TECHNOLOGY BRIEF

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Compaq Computer
Corporation

Configuring Compaq Recovery Server with Microsoft SQL Server v6.5

CONTENTS

COMPAQ

EXECUTIVE SUMMARY

The purpose of this paper is to increase customer understanding of how the combination of the Compaq Recovery Server Option and Microsoft SQL Server v6.5 should be used. The paper provides overviews of the Recovery Server Option and the fallback support provided in Microsoft SQL Server v6.5. It contains instructions for setting up a 2-node failover system combining Compaq On-Line Recovery Server with SQL Server v6.5. It also provides technical insights into the interactions between the Recovery Server Option and SQL Server v6.5.

This document assumes that the reader is well versed with the Compaq On-Line Recovery Server and with SQL Server v6.5. It further assumes that the person who implements the configuration for the On-Line Recovery Server with Microsoft SQL Server v6.5 is an authorized Database Administrator for Microsoft SQL Server v6.5.

APPLICABILITY

The information in this document applies to the Compaq Recovery Server Option version 2.10 or later and to Microsoft SQL Server v6.5 or later.

NOTE: Recovery Server Option v2.10 comes with the Compaq Windows NT Support Software Diskette v1.17. For use with SQL Server v6.5, the Compaq Windows NT Software Diskette v1.18 or later must be used.

NOTICE

The information in this publication is subject to change without notice.

Configuring Compaq Recovery Server
with Microsoft SQL Server v6.5

INTRODUCTION

Minimizing server downtime is vital for mission critical applications. The Compaq Recovery Server Option offers a cost effective means of increasing availability of mission-critical applications through automated server failover. The Compaq Recovery Server Option is now supported by Microsoft SQL Server v6.5. This technology brief provides overviews of the Recovery Server Option and the fallback support provided in Microsoft SQL Server v6.5. It contains instructions for setting up a 2-node failover system combining Compaq On-Line Recovery Server with SQL Server v6.5. It also provides technical insights into the interactions between the Recovery Server Option and SQL Server v6.5.

This document assumes that the reader is well versed with the Compaq On-Line Recovery Server and with SQL Server v6.5. It further assumes that the person who implements the configuration for the On-Line Recovery Server with Microsoft SQL Server v6.5 is an authorized Database Administrator for Microsoft SQL Server v6.5.

OVERVIEW OF COMPAQ RECOVERY SERVER OPTION

The Compaq Recovery Server Option allows automatic transfer of operations from a failed server to a partner server. The option can be configured to provide either Compaq Standby Recovery Server or On-Line Recovery Server functionality. However, to maximize the use of Compaq hardware and to receive the most benefit from the fallback support in SQL Server v6.5, it is recommended that the Recovery Server Option be configured as On-Line Recovery Server.[1]

The On-Line Recovery Server configuration offers a cost-effective means of increasing the availability of business-critical applications for customers with servers operating in the Windows NT 3.51, or, later environment. It allows a ProLiant or ProSignia server to act as a hot (on-line, active) spare for another ProLiant or ProSignia server.

The On-Line Recovery Server allows software to take advantage of this high-availability environment. The On-Line Recovery Server offers:

- Increased server availability

- Fully automated switchover

- Ability to pair independently operating servers with identical or different hardware configurations

- Ability to schedule server maintenance at a convenient time

- Cost-effective solution

The On-Line Recovery Server allows data from one server to be automatically accessible from a surviving partner server in the event of a server failure. The On-Line Recovery Server allows applications to be up and running with minimal interruption. It is designed to work with the comprehensive alert features of Compaq Insight Manager. It also allows servers to be serviced or replaced at a convenient, scheduled time without interrupting user access to data.

Before continuing, the reader is encouraged to read the technology brief "Compaq On-Line Recovery Server" (document number 286A/1196) and *The Recovery Server Option User Guide* (part number 213818-002).

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[1] The Standby Recovery Server configuration can be used with SQL Server v6.5; however, it involves the use of an idle backup server. In the event of a system failure, the standby server will boot from the failed server's disks and assume its logical network identity. To obtain more information about the functionality of the Standby Recovery Server, refer to the technology brief titled *Compaq Standby Recovery Server* (document number 287A/1196) and *The Recovery Server Option User Guide* (part number 213818-002).

OVERVIEW OF MICROSOFT SQL SERVER V6.5

Microsoft SQL Server v6.5 is a relational database management system that operates in the distributed client-server computing environment. SQL Server v6.5 provides businesses with the technology to store, access, and distribute information.

Beginning with Version 6.5 of SQL Server, Microsoft has taken steps to increase database availability and fault-tolerance. Working in conjunction with Compaq, Microsoft now offers fallback support, which takes advantage of the Compaq Recovery Server Option. Fallback support ensures that SQL Server v6.5 databases will be accessible in the event of a server hardware or software failure. The SQL Server v6.5 call-level interfaces (DB-Library and ODBC) also enable clients to connect automatically to the surviving server if its partner server fails.

Documentation of the fallback Support for SQL Server v6.5 is found in the *SQL Server Books On-Line* that is included with SQL Server v6.5.

TERMINOLOGY

Compaq and Microsoft use slightly different terminology to describe the components and events involved with server and database recovery. This paper will use the following terminology in discussing failover issues.

Single fallback – In single fallback systems, there are two independently operating Compaq servers, but failover occurs in only one direction. The servers are referred to as the *primary* (failed) and *surviving* (hot standby) server.

Mutual fallback – In the mutual fallback scenario, two independently operating Compaq servers are paired as automatic, hot standbys for each other and failover can occur in either direction. The servers are also referred to as the failed and *surviving* (hot standby) server, respectively.

The process of transferring control of the disk drives to the surviving server is called a *switchover*. The disk controller within the surviving server that gains control of the drives after the switchover is referred to as the *recovery controller*.

In its documentation, Microsoft refers to this surviving server as a *backup* or *standby* server. Microsoft does not have a term that describes the switchover of the drives but refers to the recovery of the database(s) as the *fallback* of the databases.

HOW THE SYSTEM WORKS

The purpose for the integration of SQL Server v6.5 with Compaq On-Line Recovery Server is to have a fallback mechanism for Microsoft SQL Server v6.5 databases in the event of a server failure. This requires two interconnected servers, each running Microsoft SQL Server v6.5. If one of the paired servers fails, then the ProLiant Storage System(s) attached to the failed server will switch over to the surviving server. The surviving server will take over the responsibilities of the failed server and continue servicing the clients of the failed server with minimal disruption.

