Dell™ PowerEdge™ Systems Dell Oracle Database 10*g* R2 Standard Edition on Microsoft® Windows Server® 2003, SP2, Standard x64 Edition

Deployment Guide Version 1.3

Notes and Notices

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

April 2007 Rev. A02

Contents

This document provides information for installing, configuring, reinstalling, and using your Oracle Database 10*g* R2 software following Dell's supported configurations for Oracle.

Use this document in conjunction with the *Dell Deployment* CD to install your software. If you install your operating system using only the operating system CDs, the steps in this document may not be applicable.

The following topics are covered:

- Software and hardware requirements
- Installing and configuring Microsoft® Windows Server® 2003, SP2 Standard x64 Edition
- Verifying cluster hardware and software configurations
- Configuring networking and storage for Oracle Real Application Clusters (RAC) 10*g* R2
- Installing Oracle Database 10*g* Release 2 patchset 10.2.0.3 and software updates
- Supported software stack
- Troubleshooting
- Getting help

For more information on Dell's supported configurations for Oracle, see the Dell|Oracle Tested and Validated Configurations website at **www.dell.com/10**g.

If you purchased the Oracle 10*g* RAC Deployment Service, your Dell Professional Services representative will assist you with the following:

- Verifying cluster hardware and software configurations
- Configuring networking and storage
- Installing Oracle Database 10*g* Release 2 patchset 10.2.0.3

Terminology Used in this Document

This document uses the terms *logical unit number* (LUN) and *virtual disk*. These terms are synonymous and can be used interchangeably. The term *LUN* is commonly used in a Dell|EMC Fibre-Channel storage system environment and *virtual disk* is commonly used in a Direct-attached SAS (Dell MD3000) storage environment.

Software and Hardware Requirements

The following sections describe the minimum software and hardware requirements for Dell's Supported Configurations for Oracle.

For information on supported software versions for drivers and applications, see "Supported Software Stack after Deployment."

Minimum Software Requirements

Table 1-1 lists the basic software requirements for Dell's supported configurations for Oracle.

NOTE: If you do not have an Oracle software license, contact your Dell sales representative.

Table 1-1. Software Requirements

Software Component	Configuration
Windows Server 2003, SP2	Standard x64 Edition
Oracle Database 10*g*, SP2	Version 10.2.0.1
	Standard Edition, including the RAC option for clusters
Oracle patchset	Version 10.2.0.3
EMC® PowerPath® (Fibre Channel clusters only)	Version 4.6.1

Minimum Hardware Requirements

Table 1-2 lists the hardware requirements. For more information on specific hardware components, see the documentation that came with your system.

NOTE: Depending on the number of users, the application you use, your batch processes, and other factors, you may need a system that exceeds the minimum hardware requirements in order to achieve your desired performance.

NOTE: The hardware configuration of all the nodes must be identical.

Table 1-2. Minimum Hardware Requirements for the Direct-Attached (SAS or Fibre Channel) and SAN-Attached Fibre Channel Cluster Configuration

Hardware Component	Configuration
Dell™ PowerEdge™ 1850 system (up to two nodes)	Intel® Xeon® processor family.
Dell PowerEdge 1950 system (up to two nodes)	1 GB of RAM.
Dell PowerEdge 2850 system (up to two nodes)	PowerEdge Expandable RAID Controller (PERC) for internal hard drives.
Dell PowerEdge 2900 system (up to two nodes)	Two 73-GB hard drives connected to a PERC controller.
Dell PowerEdge 2950 system (up to two nodes)	**NOTE:** Dell recommends two 73-GB hard drives (RAID 1) connected to a PERC 5/i, PERC 4e/Di, or PERC 4e/Si based on your system. See your PowerEdge system documentation for more details.
Dell PowerEdge 6850 system (up to two nodes)	Three Gigabit Network Interface Cards (NICs).
	Two Host Bus Adapters (HBAs) (1 QLE2462[dual port] HBA for use with PowerEdge 1850 and PowerEdge 1950).

Table 1-2. Minimum Hardware Requirements for the Direct-Attached (SAS or Fibre Channel) and SAN-Attached Fibre Channel Cluster Configuration *(continued)*

Hardware Component	Configuration
Dell PowerEdge 6950 system (up to two nodes)	AMD Opteron™ processor family. 1 GB of RAM. PowerEdge Expandable RAID Controller (PERC) for internal hard drives. Two 73-GB hard drives connected to a PERC 5/i controller. **NOTE:** Dell recommends two 73-GB hard drives (RAID 1) connected to a PERC 5/i based on your system. See your PowerEdge system documentation for more details. Three Gigabit Network Interface Cards (NICs). Two host bus adapters (HBAs).
Dell PowerEdge 2970 system (up to two nodes)	AMD Opteron processor family. 1 GB of RAM. PowerEdge Expandable RAID Controller (PERC5/i) for internal hard drives. Two 73-GB hard drives connected to a PERC 5/i controller. **NOTE:** Dell recommends two 73-GB hard drives (RAID 1) connected to a PERC 5/i based on your system. See your PowerEdge system documentation for more details. Three Gigabit Network Interface Cards (NICs). Two host bus adapters (HBAs).
Gigabit Ethernet switch (two required)	See **dell.com/10***g* for information on supported configurations.
For Fibre Channel: Dell|EMC CX300, CX500, CX3-10C, CX3-20 Fibre Channel storage system	See the Dell | EMC system documentation for more details.
For Direct-attached SAS: Dell™ PowerVault™ MD3000 storage system.	See your Dell PowerVault MD3000 storage system documentation for more details.

Installing and Configuring the Operating System

NOTICE: To ensure that the operating system is installed correctly, disconnect all the external storage from the system *before* you install the operating system.

This section provides information about installing and configuring the Windows Server 2003, SP2 Standard x64 Edition operating system for Oracle deployment.

NOTE: If the stand-alone CD for *Windows Server 2003, SP2 Standard x64 Edition* is not yet available, then use *Windows Server 2003, R2 Standard x64 Edition* during deployment and update it to SP2 using the *Windows Server 2003, SP2 (x64) ISO-9660* CD image.

