
AMD Geode™ GX Thin Client RDK Windows® CE.NET 4.2 Software Developer's Guide



1.0 Scope

This document describes how to build a Microsoft® Windows® CE.NET 4.2 Operating System (OS) for the AMD Geode™ GX Thin Client Reference Design Kit (hereafter referred to as TCRDK) using the Microsoft CE.NET 4.2 Platform Builder and the TCRDK's CE.NET Board Support Package (BSP). The method for changing or upgrading drivers after the initial image has been built is also described.

2.0 Discussion

Building a fully functional and optimized CE.NET 4.2 OS image for the Geode GX TCRDK requires a correct and up-to-date installation of Microsoft's CE.NET 4.2 Platform Builder, the proper addition of the TCRDK's BSP to the Platform Builder's catalog, and the proper creation and compilation of an Geode GX TCRDK project within Platform Builder. After this has been successfully completed, additional drivers and software applications that extend the TCRDK's functionality beyond that of the original BSP can be added. Updated drivers can be compiled into the existing TCRDK project, replacing those that came with the original TCRDK BSP. Finally, settings for existing drivers can be changed and compiled into the image.

To clearly describe the methods used to accomplish these tasks, this discussion continues with the following topics:

- CE.NET 4.2 Platform Builder Installation (Section 2.1 on page 1)
- BSP Installation (Section 2.2 on page 2)
- Adding Other Drivers and Applications to the TCRDK Image (Section 2.5 on page 3)
- Changing Driver Settings (Section 2.6 on page 3)
- Updating Drivers (Section 2.7 on page 4)

2.1 CE.NET 4.2 Platform Builder Installation

After purchasing a copy of Microsoft's CE.NET 4.2 Platform Builder, follow the accompanying instructions for installation on a build machine that meets Microsoft's minimum system hardware and software requirements.

Once the installation is complete, run Platform Builder and click on the *Support* hyperlink that appears at the bottom of the list in the center of the application. Click on the *QFE* (Quick Fix Engineering) tab that is displayed in the resulting page and then click on the *Windows CE QFEs* hyperlink. Scroll down in the resulting screen and click on the *Quick Fix Engineering Updates* hyperlink.

The resulting page shows the latest QFEs available for Microsoft's CE.NET 4.2 Platform Builder. At the time of this publication, the latest QFEs to be downloaded were:

- 1) Windows CE.NET 4.2 Platform Builder Yearly Updated Full QFE Package (through 12/31/2003)
- 2) Windows CE.NET 4.2 Platform Builder Quarterly QFE Package (January - March 2004)

At a minimum, these two packages should be downloaded and installed. The packages are in the form of executable files (.exe) and should be executed on your build machine while Platform Builder is not running. Also, it is best to install older QFEs first. Therefore, install these two QFEs in the order listed above.

Be sure to check this area occasionally for new QFEs as more may be released for CE.NET 4.2 Platform Builder in the future.

2.2 BSP Installation

The AMD Geode GX TCRDK ships with a Windows CE.NET 4.2 BSP. Installing this BSP requires the following actions:

- 1) Make sure Platform Builder is not running on your build machine.
- 2) Place the .MSI file from the BSP in a directory on your build machine.
- 3) Double-click on the .MSI file name and installation will begin. Simply follow the prompts provided by the installation process.

Note: If prompted, "Mambosrc.cec already exists. OK to overwrite?" Select Yes.

If updating the BSP, the following steps are required:

- 1) Open Platform Builder, pull down the *File* menu, and select *Manage Catalog Features*.
- 2) Select the BSP to be updated - *Mambo BSP with driver source* - and click on *Remove*.
- 3) Click *OK* - the BSP has now been removed from the catalog.
- 4) Close Platform Builder and perform the next installation steps listed above.

2.3 Creating a Base Image

Now you are ready to prepare for the initial TCRDK image compilation. Open up Platform Builder and follow these steps:

- 1) Click on the *New Platform* button in the center of Platform Builder's main window.
- 2) Click *Next* and a list of available BSPs is presented. Select *MAMBO: X86* and click on *Next*.
- 3) Select one of the configurations shown - *Internet Appliance* is a good choice for many thin client applications.
- 4) Enter a Platform Name for your build tree - use a name that will help identify this build from others on your system. Click on *Next* after entering your Platform Name.
- 5) Select the Application & Media features to include in your image and click on *Next*.
- 6) Select the Networking & Communications features to include in your image and click on *Next*.
- 7) Click on *Finish* and Platform Builder will create the build tree and prepare it for the first build.