As an example, assume that there are two servers, Server 1 and Server 2, with the SQL Server v6.5 engine running on their local (non-switchable) disks (see Figure 1). In this example, Server 1 contains a single Compaq SMART or SMART-2 Array Controller configured with one Compaq ProLiant Storage System; Server 2 also contains one Compaq SMART or SMART-2 Array Controller configured as a "Recovery Controller" which is attached to the same ProLiant Storage System as Server 1. A Compaq Recovery Server switch has been installed in the ProLiant Storage System. Both Server 1 and Server 2 are physically connected to the ProLiant Storage System by external SCSI cables, but only one server is electrically connected to a storage unit at any given time. The hard disks in the ProLiant Storage System are called "switchable disks." Critical databases are stored on these switchable disks. In the event that Server 1 fails, the electrical

connection between Server 1 and ProLiant Storage System 1 is broken; and an electrical connection from the ProLiant Storage System to Server 2 is established (see Figure 2). Server 2 then controls these disks and the databases stored on them. For a full discussion of On-Line Recovery Server technology, refer to the technology brief titled *Compaq On-Line Recovery Server.*
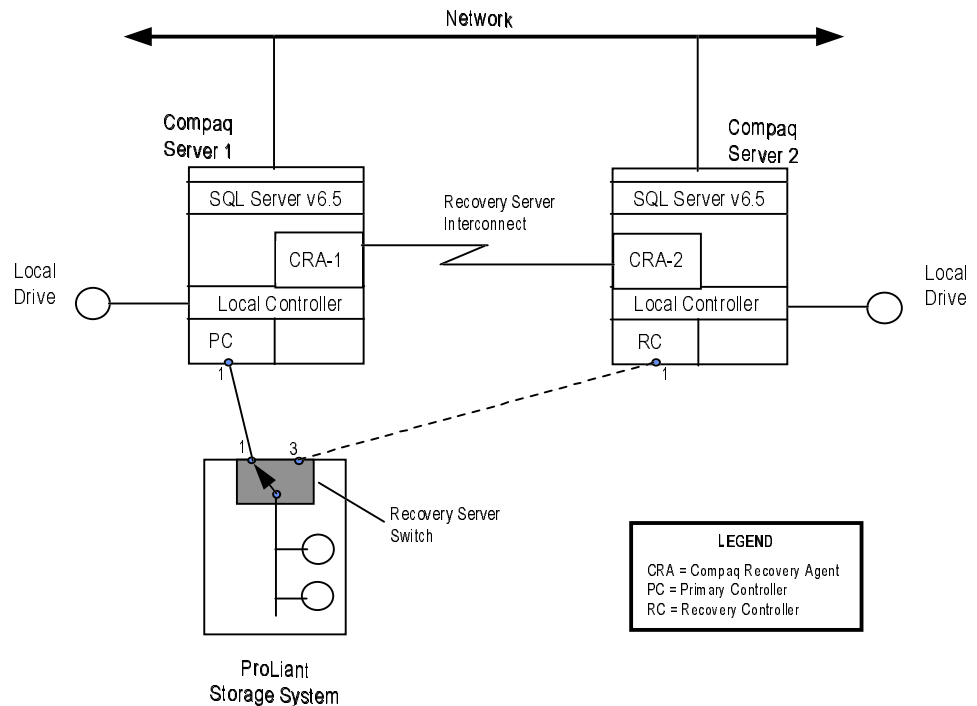
Figure 1.   Normal operation of an On-Line Recovery Server single fallback pair in which Server 1 has external storage
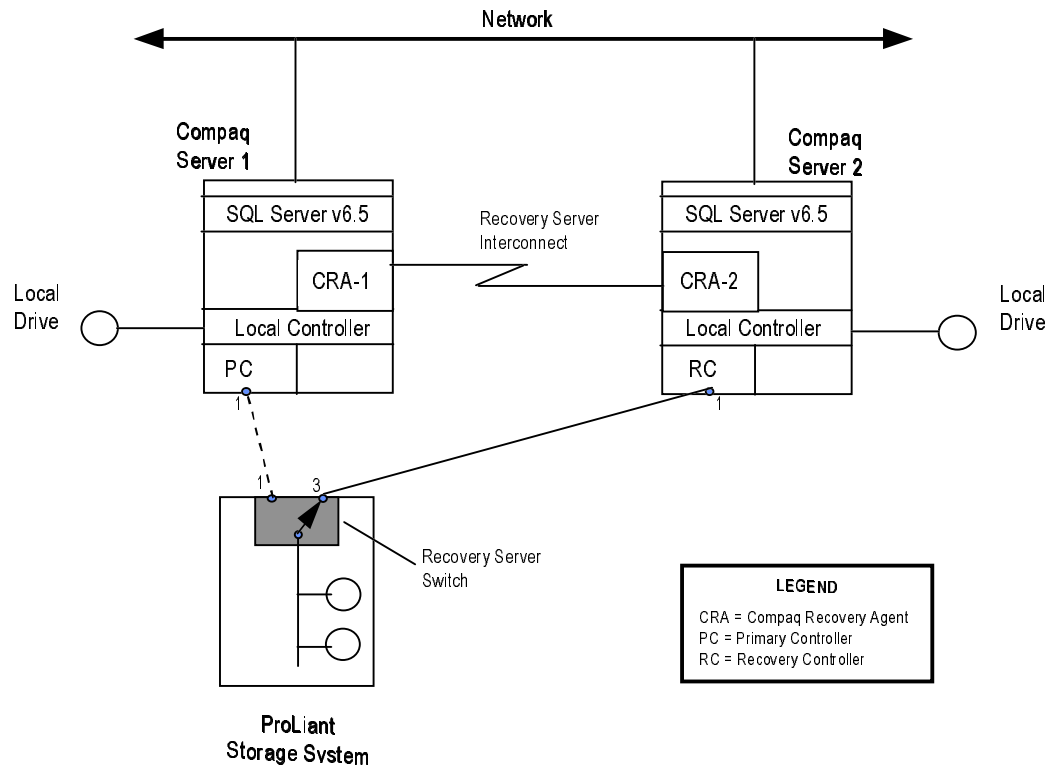
Figure 2. Operation of the On-Line Server single fallback pair in Figure 1 after failure of Server 1 and an automated switchover.

SYSTEM REQUIREMENTS

The On-Line Recovery Server includes both software and hardware components. On-Line Recovery Server software is a specific installation item on the Compaq Software Support Diskette for Microsoft Windows NT. This software is provided in the Compaq Recovery Server Option Kit (Compaq part number 213817-001).