The installation procedure may vary, depending on the installation CDs that you purchased with your system. See Table 1-3 for the installation procedure that applies to your configuration.

Table 1-3. Determining Your Installation Procedure

CDs	Installation Procedure
Windows Server 2003, SP2 Standard x64 Edition CD	See "Installing the Operating System Using the Deployment CDs."
Dell Deployment CD *Oracle Database 10g Release 2 Standard Edition* CD *Oracle Database 10g Release 2 patchset 10.2.0.3* CD	See the Dell|Oracle Tested and Validated Configurations website at **www.dell.com/10g** for more information.

Installing the Operating System Using the Deployment CDs

Repeat the steps in this section for both nodes in the cluster.

NOTE: See the Dell Support website at **support.dell.com** for the latest BIOS, firmware, and driver updates.

1. Shut down your system.
2. Disconnect all the external storage devices from your system.
3. Locate the *Dell Deployment* CDs and the *Microsoft Windows Server 2003, SP2 Standard x64 Edition* CD.
4. Turn on your system.
5. Insert the *Dell Deployment* CD1 into the CD drive.

   Your system boots from the *Dell Deployment* CD1. After startup, a text screen appears, prompting you to select an option.

   If your system does not boot from *Dell Deployment* CD1, restart your system. On reboot, press <F2> and verify that the CD drive appears first in the boot order.
6. At the command prompt, type `2` to select **Oracle 10*g* R2 SE on Windows Server 2003 SE x64 SP2** and press <Enter>.
7. When prompted for the choice of deployment, type `1` and press <Enter>.

   Several scripts run.

8 When prompted, remove the *Dell Deployment* CD1 from the CD drive and insert the *Dell Deployment* CD2 into the CD drive.

The system automatically copies the required files from the CD.

9 When prompted, insert *Microsoft Windows Server 2003, SP2 Standard x64 Edition* CD1 into the CD drive.

The contents of the *Microsoft Windows Server* CD are copied to the **Deployment** partition, the system is rebooted, and normal Windows installation begins. The Windows setup screen prompts you to Personalize Your Software.

10 In the **Name** and **Organization** fields, enter the appropriate information and click **Next**.

11 When prompted, enter your product key for Windows Server 2003 SP2 Standard x64 Edition and click **Next**.

12 In the **Computer Name** and **Administrator password** fields, enter the appropriate information and click **Next**.

NOTICE: Do not leave the administrator password blank.

NOTE: To configure the public network properly, the computer name and the public NIC card's host name must be identical.

NOTE: Record the password that is required to log on to the computer later.

13 Follow the instructions on your screen to complete the installation.

NOTE: This procedure may take several minutes to complete.

When the installation procedure is completed, the **Welcome to Windows** window appears.

14 Shut down the system, reconnect all external storage devices, and start the system.

15 In the **Welcome to Windows** window, press <Ctrl><Alt><Delete> to continue.

The **Log On** window appears.

16 In the **Password** field, type the administrator password that you created in step 12 in this procedure and click **OK**.

You are prompted to insert the *Windows Server* CD2. You can choose to install the contents of Windows Server CD2 or select **Cancel**.

NOTE: If you install the contents of *Windows Server* CD2, follow the prompts through the normal installation process. The following process assumes you are not installing the *Windows Server* CD2.

17 Select **Cancel**.

You are prompted that the contents of *Windows Server* CD2 are not going to be installed.

18 Select **OK**.

You are prompted to configure Windows Server Post-Setup (optional).

19 Select **Finish**.

You are prompted to close the page.

20 Select **Yes**.

The **Manage Your Server** windows management displays.

21 Close the window.

22 If you used Windows Server 2003, R2 Standard x64 Edition in step 9, then insert the *Windows Server 2003 SP2 (x64) ISO-9660* CD and follow the onscreen instructions to update the operating system to SP2. If you used Windows Server 2003, SP2 Standard x64 Edition in step 9, then ignore this step.

Verifying the Temporary Directory Paths

Verify that the paths to the **Temp** and **Tmp** directories have been set correctly. Repeat the following steps for both nodes in the cluster.

1 Click **Start** and select **Run**.

2 In the **Open** field, type `cmd` and click **OK**.

3 At the command prompt, type `echo %Temp%` and press <Enter>. The following path appears:

`%SystemDrive%\Temp`

4 At the command prompt, type `echo %Tmp%` and press <Enter>. The following path appears:

`%SystemDrive%\Tmp`

Verifying Cluster Hardware and Software Configurations

Before you begin the cluster setup, ensure that you have the minimum hardware installed as shown in Table 1-2. This section provides setup information for hardware and software cluster configurations.

Each node must have the following software installed:

- Windows Server 2003 SP2 Standard x64 Edition (see Table 1-1)
- HBA drivers.
- *PowerVault MD3000 Resource* CD (when using the PowerVault MD3000 as backend storage)
- SAS 5/E driver (when using the PowerVault MD3000 as backend storage)

The storage must be configured with a minimum of 4 virtual disks/LUNs (2 for the redundant Voting Disk and Oracle Cluster Registry and two for the database and Flash Recovery area) assigned to cluster nodes.

Table 1-4. Virtual Disk/LUN Configuration and Sizes

Virtual Disk/LUN	Minimum Size	Number of Partitions	Used for
1	1 GB	2 (120 MB and 50 MB)	Voting disk Oracle Registry
2	1 GB	2 (120 MB and 50 MB)	Voting disk Oracle Registry
3	Larger than the database	1	Database
4	At least twice the size of the database	1	Flash Recovery Area

Setting Up Your Fibre Channel Cluster

After a Dell Managed Services representative completes the setup of your Fibre Channel cluster, verify the hardware connections and the hardware and software configurations as described in this section.

This section shows you how to connect hardware for a direct-attached and SAN-attached Fibre Channel cluster.

