_UNKNOWN, returns STATUS.

```
#define msgXTextModLine           MakeMsg(clsXText, 0x83)
```

XTRACT.H

This file contains part of the API definition for **clsXtract**. For the remainder see xlate.h.

clsXtract inherits from **clsObject**.

```
#ifndef XTRACT_INCLUDED
#define XTRACT_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef CLSMGR_INCLUDED
#include <clsmgr.h>
#endif
```

Messages

msgSave:

Saves an extraction object.

Takes P_OBJ_SAVE, returns STATUS.

Comments — Writes the instance data for this object out to a file.

msgRestore:

Restores an extraction object.

Takes P_OBJ_RESTORE, returns STATUS.

Comments — Reads back in from a file the instance data for an extraction object and recreates the object.

Initialization Messages

msgAdded:

Attachment to a scribble object

Takes OBJECT, returns STATUS.

Comments — The extraction object receives this message when it has been made an observer of a scribble object. When it receives this message, the extractor queries the scribble for all strokes which have been added to the scribble up to this time. Henceforth the scribble object will send **msgScrAddedStroke** to the extraction object every time a new stroke is added to the scribble. Thus one way or another the extractor has access to all the strokes associated with the scribble.

An extractor cannot be an observer of more than one scribble object at a time.

msgRemoved:

Detachment from a scribble object

Takes OBJECT, returns STATUS.

Comments

The extraction object receives this message when it is no longer an observer of the scribble object.

msgXtractGetScribble:

Reads the id of the attached scribble object.

Takes P_OBJECT, returns STATUS..

```
#define msgXtractGetScribble        MakeMsg(clsXtract, 1)
```

Comments

This message is used to obtain the id of the scribble object that this extraction object is attached to. It can be used by the client or by a subclass if it is interested in modifying and/or reading the scribble information directly.

Control Messages

msgScrAddedStroke:

Add a stroke to the extraction object.

Takes P_SCR_ADDED_STROKE, returns STATUS.

Comments

This message is received by the extractor from the scribble object each time a new stroke is added to the scribble.

msgScrRemovedStroke:

Remove a stroke from the extraction object.

Takes P_SCR_REMOVED_STROKE, returns STATUS.

Comments

This message is received by the extractor from the scribble object each time an existing stroke is deleted from the scribble.

msgXtractStrokesClear:

Clears out all strokes previously sent to translation object by scribble

Takes NULL, returns STATUS.

```
#define msgXtractStrokesClear          MakeMsg(clsXtract, 3)
```

Comments

Effectively restarts the translator as if it had just been attached to a fresh scribble.

As a side effect, the shape engine is released. A new shape engine will be attached as soon as new strokes get added by the scribble.

All the settings of the translator remain unchanged (e.g. **hwxFlags**, **xlateCaseMetrics**, **xlateMetrics**, etc).

This message was formerly called **msgXtractContextClear**. The new name more accurately reflects its functionality.

msgScrCompleted:

Notification that no more strokes will be added to scribble.

Takes NULL, returns STATUS.

Comments

This message is sent by the scribble object to the extraction object when the scribble has determined that no more strokes will be added. When it receives this message, the extractor will self-send the message **msgXtractComplete** (see below) to kick off the final stages of translation.

msgXtractComplete:

Hook for subclasses to complete the translation.

Takes NULL, returns STATUS.

```
#define msgXtractComplete          MakeMsg(clsXtract, 0x81)
```

Comments

The extraction object self-sends this message when it receives the message **msgScrCompleted**. This message will be processed by the appropriate subclass of **clsXtract** which will complete the translation.

Note that in certain instances (such as multiple line text pads), the translation object may have already translated a subset of the existing strokes as they were entered. This message tells the translation object to finish up (complete) the translation and not wait for any further strokes.

XWORD.H

This file contains the API definition for **clsXWord**.

clsXWord inherits from **clsXText**.

```
#ifndef XWORD_INCLUDED
#define XWORD_INCLUDED
#ifndef GO_INCLUDED
#include <go.h>
#endif
#ifndef UID_INCLUDED
#include <uid.h>
#endif
```

Common #defines and typedefs

```
#define xWordSpellCorrection        flag0
#define xWordSpellOnly              flag1
#define xWordProofEnable            flag2
#define xWordAbbrEnable             flag3
```

Messages

msgNewDefaults:

Fills in default values for a new Word translation object.

Takes P_XLATE_NEW, returns STATUS..

Comments

The default values are the same as for **clsXText**, except for the following **hwxFlag** setting:

xltSpellingEnable will be ON

xltSmartCaseDisable will be OFF

In addition,

```
pArgs->xlate.xlateCaseMetrics.type = xcmSentence;
pArgs->xlate.xlateCaseMetrics.writer = xcmMixedCaseWriter;
```

Capitalize first letter of each sentence, etc.

msgNew:

creates a new Word translation object.

Takes P_XLATE_NEW, returns STATUS..

msgXWordComplete:

Hook for subclasses to indicate completion.

Takes NULL, returns STATUS.

```
#define msgXWordComplete          MakeMsg(clsXWord, 0x81)
```

Comments

Not implemented

PENPOINT API REFERENCE / VOL I
INDEX

API1 denotes *PenPoint API Reference, Volume I*

API2 denotes *PenPoint API Reference, Volume II*

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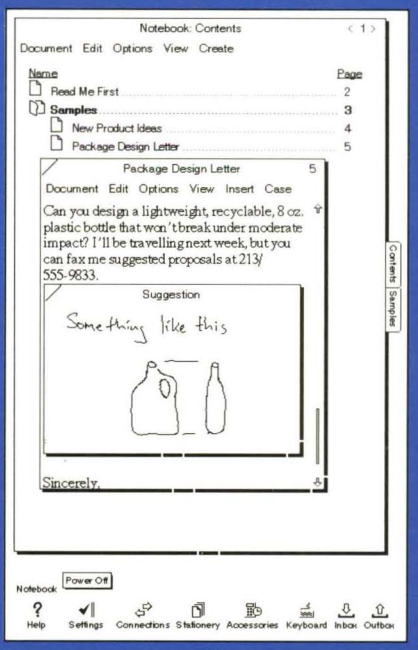
PenPoint™ Application Programmatic Interface, Volume I

Together with Volume II, *PenPoint™ Application Programmatic Interface, Volume I* provides a complete reference to the classes, messages, functions, and structures provided by the PenPoint Software Development Kit (SDK).

The parts in the *PenPoint API Reference* are organized in parallel with the parts in the *PenPoint Architectural Reference* (also available from Addison-Wesley). This volume contains datasheets on the APIs to the:

PenPoint class manager
PenPoint Application Framework™
Input subsystem and handwriting translation
User interface toolkit
Windows and graphics subsystem



Other volumes in the GO Technical Library are:

PenPoint Application Writing Guide provides a tutorial on writing PenPoint applications, including many coding samples.
PenPoint User Interface Design Reference describes the elements of the PenPoint Notebook User Interface, sets standards for using those elements, and describes how PenPoint uses the elements.
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