The software and hardware requirements for On-Line Recovery Server are described in Table 1. The software requirements for using On-Line Recovery Server with SQL Server v6.5 are identified in Table 2.

TABLE 1: SYSTEM REQUIREMENTS FOR THE ON-LINE RECOVERY SERVER

System Component	Requirement	Installation Notes
operating system	Microsoft Windows NT 3.5X	All files must be stored in local, non-switched storage.
application software	The On-Line Recovery Server can support any application for which an appropriate application launcher is available.	Verify with the software vendor that the application software is designed to behave predictably upon system failure. If so, it will have less chance of data corruption as a result of a service outage.
Recovery Server Option Kit	One kit for each switchable ProLiant Storage System.	See the *Recovery Server Option User Guide* for the contents of this kit and installation instructions.
Servers	Two Compaq ProLiant or ProSignia servers including any of these models in any combination: ProSignia 300 or 500; ProLiant 5000, 5000R, 4500, 4500R, 4000, 4000R, 2500, 2000, 2000R, 1500, 1500R. or 800.	The two servers need not have identical hardware configurations. They must, however, be located within 12 feet (2.73 meters) of each other.
Compaq SMART or SMART-2 SCSI Array Controllers	The number required depends on the configuration. Primary and Recovery Controllers in the On-Line Recovery Server configuration must be Compaq SMART or SMART-2 SCSI Array Controllers. Use of SMART or SMART-2 Array Controllers with local storage disks is optional. Each SMART or SMART-2 Array Controller can support up to two ProLiant Storage Systems. However, it must be dedicated to only one function: either Primary Controller or Recovery Controller.	The array accelerator on the SMART Array Controller must be disabled. For the On-Line Recovery Server, the EISA System Configuration Utility forces the array accelerators to be disabled for SMART controllers attached to switchable disks. The Array Configuration Utility is used to set the Array Accelerator on SMART-2 controllers to the 100% read cache setting.
disk controllers	One for each server to support its local disk drives (non-switchable, internal or external drives).	Compaq 32-Bit SCSI-2 Controllers or SMART or SMART-2 Array Controllers may be used with local storage disks.
internal hard drives in server	Can be used only as local disk drives. They are non-switchable.	For internal CD-ROM and tape drives, integrated controllers may be used.
COM port	One serial port (COM Port 1, 2, 3, or 4) on each server for communication between the paired servers.	The same COM port need not be used on both servers.
external SCSI cables	Standard-to-wide or wide-to-wide cables required to connect Primary and Recovery Controllers in each server to the Recovery Server Switch in the associated storage system(s).	See the *Recovery Server Option User Guide* for cabling requirements.
switchable external disk storage	A minimum of one switchable ProLiant Storage System between the paired servers. Any ProLiant Storage System may be used except Compaq part numbers 146700 (North America) and 146750 (outside North America).	All switchable disk drives must be located in an external storage unit. A Recovery Server Switch must be installed in each switchable external storage unit.

TABLE 1: SYSTEM REQUIREMENTS FOR THE ON-LINE RECOVERY SERVER
CONTINUED

System Component	Requirement	Installation Notes
local disk drives	Each server must have a minimum of one local (non-switchable) disk drive on which the operating system is stored.	Application software may also be stored on local disk drives; however, nothing stored on local disk drives switches over if a server fails.

TABLE 2: SOFTWARE REQUIREMENTS FOR USING
ON-LINE RECOVERY SERVER WITH SQL SERVER V6.5

Requirement	Source	Installation Notes
System Configuration Utility v2.30f or later	Software Support CD v1.21 or later, which is included in the Compaq Recovery Server Option Kit, v2.1 or later	
System ROMPAQ v2.23b or later	Software Support CD v1.21 or later, which is included in the Compaq Recovery Server Option Kit, v2.1 or later	
Compaq Windows NT Software Support Disk (NT SSD) v1.18 or later	• Compaq Customer Support • Compaq internet location (http:\\www.compaq.com) • Compaq Bulletin Board Service	Software Support CD v1.21 includes v1.17 of the NT SSD. However, v1.18 or later is required for using SQL Server v6.5 in conjunction with the Recovery Server Option.
Microsoft Windows NT 3.51 or later		
Microsoft Windows NT 3.51 Service Pack 4		
Compaq Insight Management Agents for Microsoft Windows NT		
Microsoft SQL Server v6.5		
Softpaq No. SP1623	• Compaq Customer Support • Compaq internet location (http:\\www.compaq.com) • Compaq Bulletin Board Service	This item is not shipped in the Compaq Recovery Server Option Kit.

PLANNING

Careful planning of the On-Line Recovery Server configuration is important. This section identifies some factors that should be considered during the planning.

Hardware Considerations

For easy server maintenance and trouble shooting, Compaq recommends that paired servers be similar server models.

Post-switchover traffic should be evaluated. Because the surviving server will take on the responsibilities of a failed server, system performance can become degraded after switchover. Adding extra hardware should be considered as a way to service the additional users and databases of the failed server without performance degradation.

Just as On-Line Recovery Server gives server level fault tolerance, RAID gives drive level fault tolerance. Compaq recommends using the RAID capabilities on SMART or SMART-2 drive array controllers.

Performance Considerations

The Array Accelerator on a SMART or SMART-2 array controller serves as a read/write cache for I/O requests directed to the Array Controller. In an On-Line Recovery Server configuration, the Compaq System Configuration Utility automatically:

- disables the Array Accelerator of any SMART controller attached to switchable disks.

- changes the Array Accelerator of any SMART-2 controller to 100% read cache when the SMART-2 controller is attached to switchable disks.

Changing the Array Accelerator configuration can affect overall system performance. The extent of that effect is determined by the interaction of the controllers with software and other hardware in the system and by tuning of the system. For example, Microsoft SQL Server might be tuned so that it is processor constrained and not I/O constrained. In this case, enabling, disabling, or changing the Array Accelerator configuration would have little effect on overall system performance. However, in an I/O-constrained system, disabling or changing the Array Accelerator could reduce system performance. For this reason, system performance should always be considered when planning for an On-Line Recovery Server configuration.

Windows NT Security Considerations

When the primary server fails, the ProLiant Storage System(s) attached to the failed server automatically switch over to the surviving server. The security configuration of the paired servers must therefore permit clients of a failed server to log in to the surviving server of the pair and to access the drives that have been switched over.

SQL Server v6.5 Considerations

Server names must be unique. It is recommended that an alphanumeric combination be used for the server names to avoid a conflict with words reserved by Microsoft SQL Server v6.5.