Hardware Connections for a Direct-Attached Fibre Channel Cluster

Figure 1-1 and Table 1-5 illustrate the required cluster connections for a direct-attached Fibre Channel cluster.

Figure 1-1. Hardware Connections for a Direct-Attached Fibre Channel Cluster

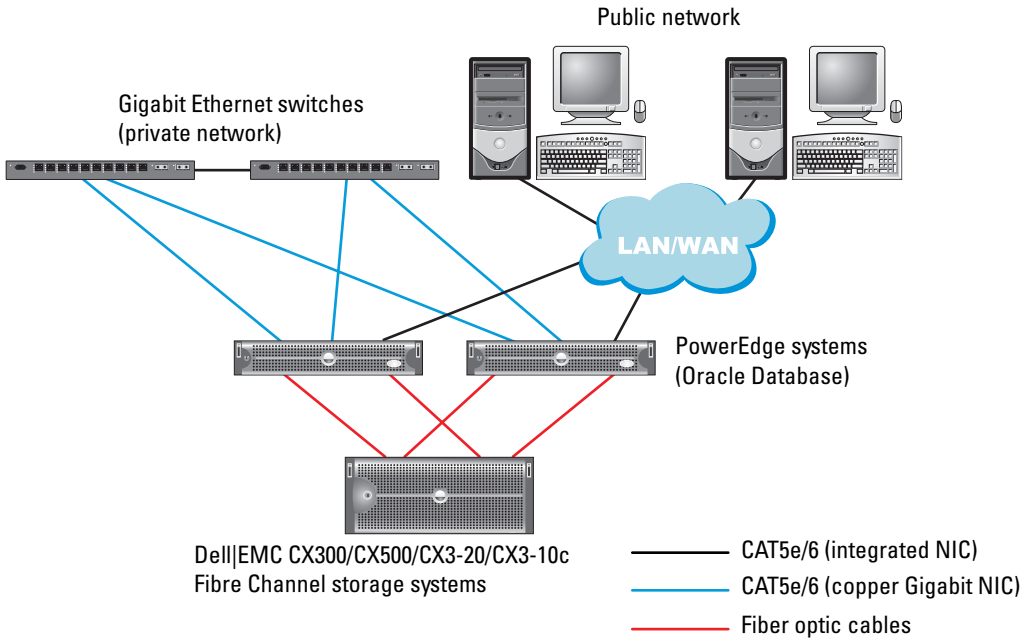


Table 1-5. Hardware Interconnections for a Direct-Attached Fibre Channel Cluster

Cluster Component	Connections
Each PowerEdge system node	One CAT5e/6 cable from the public NIC to the Local Area Network (LAN) - not shown in Figure 1-1
	One CAT5e/6 cable from the private Gigabit NIC to the Gigabit Ethernet switch
	One CAT5e/6 cable from the redundant private Gigabit NIC to the redundant Gigabit Ethernet switch
	One optical cable from the optical HBA 0 to the first storage system storage processor and one optical cable from HBA 1 to the remaining storage processor
Each Dell|EMC Fibre Channel storage system	Two CAT5e/6 cables connected to the LAN
	One optical connection from each storage processor to one HBA on each PowerEdge system
	See "Cabling Your Dell | EMC Direct-Attached Fibre Channel Cluster" for more information.
Each Gigabit Ethernet switch	One CAT5e/6 connection to the private Gigabit NIC on each PowerEdge system
	One CAT5e/6 connection to the other Gigabit Ethernet switch

Hardware Connections for a SAN-Attached Fibre Channel Cluster

Figure 1-2 illustrates the hardware connections used in setting up a SAN-attached Fibre Channel cluster.

Figure 1-2. Hardware Connections for a SAN-Attached Fibre Channel Cluster

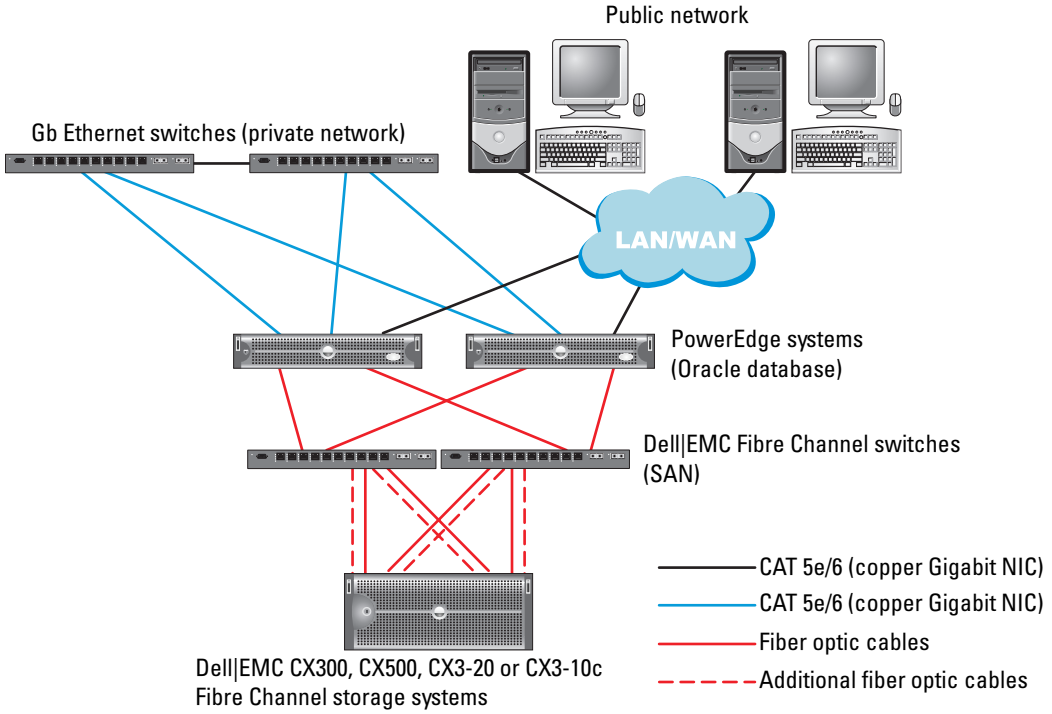


Table 1-6. SAN-Attached Fibre Channel Hardware Interconnections

Cluster Component	Connections
Each PowerEdge system node	One CAT 5e/6 cable from the public NIC to the local area network (LAN) - not shown in Figure 1-2
	One CAT 5e/6 cable from the private Gigabit NIC to the Gigabit Ethernet switch (private network)
	One CAT 5e/6 cable from the redundant private Gigabit NIC to the redundant Gigabit Ethernet switch (private network)
	One optical cable from the HBA 0 to Fibre Channel switch 0 and one optical cable from the HBA 1 to switch 1