Before executing the build, the platform's settings should be checked. Pull down the *Platform* menu in Platform Builder and select *Settings*. The resulting window allows various features to be viewed and set:

- 1) Click on the *General* tab.
- 2) Make note of the Release Directory. This shows the location where the image file (nk.bin) will be stored after being built. This location can be changed here (i.e., *General* tab).
- 3) Check the *Build Type*. A Retail build is the default and yields the best performance. A Debug build can be selected for debugging purposes. A Debug build runs slower than a Retail build.
- 4) Click on the *Build Options* tab.
- 5) *Enable Full Kernel Mode* can be selected. This mode yields best performance - however, it also allows every thread to run in kernel mode, which allows each thread access to physical memory. This may cause a security issue in your application and therefore requires consideration.
- 6) *Enable Image for Flash* must be selected to enable the image to be written to Flash after downloading.
- 7) *Enable Image for Larger than 32MB* must be selected to support for greater than 32MB of RAM.
- 8) Look at the other items in the *Build Options* tab to decide what else to include. Platform Builder's Help provides descriptions for each of the selections. Help is started by 'hitting F1'.
- 9) When finished with the *Platform Settings* window, click *OK* to proceed.

The first image is now ready to be built. Pull down the build menu and select *Rebuild Platform*. When Platform Builder finishes, your image is found as nk.bin in the release directory defined in Platform Settings. Copy nk.bin to your TCRDK and reboot the system.

2.4 Adding/Removing Features

The image can now be customized to include or exclude features from the Platform Builder catalog.

The items available are listed in the Catalog, which is normally on the right side of the Platform Builder window. Items that are to be built in the image are in the Platform BOM, which is normally on left side of the Platform Builder window.

Items may be added to the platform by 'dragging' the item from the Catalog window and 'dropping' in the Platform Feature View window or by selecting the item in the Catalog, right clicking and selecting 'Add to platform'. Items may be removed from the platform by selecting in the Platform Feature View window, right clicking and selecting 'Delete'.

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Common features for modification include:

File System

A File System is a core feature required to support any mass storage device. This feature requires several additions to the image. First, add the *Core OS --> Display based devices --> File Systems and Data Store --> Storage Manager --> Fat File System* feature to enable the basic storage. The *CD/UDFS File System* may also be selected to allow access to CD storage devices. Second, add the *Device Drivers --> Storage Devices --> Storage Devices --> ATAPI PCI/IDE Storage Block Driver* to access IDE attached storage devices. USB storage devices may also be utilized. This is described in USB Device Drivers section.

Power Management

Power Management configuration is an advanced feature. Therefore, only two basic configurations will be discussed. Basic Power Management can be enabled by adding two features to the image. The first is *Core OS --> Display based devices --> Core OS Services --> Power Management (Choose 1) --> Power Management (Full)*. If asked about changing this feature, select Yes. The second is *Third Party --> Device Drivers --> Power Management Controller*.

Power Management features may be disabled by adding the *Core OS --> Display based devices --> Core OS Services --> Power Management (Choose 1) --> Power Management (Minimal)* and removing the *Device Drivers --> Power Management Controller* feature in the Platform BOM.

USB Device Drivers

Several USB Device Class drivers are available in Platform Builder. These are found in the *Core OS --> Display based devices --> Core OS Services --> USB Host Support* Catalog folder. Select the appropriate Class drivers for inclusion.

Video Acceleration

Acceleration of video overlay and some 2D functions requires the inclusion of the DirectDraw component. This feature can be added by selecting the *Core OS --> Display based devices --> Multimedia Technologies --> Multimedia Components --> Direct Draw*.

Video Codecs

Numerous video compression standards are supported by Windows CE. Support can be added by selecting features from the *Core OS --> Display based devices --> Multimedia Technologies --> Multimedia Components --> DirectShow --> Video Codecs and Renderers* Catalog folder.

File Viewers

Numerous viewers for common file types are supported by Windows CE. Support can be added by selecting features from the *Core OS --> Display based devices --> Applications - End User --> File Viewers* Catalog folder.

Persistent Registry

Persistent Registry allows the Windows Registry to be retained through a power cycle by storing to the root drive. This feature may be added to a platform by adding the *Core OS --> Display based devices --> File Systems and Data Store --> Registry Storage --> Hive-based Registry* Catalog feature. If asked about changing this feature, select Yes. Also, the File System Feature must be added for Persistent Registry to function properly. Adding the File System feature is described above.