Database names must be unique for all switchable databases residing on each of the servers. For example, if Server 1 has a *TESTDB* database, Server 2 **cannot** have a different database named *TESTDB* on its switchable or local disks. Unique names will prevent database conflicts during database enrollment in the pre-switchover configuration and during the post-switchover period.

Microsoft SQL Server v6.5 requires that identical login IDs be maintained in both SQL servers. This can be achieved by adding the same logins to both servers in the same order.

Microsoft SQL Server v6.5 must be installed to run on the local drives (non-switchable disks), and the MASTER database must be configured to be on the local drives. Critical databases that require high availability must reside on the external storage disks (switchable disks).

Each customer's needs are different, and therefore the placement of database files and the installation of each type of database file will vary. The table below suggests where a Database Administrator might locate each of the file types associated with *switchable* databases.

Profile	Local	Switchable Drive 1	Switchable Drive 2
OLTP	Windows NT system files SQL program files SQL error log MASTER.DAT tempdb, pubs, msdb, model	Transaction logs	User data bases Index files Stored procedures
Batch	Windows NT system files SQL program files SQL error log MASTER.DAT tempdb, pubs, msdb, model	Transaction logs	User data bases Index files Stored procedures
Decision Support, General, or Small	Windows NT system files SQL program files SQL error log MASTER.DAT tempdb, pubs, msdb, model	Transaction logs User data bases Index files Stored procedures	

Under certain circumstances, if a server is powered on and the expected SQL database(s) are not accessible, SQL Server databases may have been marked as "suspect." This situation occurs most commonly when a database has been failed over to the surviving server and then the failed server has been repaired and booted back up. The failed server starts SQL Server, SQL Server looks for the databases, and does not find them because they are still running on the surviving server. Because the failed server cannot find the databases, it marks them as "suspect."

The simplest way to avoid this problem is to ensure SQL Server v6.5 does not automatically start when the server is powered on. To do that, during the installation of SQL Server v6.5, be sure that these two checkboxes are NOT checked:

- Auto Start SQL Server at boot time

- Auto Start SQL Executive at boot time

All SQL Server v6.5 stored procedures that will be used with databases residing on switchable external disks must reside on the same external disks, not on a local disk. This ensures that when a fallback occurs and the drives switch over, any SQL Server v6.5 stored procedures used with the databases are available to the surviving server.

Drive Letter Mapping

Compaq recommends that the System Administrator or Database Administrator record the drive letters of each server before a switchover to aid in understanding the drive maps after the switchover process.

Compaq also recommends that the drive letters on both the paired servers be named in such a way that those drive letter names will not change after a switchover. The drive mapping scheme in Table 1 illustrates how this can be done for a single fallback system (a server pair such as the one illustrated in Figures 1 and 2 in which only one server has switchable external storage). Note in Table 1 that the switchable drives in Server 1 have been given different drive letters. Therefore, if Server 1 fails, its drives E and F can switchover to Server 2 while maintaining their original drive letters E and F.

The drive mapping scheme in Table 2 illustrates how this can be done for a mutual fallback system (a server pair such as the one illustrated in Figure A-1 in which both servers have switchable external storage disks).

This method of drive mapping is very helpful in troubleshooting the post-switchover environments. For a more detailed discussion of drive letter mapping, refer to the section "Drive Letter Mapping" in the technology brief titled "On-Line Recovery Server."

TABLE 1: SAMPLE DRIVE MAPPING SCHEME FOR SINGLE FALLBACK SYSTEM

SERVER 1		SERVER 2	
Drive Letter	Type of Drive	Drive Letter	Type of Drive
C	local	C	local
D	CD-ROM	D	CD-ROM
E	first switchable	G	non-switchable
F	second switchable		

TABLE 2: SAMPLE DRIVE MAPPING SCHEME FOR MUTUAL FALLBACK SYSTEM

SERVER 1		SERVER 2	
Drive Letter	Type of Drive	Drive Letter	Type of Drive
C	local	C	local
D	CD-ROM	D	CD-ROM
E	first switchable	G	first switchable
F	second switchable	H	second switchable

CONFIGURATION PROCEDURES

This section defines the procedures necessary for configuring On-Line Recovery Server with Microsoft SQL Server v6.5.

Hardware Installation

Follow the instructions in the *Recovery Server User Guide* (delivered with the Recovery Server Option Kit) to complete the following hardware configuration tasks:

- Install the SMART Controllers.

- Install Recovery Server Switches required for this configuration.

- Connect SCSI cabling.

- Connect Serial Interconnect cabling.

System Configuration

System configuration includes updating the SMART controller firmware, configuring the system, installing the SMART controller driver, and setting up switchable storage.

Updating the SMART Controller Firmware

On each of the two paired servers, use the Compaq Options ROMPaq diskette to install and update SMART Controller firmware that is required for the On-Line Recovery Server:

1. Boot each server using the Options ROMPaq disk.

2. Follow the instructions on screen to update the SMART Controller firmware.

Configuring the System

You must use the Compaq System Configuration Utility to configure the two paired servers. On each of the servers, perform the following steps:

1. Run the Compaq System Configuration Utility. Compaq recommends that you obtain the latest version of the Compaq System Configuration Utility, since new releases could include changes that affect On-Line Recovery Server and Compaq hardware. The selections for the On-Line Recovery Server appear in the SMART Controller configuration section.

2. In the SMART Controller configuration section, designate each SMART Controller attached to a switchable ProLiant Storage System as either an On-Line Recovery Server "primary" controller or an On-Line Recovery Server "recovery" controller. Designate all SMART Controllers used for local storage as On-Line Recovery Server "disabled."

3. Configure Automatic Server Recovery to "Boot Compaq Utilities."

4. Complete any other configuration activities needed for your specific hardware configuration.

5. Exit the configuration utility, and restart Windows NT.

Installing the SMART Controller Driver

Depending on the hardware configuration and the procedure used to install Windows NT, it may be necessary to install the SMART controller device driver. If you are using SMART Controllers for local storage, the driver would have been installed when you installed Windows NT. If you are not using SMART Controllers for local storage, you must install the driver at this time. The

driver is located on the Compaq SSD for Microsoft Windows NT. To install the driver, follow the installation instructions in the *NTREADME.HLP* file on the Compaq SSD for Microsoft Windows NT.

Setting Up Switchable Storage

Once the SMART Controller device driver has been installed, use the Windows NT Disk Administrator to initialize the switchable disks attached to the primary switchable SMART Controllers. Compaq recommends formatting the switchable disks using NTFS as the file system type. Once the formatting is complete, the switchable disk drives are available for use.