Table 1-6. SAN-Attached Fibre Channel Hardware Interconnections *(continued)*

Cluster Component	Connections
Each Dell|EMC Fibre Channel storage system	Two CAT 5e/6 cables connected to the LAN (from each storage processor)
	One to four optical connections to each Fibre Channel switch in a SAN-attached configuration
	See "Hardware Connections for a SAN-Attached Fibre Channel Cluster" for more information
Each Dell|EMC Fibre Channel switch	One optical connection from each storage processor
	One optical connection to each PowerEdge system's HBA
Each Gigabit Ethernet switch	One CAT 5e/6 connection to the private Gigabit NIC on each PowerEdge system
	One CAT 5e/6 connection to the other Gigabit Ethernet switch

Before You Begin

Verify that the following tasks have been completed for your cluster:

- All hardware is installed in the rack.
- All hardware interconnections are configured.
- All virtual disks/LUNs, RAID groups, and storage groups are created on the storage system.
- Storage groups are assigned to the cluster nodes.

NOTICE: Before you perform the procedures in the following sections, ensure that the system hardware and cable connections are installed correctly.

Cabling Your Dell | EMC Fibre Channel Cluster

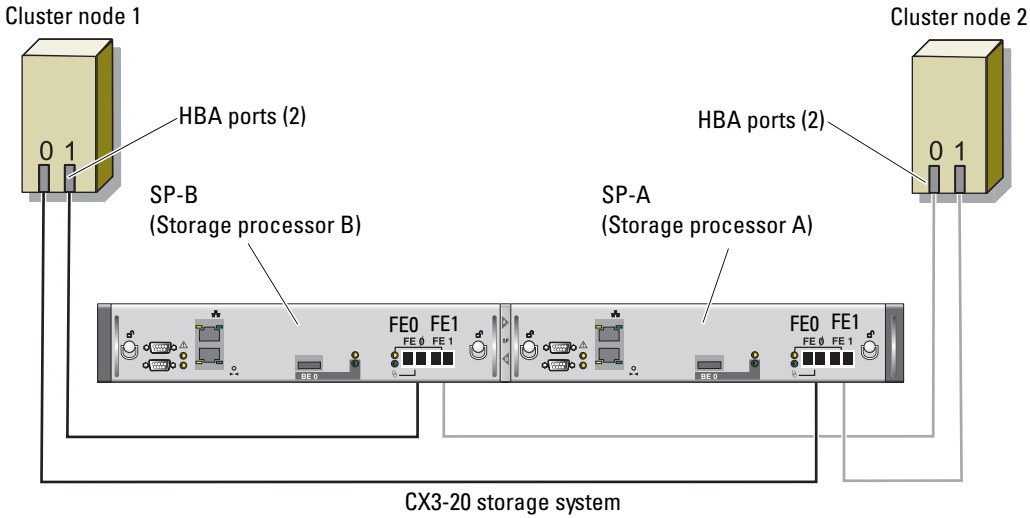
The following sections show you how to cable your Fibre Channel Cluster.

Cabling Your Dell | EMC Direct-Attached Fibre Channel Cluster

Figure 1-3 illustrates how to cable a direct-attached Fibre Channel cluster.

NOTE: Figure 1-3 illustrates how to cable using a CX3-20 as an example. See the user's guide that is specific for your storage system when connecting the CX-300 and CX-500.

Figure 1-3. Cabling a Dell | EMC Direct-Attached Fibre Channel Cluster



To configure your nodes in a direct-attached configuration (see Figure 1-3), perform the following steps:

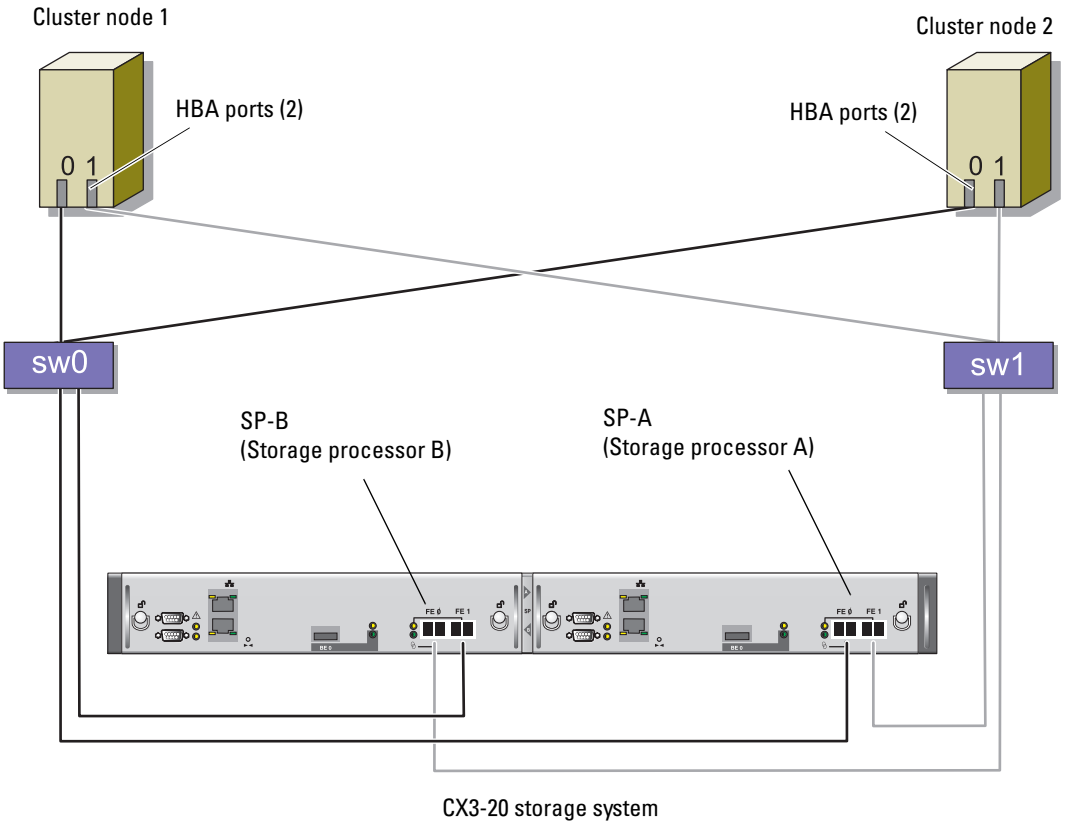
1. Connect one optical cable from HBA 0 on node 1 to port 0 of SP-A.
2. Connect one optical cable from HBA 1 on node 1 to port 0 of SP-B.
3. Connect one optical cable from HBA 0 on node 2 to port 1 of SP-A.
4. Connect one optical cable from HBA 1 on node 2 to port 1 of SP-B.