It is advisable to 'Rebuild' the image following any changes to the Platform features. This is accomplished by selecting *Build* from the menu bar then *Rebuild Platform*.

2.5 Adding Other Drivers and Applications to the TCRDK Image

Third-party drivers and applications can easily be added to Platform Builder's catalog if they have been wrapped into a .MSI file. If this is the case, execute the .MSI file according to the vendor's installation instructions. The next time Platform Builder is run, the new item(s) installed will be accessible in the Catalog window and can be added to the platform as described above.

There are other ways to add drivers and applications to the CE.NET image, but they involve additional file types, hand-editing of registry files, placing required files in exactly the right areas, etc. These procedures are beyond the scope of this document and would most likely be undertaken by an experienced CE.NET developer.

2.6 Changing Driver Settings

Changing settings within a CE.NET driver usually involves identifying and editing the pertinent registry file. The most common files that require editing are:

Platform Registry

The platform.reg file can be accessed by selecting the Parameter View of the Platform BOM under the *C:\WINCE420 --> Mambo --> Hardware Specific Files* folder. This file is used to set platform specific configurations for the built-in drivers.

Project Binary Image Builder

The project.bin file can be accessed by selecting the Parameter View of the Platform BOM under the C:\WINCE420 --> Mambo --> Project Specific Files folder. This file is used to include project specific files (such as applications) into the image.

GX Video Registry

The gxvideo.reg file can normally be found in the \$(_WINCEROOT)\others\AMD\GX2\VIDEO directory. This file contains the initial graphics configuration settings.

When any configuration file is changed, it is advisable to perform a *Rebuild Platform*. The resulting nk.bin image will then include the new settings.

2.7 Updating Drivers

It may become necessary or desirable to update some or all of the drivers included in the Geode GX TCRDK BSP. Later driver revisions may improve performance or add functionality. A new display driver with additional resolutions and refresh rates, for example, may be released several months after the release of the TCRDK BSP. Using this example, the following steps proceed with the display driver replacement:

- 1) Open Platform Builder, pull down the *File* menu, and select *Manage Catalog Features*.
- 2) Select the driver to be updated - for example the *AMD GX2* display driver - and click on *Remove* if this feature is present.
- 3) Click *OK* - the driver has now been removed from the catalog.
- 4) Go to the Platform BOM and delete the targeted driver - for example the *AMD GX2* display driver entry under *Mambo:x86 --> Device Drivers --> Display*.
- 5) Close Platform Builder.
- 6) Open Windows Explorer and delete the files associated with the old driver. The files to be removed and their locations will be referred to in the new driver's documentation.
- 7) Execute the new driver's .MSI file - this adds the new driver to Platform Builder's catalog.
- 8) Start Platform Builder and open the Geode GX TCRDK platform.
- 9) The updated display driver should be in the Catalog window under the associated listing.
- 10) Drag the updated display driver to the Platform BOM and perform a *Rebuild Platform*.

The resulting nk.bin image will include the updated driver.

2.8 Installing the nk.bin

Installation of a new nk.bin on the TCRDK requires several components.

Requirements

- 1) Bootable USB Flash Media
- 2) LPC ROM labeled BIOS Shipped with kit

An updated XpressROM or Embedded BIOS may be used if 'Boot from USB' is supported.

Installation Steps

- 1) Copy nk.bin from the development platform release directory onto bootable USB Flash media.
- 2) Install 'BIOS' into the TCRDK.

Note: The Xpressloader shipped does not support update.
- 3) Install the bootable USB Flash media into the AMD TCRDK.
- 4) Boot the system.
- 5) When prompted, 'Hit F1' to enter CMOS settings.
- 6) Set the *Motherboard and Device Configuration --> IDE Configuration* settings as follows:
 - IDE BIOS Support Enabled
 - Boot Order Configuration 1: CD_ROM Drive
 - CD-ROM Boot Enabled
 - Flash Interface Disabled
- 7) Exit and Save setting.
- 8) System will automatically reboot. Copy nk.bin from bootable USB Flash media to IDE Flash disk. (Usually C: to D:)
- 9) Power down.
- 10) Remove bootable USB Flash media.
- 11) Replace Xpressloader.
- 12) Boot system.

3.0 Summary

This document has clearly described how to build and customize Microsoft Windows CE.NET Operating Systems for the Geode GX TCRDK. Be sure to stay in touch with your AMD sales contact and check AMD's Geode Developers web site for relevant hardware and software updates as well as new and/or updated documentation.

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