On-Line Recovery Server Driver Installation

The On-Line Recovery Server software must be installed from the Compaq Windows NT Software Support Disk (NT SSD). The installation process installs the software components and sets configuration values. After the setup process is completed, the installation of the Recovery Agent is verified. The Windows dialog box used during the installation process to prompt for configuration values is the same as that used by the Configuration and Control applet. Certain testing functions are disabled during the installation process.

To install the On-Line Recovery Server software components:

1. Execute the file *SETUP.CMD* that is found on the NT SSD. This starts the setup process to install the On-Line Recovery Server software.

2. When prompted to do so, select the "On-Line Recovery Server" item for installation.

    Installation of the On-Line Recovery Server option requires installation of the Compaq System Management support. If System Management is not explicitly selected, the SETUP program ensures that it is installed in addition to the Recovery Server software components.

3. When prompted to do so, set configuration parameters for the On-Line Recovery Server.

UPDATE SQL SERVER FALLBACK SCRIPT

If SQL Server v6.5 Service Pack 2 is not installed, the latest fallback stored procedures must be installed on both servers, regardless of whether the system is being set up as a single fallback system or as a mutual fallback system. Included in Compaq Softpaq 1623 is the file FALLBAC3.SQL. This file will update the fallback stored procedures to the correct revision. These stored procedures replace earlier versions present in ProcSyst.SQL (The original file shipped with SQL Server v6.5 has near the top of the file a date/time of '1996/03/26 16:54'). The System Administrator should execute this FALLBAC3.SQL file into any Microsoft SQL Server v6.5 server that might make use of the fallback feature.

To update the stored fallback procedures:

1. Unpack Compaq SoftPAQ 1623 and locate the file FALLBAC3.SQL.

2. Extract the FALLBAC3.SQL file from the Softpaq diskette.

3. Execute the program ISQL.EXE from a command line as shown below:

        ISQL.EXE -Usa -S -n -I Fallbac3.SQL

Note: Do not use ISQLW to perform this procedure.

Note: If Microsoft SQL Server v6.5 Service Pack 2 has been installed, the execution of the above procedures will produce several error messages. Do not be alarmed, FALLBAC3.SQL will not

overwrite of any of the newer stored procedures that were added as part of the Service Pack 2 update.

CONFIGURE SQL SERVER FALLBACK SETUP

SQL Server can be configured either for single fallback support or for mutual fallback support. In a single fallback system, only one of the paired servers has one or more switchable ProLiant Storage Systems. If that server fails, its switchable disk(s) switch over to the surviving server. In a mutual fallback system, both paired servers have one or more switchable ProLiant Storage Systems that will fall back if their respective server fails. This section explains the procedures for configuring a single fallback system like the simple one illustrated in Figures 1 and 2. This example consists of Server 1, Server 2, and a single ProLiant Storage System configured to use the Recovery Server Option and SQL fallback support. Procedures for configuring a mutual fallback system are provided in Appendix A.

IMPORTANT:

- When configuring your own system, in each installation step replace the names Server_1 and Server_2 with the actual names assigned to the servers in your environment.

- Type all italicized SQL commands exactly as indicated in this document; all single quotes appearing in italicized SQL commands are required.

Installing Single Fallback Support with SQL Server v6.5 Stored Procedures

Compaq recommends that you execute all the stored procedures from the QUERY function of SQL Enterprise Manager, which ships with SQL Server v6.5. These SQL stored procedures tell SQL Server v6.5 that Server 2 is the fallback Server for Server 1. The procedures also set up the capability to perform a remote login from Server 1 to Server 2, which is required for the automatic fallback of the database(s) on Server 1.

1. In an NT Command Prompt window, type the command CPQRSMAP.EXE and press Enter. This will record the current drive letter(s) assigned to each switchable drive partition.

2. On Server 1, ensure that "master" is the default database. Then execute the SQL stored procedures in the following steps:

3. To record Server 2 as the fallback server, execute:

   sp_addserver 'Server_2', 'fallback'

   If Server 2 has already been configured in Server 1 as a server for Remote Procedure Call (as determined by running the stored procedure *sp_helpserver*), then execute this stored procedure instead:

   sp_serveroption 'Server_2', 'fallback', 'true'

4. To give the system administrator (SA) on the fallback server, Server 2, the ability to logon as SA on Server 1, execute:

   sp_addremotelogin 'Server_2', 'sa', 'sa'

5. On Server 2, execute the following SQL stored procedure:

   sp_addserver 'Server_1'

   Note: If Server 1 has already been configured in Server 2 as a server for Remote Procedure Call (as determined by running the stored procedure *sp_helpserver*), then this step does not need to be performed.

6. To give the system administrator (SA) on Server 1 the ability to logon as SA on Server 2, execute:

    sp_addremotelogin 'Server_1', 'sa', 'sa'

7. To determine if Server 2 is already configured for Remote Procedure Calls on Server 1, execute this stored procedure on Server 1:

    sp_helpserver

    The following results will be displayed:

	name		network_name		status		id
1.	name	1.	network_name	1.	status	1.	id
2.	Server_1	2.	Server_1	2.		2.	
3.	Server_2	3.	Server_2	3.	rpc,fallbac	3.	

    If "rpc" is listed in the "status" column for Server 2, then Server 2 has already been configured to perform remote procedure calls. In that case, execute the following stored procedure on Server 1:

    sp_serveroption 'Server_2', 'fallback', 'true'

8. To ensure that Server 2 is configured as the fallback server for Server 1, execute the following stored procedure on Server 1:

    sp_helpserver

    The following results should be displayed:

	name		network_name		status		id
1.	name	1.	network_name	1.	status	1.	id
2.	Server_1	2.	Server_1	2.		2.	
3.	Server_2	3.	Server_2	3.	rpc,fallbac	3.	

9. Using SQL Service Manager, stop and then start the SQL Server v6.5 engine, *MSSQLServer*, on both Server 1 and Server 2.

10. Execute the following stored procedures to ensure that the RPC connection is properly configured:

    On Server 1:   *Server_2...sp_helplogins*

    On Server 2:   *Server_1...sp_helplogins*

    If an error message is returned, additional information about the RPC connection can be obtained by executing the stored procedure *sp_helpserver*.

Enrolling the Databases for Fallback Support

1. On Server 2, for <u>each</u> critical database that normally resides on Server 1, execute the following SQL stored procedure:

    sp_fallback_enroll_svr_db 'Server_1', 'dbname1'

    When typing in the procedure, substitute the actual name of a database for the term *dbname1*. This procedure sets Server 2 as the fallback server for the database.