Cabling Your DELL | EMC SAN-Attached Storage Cluster

Figure 1-4 illustrates how to cable a SAN-attached Fibre Channel cluster.

NOTE: Figure 1-4 illustrates how to cable using a CX3-20 as an example. See the user's guide that is specific for your storage system when connecting the CX-300 and CX-500.

Figure 1-4. Cabling in a DELL | EMC SAN-Attached Fibre Channel Cluster



Use the following procedure to configure your Oracle cluster storage system in a four-port, SAN-attached configuration:

1. Connect one optical cable from SP-A port 0 to Fibre Channel switch 0.
2. Connect one optical cable from SP-A port 1 to Fibre Channel switch 1.
3. Connect one optical cable from SP-B port 0 to Fibre Channel switch 1.
4. Connect one optical cable from SP-B port 1 to Fibre Channel switch 0.
5. Connect one optical cable from HBA 0 on node 1 to Fibre Channel switch 0.
6. Connect one optical cable from the HBA 1 on node 1 to Fibre Channel switch 1.
7. Connect one optical cable from the HBA 0 of each additional node to Fibre Channel switch 0.
8. Connect one optical cable from the HBA 1 of each additional node to Fibre Channel switch 1.

Setting Up Your SAS Cluster with a PowerVault MD3000

To configure your PowerEdge Systems and PowerVault MD3000 hardware and software to function in an Oracle Real Application Cluster environment, verify the following hardware connections and the hardware and software configurations as described in this section using Figure 1-5, Table 1-7, Figure 1-6 and Table 1-4.

Figure 1-5. Cabling the SAS Cluster and PowerVault MD3000

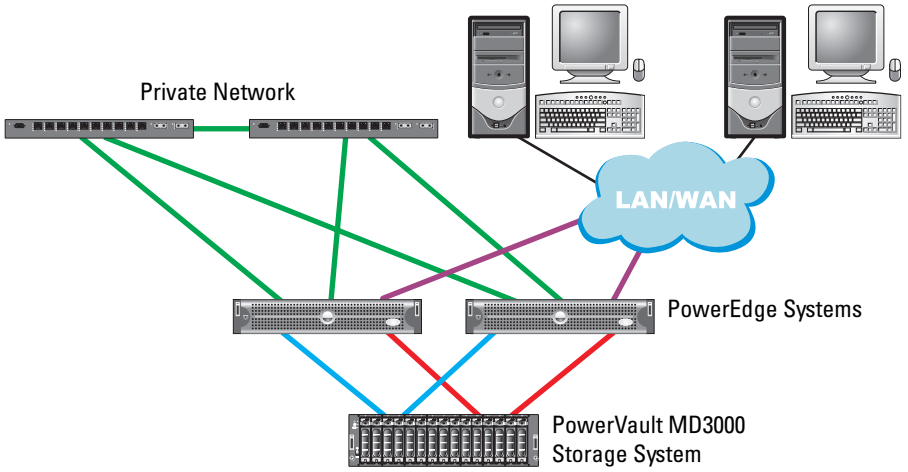


Table 1-7. SAS Cluster Hardware Interconnections

Cluster Component	Connections
Each PowerEdge system node	One CAT 5e/6 cable from public NIC to the local area network (LAN)
	One CAT 5e/6 cable from private Gigabit NIC to Gigabit Ethernet switch (private network)
	One CAT 5e/6 cable from redundant private Gigabit NIC to redundant Gigabit Ethernet switch (private network)
	Two SAS connections to a PowerVault MD3000 storage system node using a SAS 5/E controller. See "Cabling Your SAS Storage System."
Each Dell PowerVault MD3000	Two CAT 5e/6 cables connected to a LAN (one from each storage processor module).
	Two SAS connections to each PowerEdge system node using a SAS 5/E controller. See "Cabling Your SAS Storage System."

Table 1-7. SAS Cluster Hardware Interconnections

Cluster Component	Connections
Each Gigabit Ethernet switch	One Cat 5e/6 connection to the private Gigabit NIC on each PowerEdge system
	One Cat 5e/6 connection to the other Gigabit Ethernet switch

Before You Begin

Verify that the following tasks have been completed for your cluster:

- All hardware is installed in the rack.
- All hardware interconnections are configured.
- All virtual disks/LUNs, RAID groups, and storage groups are created on the storage system.
- Storage groups are assigned to the cluster nodes.

NOTICE: Before you perform the procedures in the following sections, ensure that the system hardware and cable connections are installed correctly.