Note: This procedure must be executed for **each** database that is intended to fallback to Server 2.

2. To display the status of the enrolled fallback databases for Server 2, execute the following SQL stored procedure on Server 2:

> *sp_fallback_help*

Note: Enrollment of databases as performed in the two steps above is valid as long as there are no changes to the space allocation for a database. If a database is expanded or shrunk, the enrollment process should be repeated. The database should be expanded or shrunk only on the SQL Server that is the original owner of that database.

Setting Up Generic Application Launcher for Automatic Fallback of SQL Databases

With the On-Line Recovery Server configuration, when a primary server fails, its switchable disks automatically switch over to the surviving server. To mount the databases, however, SQL Server v6.5 requires extra software that will be triggered when the drive switchover occurs. Compaq provides two files necessary to automate the fallback of the SQL databases. These files call the necessary stored procedures to fallback each database that has been properly enrolled via the steps outlined in the previous section of this paper.

To install the software files provided by Compaq, perform the following steps:

1. From Softpaq 1623, copy the two files named CPQRSSQL.EXE and CPQRSCFG.BAT to the \%SYSTEMROOT%\SYSTEM32 directory on Server 2.

   Note: Substitute the actual name of the root directory on Server 2 for the term *%SYSTEMROOT%*; for example, \WINNT35\SYSTEM32.

2. Edit the file CPQRSYS.CMD located in the directory \%SYSTEMROOT%\SYSTEM32 to add the following line to the end of the file, and then save the file:

   > CPQRSGL CPQRSCFG.BAT

   Note: To aid in automatically starting an application launcher or other program, the Compaq Recovery Agent service executes CPQRSYS.CMD when it begins execution. When the On-Line Recovery Server software is installed, a CPQRSYS.CMD file is created; however, it contains no commands. You must edit this file or create one of the same name. The commands in the file are executed after the Recovery Agent has completed its initialization activities and before it attempts to receive its partner server's heartbeat message.

3. Edit the file CPQRSCFG.BAT and change the server name "*Primary_Server_Name*" to the name of the primary server in your environment.

4. Bring up the Main Program group box; double click on Control Panel; choose the Services subgroup; and select Compaq On-Line Recovery Agent.

5. Stop and then start the On-Line Recovery Agent service.

The Online Recovery Server option and Microsoft SQL Server fallback options are now configured. If the Primary server fails, the Compaq On-Line Recovery Agent on the backup server will switch the drives that were designated as switchable and inform SQL Server to mount any databases designated for fallback.

BRINGING A FAILED SERVER BACK ON-LINE

Once a fallback occurs, the failed server is off line. When the cause of the outage is identified and resolved, the server needs to be brought back on line, returning the pair of servers to their original state.

Assume that Server 1 is the server that failed and that the fallback databases are running on Server 2. To bring the failed server back on line, complete the following steps:

1. Deactivate fallback databases currently activated on Server 2. Do this by executing the following stored procedure on Server 2:

    sp_fallback_deactivate_svr_db 'Server_1', '%'.

    Note: All fallback databases **must** be deactivated. Not doing so may cause databases to be marked as suspect. See the following section, "Suspect Databases," for details.

2. Shut down both servers and power them off.

3. Power off the ProLiant Storage System(s).

4. Power on the ProLiant Storage System(s).

5. Power on each of the servers. The fallback databases will then be available on Server 1, while Server 2 again acts as the Recovery Server.

Suspect Databases

Under certain circumstances, if a server is powered on and the expected SQL database(s) are not accessible, SQL Server databases could be marked as suspect. This situation could be caused by the following events:

Primary Server

- The SQL Server engine on the primary server is configured to start automatically when the server is powered on, but the critical databases have not reverted back to the primary user as described in the section above.

- The ProLiant Storage System was not powered off to move the SCSI switch back to the primary server.

Secondary Server

- The fallback databases were not deactivated prior to moving them back to the primary server.

- The SQL Server engine on the secondary server is configured to start automatically when the server is powered on, but the critical databases have reverted back to the primary server before being properly deactivated.

When both the servers are brought back on line with the databases again accessible to the original owner, the fallback server will still expect to be connected to the fallback databases because they have not been deactivated. Therefore, the fallback server will mark the SQL Server databases as suspect.

To reset the suspect status of the databases, execute the following stored procedure:

    sp_resetstatus

    Note: Refer to SQL Server v6.5 documentation for details of this stored procedure.

The simplest way to avoid this suspect database problem is to ensure that SQL Server v6.5 does not automatically start when the server is powered on. To do that, during the installation of SQL Server v6.5, ensure that the following two checkboxes are NOT checked:

- Auto Start SQL Server at boot time.

- Auto Start SQL Executive at boot time.

CLIENT ACTIONS DURING FALLBACK

During a switchover, clients of the failed server will experience a service outage of several minutes. Because the two paired servers in the On-Line Recovery Server configuration have different network addresses, clients of the failed server must manually logon to the surviving server to become connected to it and regain access to storage disks that have been switched over.

By knowing the address of the recovery server, it is possible to program logic into client software to effect an automated client switchover to the surviving server. Also, by modifying SQL Server v6.5 client DB-Library applications, it is possible to effect an automatic client switchover to the fallback database(s). Doing so can reduce the time interval during which the switched drives will not be available to clients.

The exact amount of time that the databases are inaccessible to clients is dependent on the number of drives that switch over, the values of certain user-defined parameters in System Configuration, and the amount of time it takes SQL Server to mount and verify the integrity of the fallback databases. Refer to the sections "Client Behavior" and "Speed of Switchover" in the technology brief *Compaq On-Line Recovery Server* for additional information.

Automatic Client Reconnect to SQL Server Database(s)

SQL Server v6.5 client DB-Library applications can be enabled to connect automatically to a fallback server in the event of a server failure. To understand the enhancements SQL Server v6.5 has in this area, research the following commands in the *SQL Server Books On-Line* that is included with SQL Server v6.5.

To enable fallback support in a Client application via DB-Library, the following commands must be used:

> *SQLSetlFallback(loginrec, "ON");*

> *sqlconn = SQLopen(loginrec, "Server_1")*

SQL Server 6.5 also allows client applications that utilize ODBC to reconnect automatically to the fallback server in the event of a Primary server failure. To enable fallback support in a Client application via ODBC, the following commands must be used:

> *SQLSetConnectOption(hdbc, SQL_FALLBACK_CONNECT, SQL_FALLBACK_CONNECT_ON);*

> *SQLConnect(hdbc, <Server_1's DSN>, ...);*

Either method above enables the client to recognize that fallback is enabled and to try connecting to the fallback server if the connection to "Server_1" fails. If the application already has a connection to the primary server and that connection is lost, this same logic can be used to try reconnecting to the primary server; and if this fails, it will automatically try to connect to the fallback server.

Manual Client Reconnect

SQL Server v6.5 applications that do not make use of the updated functions discussed in the previous section can still make use of the fallback server in the event of a server outage. If an application is disconnected due to a server failure, the user can manually reconnect to the fallback server and gain access to the data that has switched over to the fallback server.

VERIFYING THE INSTALLATION

During the installation of the Recovery Server Option, the System Administrator most likely verified the switchover activity. Once SQL Server v6.5 is installed and the steps outlined in the sections above have been completed, Compaq recommends that a switchover verification for the fallback database(s) be performed. Refer to *The Recovery Server Option User Guide (*Chapter 6, Part 5 "Software Installation") for instructions on how to force a switchover. Following the switchover of the drives, login to the SQL Server fallback database(s) on the surviving server to ensure that each database is accessible.

If you cannot access the database(s), refer to the next section, "Trouble Shooting Tips," and verify that each step in the "Installing Fallback Support with SQL Server v6.5 Stored Procedures" section above has been performed correctly.

TROUBLE SHOOTING TIPS

Two tables located in the system database are required to maintain information regarding the integration of On-Line Recovery Server with Microsoft SQL Server v6.5. These two tables contain information pertaining to the pre-switchover (pre-fallback) configuration: SYSSERVERS and SYSREMOTELOGINS.

Failure of RPC connection

If the RPC connection fails, execute this SQL Server v6.5 stored procedure to determine whether the servers are properly configured:

> *sp_helpserver*

Drive Mapping Problems

If problems concerning the drive mappings arise, check the CPQRSYS.RSO file to identify the pre-switchover drive letters. (The CPQRSMAP.EXE file must have run before the switchover to create this file.) The post-switchover drive information is stored in the CPQRSYSR.RSO file of the switched over drives. (The CPQRSMPR.EXE file must have run after the switchover to create this file.) For additional information, refer to the section "Drive Letter Mapping" in the technology brief *Compaq On-Line Recovery Server.*

De-activating Databases

If you are logged into a session, logout before de-activating the database(s). Then to de-activate the databases, log back in and execute the following stored procedure:

> *sp_fallback_deactivate_svr_db*

If you do not logout and log back in, Microsoft SQL Server v6.5 will display a message that users are connected to the database.

Monitoring Recovery Server

The Compaq Recovery Agent Monitor in the Administrative Tools Program Group can be used to monitor the status of the On-Line Recovery Server. The Compaq Recovery Agent Configuration and Control applet in the Control Panel group can be used to configure and to monitor the On-Line Recovery Server.

Switchover information is written to the Event Log and can be viewed through the Event Viewer.

Appendix A: Mutual Fallback Setup

In a mutual fallback system, both paired servers have one or more switchable ProLiant Storage Systems that will switchover if their respective server fails. This section explains the procedures for configuring a mutual fallback system.

IMPORTANT:

- When configuring your own system, in each installation step replace the names Server_1 and Server_2 with the actual names assigned to the servers in your environment.

- Type all italicized SQL commands exactly as indicated in this document; all single quotes appearing in italicized SQL commands are required.

Installing Mutual Fallback Support with SQL Server v6.5 Stored Procedures

The following explanation of a Compaq On-Line Recovery Server configuration is based on the example shown in Figure A-1, which consists of Server 1, Server 2, and ProLiant Storage Systems configured to use the Recovery Server Option and SQL fallback support.
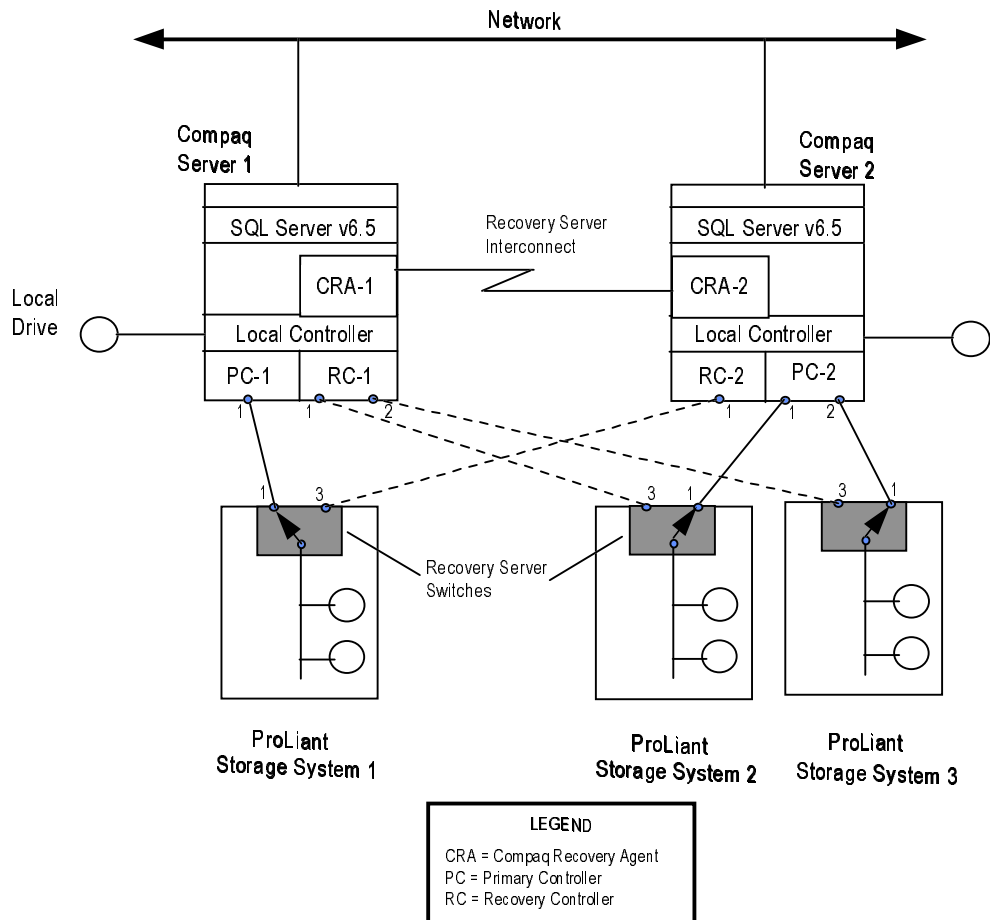
Figure A-1.   An On-Line Recovery Server pair configured for mutual fallback.