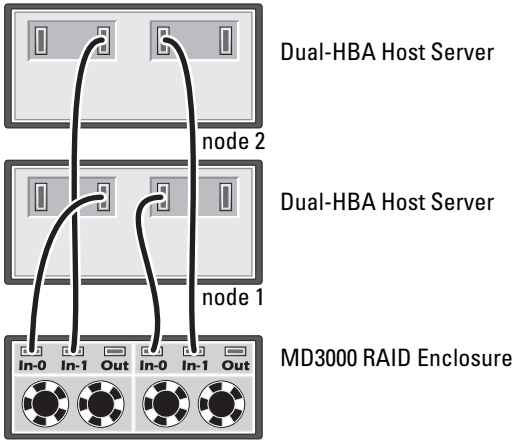
Cabling Your SAS Storage System

SAS clusters can only be installed in a direct-attached cluster, hence they are limited to two nodes only.

To configure your nodes in a direct-attached configuration (see Figure 1-6), complete the following steps:

1. Connect one SAS cable from a port of the SAS controller of node 1 to the In-0 port of RAID controller 0 in the MD3000 RAID enclosure.
2. Connect one SAS cable from a port of the other SAS controller of node 1 to the In-0 port of RAID controller 1 in the MD3000 RAID enclosure.
3. Connect one SAS cable from a port of the SAS controller of node 2 to the In-1 port of RAID controller 0 in the MD3000 RAID enclosure.
4. Connect one SAS cable from a port of the other SAS controller of node 2 to the In-1 port of RAID controller 1 in the MD3000 RAID enclosure.

Figure 1-6. Cabling in a Direct-attached SAS Cluster



Configuring Networking and Storage for Oracle 10*g* RAC R2

This section provides information about setting up a Fibre Channel or SAS cluster and includes the following procedures:

- Configuring the public and private networks
- Verifying the storage configuration
- Configuring shared storage for Oracle Clusterware and the Oracle Database

NOTE: Oracle 10*g* RAC R2 is a complex database configuration that requires an ordered list of procedures. To configure networking and storage in a minimal amount of time, perform the following procedures in order.

Configuring the Public and Private Networks

NOTE: Each node requires a unique public and private IP address and an additional public IP address to serve as the virtual IP address for the client connections and connection failover. The virtual IP address must belong to the same subnet as the public IP address. All public IP addresses, including the virtual IP address, should be registered with Domain Naming System (DNS). If a DNS server is not available, then it must be registered in the hosts file on all the nodes.

Depending on the number of NIC ports available, configure the public and private interfaces as shown in Table 1-8.

Table 1-8. NIC Port Assignments for a Two-Node Cluster

NIC Port	Three Ports Available	Four Ports Available
1	Public IP and virtual IP	Public IP
2	Private IP (NIC team)	Private IP (NIC team)

Table 1-8. NIC Port Assignments for a Two-Node Cluster *(continued)*

NIC Port	Three Ports Available	Four Ports Available
3	Private IP (NIC team)	Private IP (NIC team)
4	NA	Virtual IP

Configuring and Teaming the Private Network

Before you deploy the cluster, assign a private IP address and a private host name to each node. This procedure ensures that the nodes can communicate with each other through the private interface.

Table 1-9 provides an example of a network configuration for a two-node cluster.

NOTE: This example assumes that all the IP addresses are registered in the hosts file of all the nodes.

Table 1-9. Network Configuration Example

Host Name	Type	IP Address	Registered In
rac1	Public	155.16.170.1	%SystemRoot%\system32\drivers\etc\hosts
rac2	Public	155.16.170.2	%SystemRoot%\system32\drivers\etc\hosts
rac1-vip	Virtual	155.16.170.201	%SystemRoot%\system32\drivers\etc\hosts
rac2-vip	Virtual	155.16.170.202	%SystemRoot%\system32\drivers\etc\hosts
rac1-priv	Private	10.10.10.1	%SystemRoot%\system32\drivers\etc\hosts
rac2-priv	Private	10.10.10.2	%SystemRoot%\system32\drivers\etc\hosts

Configuring NIC Teaming for Your Private Network Adapters

NOTE: TCP Offload Engine (TOE) functionality of TOE capable NIC is not supported in this solution.

1. On node 1, identify two network adapters that will be used for NIC teaming.
2. Connect an Ethernet cable from each selected network adapter to the private network switch.
3. If you have Broadcom NICs on node 1, go to step 4. If you have Intel NICs on node 1, configure NIC teaming by performing the following steps:
   a. Right-click **My Computer** and select **Manage**.
   b. In the **Computer Management** window, click **Device Manager**.
   c. Expand **Network adapters**.
   d. Right-click one of the Intel NICs identified for NIC teaming and click **Properties**.
      The **Properties** window appears.
   e. Click the **Teaming** tab.
   f. Select **Team with other Adapters** and click **New Team**.
   g. Specify a name for the NIC team and click **Next**.

h In the **Select the Adapters to include in This Team** box, select the remaining network adapters you identified for NIC teaming and click **Next**.

i From the **Select a Team Mode** list, select **Adaptive Load Balancing** and click **Next**.

j Click **Finish** to complete the teaming.

The **Team: Private Properties** window displays.

k Click **OK**.

l Click **OK** to close the **Properties** window.

4 If you have Broadcom NICs on node 1, configure NIC teaming by performing the following steps. If not, go to step 5:

a On the Windows desktop, click **Start** and select:

Program→ Broadcom→ Broadcom Advanced Control Suite 2

The **Broadcom Advanced Control Suite 2** window appears.

b Click **Tools** and select **Create a Team**.

The **Broadcom Teaming Wizard** window appears.

c Click **Next**.

d In the **Enter the Name for the Team** field, type `Private` and click **Next**.

e In the **Team Type** area, select **Smart Load Balancing and Failover** and click **Next**.

f In the **Assigning Team Members** window, in the **Available Adapters** box, select the network adapters you identified for NIC teaming and add them to the **Team Members** box.

g Click **Next**.

h In the **Designating Standby Member** window, select **Do not Configure a Standby Member** and click **Next**.

i In the **Configuring LiveLink** window, select **No** and click **Next**.

j In the **Creating/Modifying a VLAN** window, select **No** and click **Next**.

k In the last window, select **Preview changes in Broadcom Advanced Control Suite 2** and click **Finish**.

l In the **Broadcom Advanced Control Suite 2** window, select **Apply**.