Compaq recommends that you execute all the stored procedures from the QUERY function of SQL Enterprise Manager, which ships with SQL Server v6.5. These SQL stored procedures tell SQL Server v6.5 that Server 2 is the fallback Server for Server 1. The procedures also set up the capability to perform a remote login from Server 1 to Server 2, which is required for the automatic fallback of the database(s) on Server 1.

To record the current drive letters for On-Line Recovery Server, complete these steps on both Server 1 and Server 2:

1. In a Command Prompt window, type the command CPQRSMAP.EXE and press Enter. This will record the current drive letter(s) assigned to each switchable drive partition.

To set up SQL Server for mutual fallback support, complete this procedure:

1. On Server 1, to record Server 2 as the fallback server, execute

    sp_addserver 'Server_2', 'fallback'

    If Server 2 has already been configured in Server 1 as a server for Remote Procedure Call (RPC), then execute this stored procedure instead:

    sp_serveroption 'Server_2', 'fallback', 'true'

2. On Server 1, to give the system administrator (SA) on the fallback server, Server 2, the ability to logon as SA on the primary server, Server 1, execute

    sp_addremotelogin 'Server_2', 'sa', 'sa'

3. On Server 2, to record Server 1, as the fallback server, execute

    sp_addserver 'Server_1', 'fallback'

    If Server 2 has already been configured in Server 1 as a server for Remote Procedure Call (RPC), then execute this stored procedure instead:

    sp_serveroption 'Server_1', 'fallback', 'true'

4. On Server 2, to give the system administrator (SA) on Server 1 the ability to logon as SA on the secondary server, Server 2, execute:

    sp_addremotelogin 'Server_1', 'sa', 'sa'

5. To verify that each server is configured for Remote Procedure Calls on the paired server, execute this stored procedure on each server:

    sp_helpserver

    The following results will be displayed on Server 1:

name	network_name	status	id
Server_1	Server_1		0
Server_2	Server_2	rpc,fallbac	1

    If "rpc" is listed in the "status" column for Server 2, then Server 2 has already been configured to perform remote procedure calls. In that case, execute the following stored procedure on Server 1:

    sp_serveroption 'Server_2', 'fallback', 'true'

The following results will be displayed on Server 2:

name	network_name	status	id
Server_1	Server_1	rpc, fallbac	1
Server_2	Server_2		0

6. Using SQL Service Manager, stop and then start the SQL Server v6.5 engine on both Server 1 and Server 2.

Enrolling the Databases for Fallback Support

1. For each critical database that normally resides on Server 1, type in the following SQL stored procedure on Server 2:

    sp_fallback_enroll_svr_db 'Server_1', 'dbname1'

    Step 1 sets Server 2 as the fallback server for a database. In the procedure named above, *dbname1* stands for the first database for Server 1. Step 1 must be performed for **each** database that is intended to fallback to Server 2.

2. For each critical database that normally resides on Server 2, type in the following SQL stored procedure on Server 1:

    sp_fallback_enroll_svr_db 'Server_2', 'dbname1'

    Step 2 sets Server 1 as the fallback server for a database. In the procedure named above, *dbname1* stands for the first database for Server 2. This procedure must be executed for **each** database that is intended to fallback to Server 1.

3. To display the status of the enrolled fallback databases for Server 1, execute the following SQL stored procedure on Server 1:

    sp_fallback_help

4. To display the status of the enrolled fallback databases for Server 2, execute the following SQL stored procedure on Server 2:

    sp_fallback_help

Note: Enrollment of databases as performed in the steps above is valid as long as there are no changes to the space allocation for the database. If a database is expanded or shrunk, then the enrollment process should be repeated. The database should be expanded or shrunk only on the SQL Server that is the original owner of that database.

Appendix B: Manual Fallback of Databases

To perform manual fallback of databases, complete the following steps each time the fallback server takes over a switchable disk from the primary server and assigns a new drive letter to the disk:

1. Determine pre- and post-failover drive letter assignments as recorded in CPQRSYS.RSO and CPQRSYSR.RSO respectively:

2. Once these drive letter assignments have been determined, executive the following stored procedure. Replace the drive letters "x" and "y" with the pre- and post-failover drive letters from step 1 above.

    exec sp_fallback_upd_dev_drive 'Server_1', 'x:', 'y:'

3. Activate live fallback support for all databases enrolled from Server 1 and execute the following:

    exec sp_fallback_activate_svr_db 'Server_1', '%'

Note: Replace 'Server 1' in the commands above with the name of the database's primary server.

Glossary

CPQRSMAP.EXE

A Compaq On-Line Recovery Server utility that creates a file called \CPQRSYS.RSO on each switchable drive letter that can be switched over in the event of a server software or hardware failure. This file contains the pre-switchover drive letter and is used for determining what drive letter was assigned to a given partition on the failed server. It can be manually run by the user, or it can be added to the CPQRSYS.CMD file *before* the line CPQRSGL CPQRSCFG.BAT to automate the running of this utility *before* a switchover occurs.

CPQRSMPR.EXE

A Compaq On-Line Recovery Server utility that creates a file called \CPQRSYSR.RSO on each new drive letter that switched over. This file contains the post-switchover drive letter and is used for determining what drive letter has been assigned to a given partition on the surviving server. It can be manually run by the user, or it can be added to the CPQRSYS.CMD file *after* the line CPQRSGL CPQRSCFG.BAT to automate the running of this utility *after* a switchover has occurred.

CPQRSYS.CMD

A batch file that is run automatically when the Compaq On-Line Recovery Service starts.

BACKUP SERVER or STANDBY SERVER

Microsoft's terminology for a server that takes control of the switchable disks of its failed partner. Compaq also uses these terms when describing the <u>Standby</u> configuration of the Recovery Server Option.

FALLBACK

Term used in Microsoft SQL Server v6.5 documentation to refer to relocating databases to a surviving server in the event of a server software or hardware failure.

PAIRED or PARTNER SERVER

The other server in a Compaq On-Line Recovery Server configuration pair. This terminology is used when both servers are up and running.

SURVIVING SERVER

Compaq's terminology for a server that takes control of switchable disks of its failed partner.

SWITCHABLE DISKS

Disk drives that are contained in an external Compaq ProLiant Storage cabinets in which the Compaq Recovery Server Option switch has been installed.

SWITCHOVER

The process of transferring control of disk drives from a failed server to its partner (surviving) server.