A message appears cautioning that the network connection will be temporarily interrupted.

m Click **Yes** to proceed.

n In the **IP address Setting Reminder** window, click **OK**.

o In the **Broadcom Advanced Control Suite 2** window, click **OK**.

5 Repeat step 1 through step 4 on the remaining nodes.

Configuring the IP Addresses for Your Public and Private Network Adapters

1. Update the adapter's network interface name, if required. Otherwise, go to step 3.
   a. On node 1, click **Start** and navigate to **Settings→ Control Panel→ Network Connections**.
   b. In the **Network Connections** window, right-click the public network adapter you want to rename, and select **Rename**.

      NOTE: When you configure your network adapters on the nodes, use identical names for the public adapters and the private adapters on all the nodes. Otherwise, the Oracle Database installer generates an error and prevents you from completing the installation procedure.

   c. Rename the public adapter name to **Public** and press <Enter>.
   d. Right-click the Private NIC team you want to rename and select **Rename**.
   e. Rename the Private NIC team to **Private** (if it isn't already named Private) and press <Enter>.
2. Configure the IP addresses.

   NOTE: You must set a default gateway for your Public Interface; otherwise, the Clusterware installation may fail.

   a. On node 1, navigate to:
   Start→ Settings→ Control Panel→ Network Connections→ Public→ Properties.

      A **Properties** window displays.

   b. Double-click **Internet Protocol (TCP/IP)**.
   c. Click **Use the following IP address**, enter the required IP address, default gateway address, and the DNS server IP address, and click **OK**.

      NOTE: Oracle software requires that you specify routable IP addresses for public interfaces. The Cluster Ready Services (CRS) installation may fail if you specify a standard non-routable (private) IP address.

   d. In the **Public Properties** window, select **Show icon in notification area when connected**.

      The network adapter status will appear in the system tray after you perform the procedures in this section.

   e. Click **OK**.
   f. Close the **Network Connections** window.
   g. Repeat step a through step f on the Private NIC team.

      NOTE: The private NIC team does not require a default gateway address and DNS server entry.
3. Ensure that the public and private network adapters appear in the appropriate order for access by network services.
   a. On the Windows desktop, click **Start** and navigate to **Settings→ Control Panel→ Network Connections**.
   b. In the **Network Connections** window, click **Advanced** and select **Advanced Settings**.

c From the **Adapter and Bindings** tab, ensure that the network adapters are listed in the following order:

Public

Private

<Any other network adapter>

NOTE: Click the up-arrow and down-arrow keys to change the adapter order.

d Click **OK**.

e Close the **Network Connections** window.

4 Add the public, private, and the virtual IP addresses and the host name of all the nodes to the **%SystemRoot%\system32\drivers\etc\hosts** file.

NOTE: Add the public and virtual IP addresses to the **hosts** file only if they are not registered with DNS.

For example, the following entries use the IP addresses and the host name as shown in Table 1-9:

IP Address	Node Name
155.16.170.1	rac1
155.16.170.2	rac2
10.10.10.1	rac1-priv
10.10.10.2	rac2-priv
155.16.170.201	rac1-vip
155.16.170.202	rac2-vip

NOTE: Because the private network IP addresses are not accessible from the public network, registering the IP addresses with the DNS server is not required.

5 Repeat step 1 through step 4 on the remaining nodes.

6 Ensure that the nodes can communicate with the public and the private networks.

a On node 1, open a command prompt window.

b At the command prompt, type the following and press <Enter>:

`ping <public_host_name>`

`ping <private_host_name>`

where *<public_host_name>* and *<private_host_name>* are the host names for the public and private network adapters in the remaining nodes.

If the node's network adapters do not respond to **ping** commands, check your network configuration and then repeat this step.

NOTE: The virtual IP address is configured later and cannot be pinged at this point.

c Repeat step a through step b on the remaining nodes.

Installing the Host-Based Software Needed for Storage

To install the EMC Naviagent software using the EMC software that came with your Dell|EMC system, follow the procedures in your Dell|EMC documentation.

To install the necessary host-based storage software on both the nodes for the PowerVault MD3000 storage system, use the *Dell PowerVault Resource* CD software that came with your MD3000 storage system. Follow the procedures in your Dell documentation that is included with the PowerVault MD3000 storage system to install the "Modular Disk Storage Manager Software" on the master node and the Multi-Path (MPIO) software on the second node.

Verifying the Storage Assignment to the Nodes

1. On the Windows desktop, right-click **My Computer** and select **Manage**.
2. In the **Computer Management** window, click **Device Manager**.
3. Expand **Disk drives**.
4. Under **Disk drives**, ensure that one of the following appear for each LUN assigned in the storage:
   - At least two SCSI disk devices (direct-attached configuration)
   - At least four SCSI disk devices (SAN-attached configuration)
5. Expand **Storage** and click **Disk Management**.

   If the **Welcome to the Initialize and Convert Disk Wizard** appears, perform step a through step d. Otherwise, go to step 6.

   a. In the **Welcome to the Initialize and Convert Disk Wizard** window, click **Next**.

   b. In the **Disks** window of the **Select Disks to Initialize** window, select the disks that are associated with your storage LUNs and click **Next**.

   c. In the **Select Disks to Convert** window, deselect the disk(s) that you selected in step b and click **Next**.

   NOTE: This procedure ensures that your disks are configured as **Basic** disks.

   d. Click **Finish**.
6. In the **Disk Management** window, ensure that at least two disks (for a direct-attached configuration) or at least four disks (for a switched connection) appear. The disks should be similar in size to each other and to the LUNs that are assigned to the nodes in the storage.
7. Repeat step 1 through step 6 on node 2.

Installing Multi-Path Software for Storage

Follow the documentation accompanying the storage device to install the appropriate multi-path software.

NOTE: In the case of a SAS (MD3000 storage system) cluster, the Multi-Path software should already be installed on your hosts as instructed in the section "Installing the Host-Based Software Needed for Storage."

Installing PowerPath for Dell|EMC Systems

1. On node 1, install EMC PowerPath.

NOTE: For more information, see the PowerPath documentation that came with your Dell|EMC storage system.

2. When the installation procedure is completed, restart your system.
3. Repeat step 1 and step 2 on the remaining node.

Verifying Multi-Path Driver Functionality

1. Right-click **My Computer** and select **Manage**.
2. Expand **Storage** and click **Disk Management**.

   One disk appears for each LUN assigned in the storage.
3. Ensure that each LUN is configured as a **Basic** disk.
4. Repeat step 1 through step 3 on the remaining node.

Preparing the Disks for Oracle Clusterware

This section provides information for creating the logical drives for the following disks:

- OCR disk — Contains the cluster configuration information
- Voting disk — Provides arbitration between the nodes when the private network or attached storage is unavailable to one or more nodes
- Disks for database and flash recovery area — Provide storage area for creating the database (data disk) and the flash recovery area

During the cluster configuration described in this document, you will create partitions on your Fibre Channel storage. When you create the partitions, ensure that the nodes can detect the LUNs or logical disks that are created in the attached storage system.

To prepare the disks for Oracle Clusterware, identify the OCR, Voting, data, and flash recovery disks. After you identify the appropriate disks, perform the following steps on one node.

Enabling the Automount Option for the Shared Disks

1. On node 1, click **Start** and select **Run**.
2. In the **Run** field, type `cmd` and click **OK**.
3. At the command prompt, type `diskpart` and press <Enter>.

4 At the **DISKPART** command prompt, type `automount enable` and press <Enter>.

The following message appears:

```
Automatic mounting of new volumes enabled.
```

5 At the **DISKPART** command prompt, type `exit` and press <Enter>.

6 Close the command prompt.

7 Repeat step 1 through step 6 on each of the remaining nodes.

Preparing the OCR and Voting disks for Clusterware

1 On the Windows desktop, right-click **My Computer** and select **Manage**.

2 Expand **Storage** and click **Disk Management**.

The storage disk that you initialized in "Verifying Multi-Path Driver Functionality" appears as **Unallocated**.

3 Right-click on the partition area of the shared disks that has been assigned for OCR and Voting disk and select **New Partition**.

The **Welcome to the New Partition Wizard** appears.

4 Click **Next**.

5 In the **Select Partition Type** window, select **Extended partition** and click **Next**.

6 In the **Specify Partition Size** window, accept the default partition size and click **Next**.

7 Click **Finish**.

The disk partition area you selected in step 3 is configured as an extended partition.

8 Repeat step 3 through step 7 on all the shared disks that are assigned to the nodes.

9 Create a logical drive for the Registry (OCR) disk.

a On the partition area of the disk identified for OCR and Voting disk (1 GB LUN), right-click on the free space and select **New Logical Drive**.

The **Welcome to the New Partition Wizard** appears.

b Click **Next**.

c In the **Select Partition Type** window, select **Logical drive,** and click **Next**.

d In the **Specify Partition Size** window, in the **Partition size in MB** field, type `120` and click **Next**.

e In the **Assign Drive Letter or Path** window, select **Do not assign a drive letter or drive path** and click **Next**.

f In the **Format Partition** window, select **Do not format this partition** and click **Next**.

g Click **Finish**.

10 Create a logical drive for the Voting disk.

a On the partition area of the disk identified for OCR and Voting disk (1 GB LUN), right-click on the free space and select **New Logical Drive**.

The **Welcome to the New Partition Wizard** appears.

b Click **Next**.

c In the **Select Partition Type** window, select **Logical drive,** and click **Next**.

d In the **Specify Partition Size** window, in the **Partition size in MB** field, type `50` and click **Next**.

e In the **Assign Drive Letter or Path** window, select **Do not assign a drive letter or drive path** and click **Next**.

f In the **Format Partition** window, select **Do not format this partition** and click **Next**.

g Click **Finish**.

Preparing the Data and Flash Recovery Area Disks for Database Storage

This section provides information for creating logical drives that will be used to create Automatic Storage Management (ASM) disk storage. ASM disk storage consists of one or more disk groups that can span multiple disks.

1 Create a logical drive for the database.

a Locate the disk that is assigned for the Oracle database.

b On the disk partition area, right-click on the free space and select New **Logical Drive**.

The **Welcome to the New Partition Wizard** appears.

c Click **Next**.

d In the **Select Partition Type** window, select **Logical drive** and click **Next**.

e In the **Specify Partition Size** window in the **Partition size in MB** field, type the appropriate size and click **Next**.

f In the **Assign Drive Letter or Path** window, select **Do not assign a drive letter or drive path** and click **Next**.

g In the **Format Partition** window, select **Do not format this partition** and click **Next**.

h Click **Finish**.

2 Create a logical drive for the flash recovery area.

a Locate the disk that is assigned for the flash recovery area.

b Perform step b through step h of step 1.

3 Restart node 2 and log in as administrator.

Removing the Assigned Drive Letters

1. On each of the nodes' Windows desktop, right-click **My Computer** and select **Manage**.
2. In the **Computer Management** window, expand **Storage** and click **Disk Management**.
3. If you find any drive letters assigned to the drives that you created in "Preparing the OCR and Voting disks for Clusterware" and "Preparing the Data and Flash Recovery Area Disks for Database Storage":
   a. Right-click on the logical drive and select **Change Drive Letter and Paths**.
   b. In the **Change Drive Letter and Paths** window, select the drive letter and click **Remove**.
   c. In the **Confirm** window, click **Yes**.
   d. Repeat step a through step c for the remaining logical drives on the storage partition.

Installing Oracle 10*g* RAC R2 Using ASM

This section provides information about installing the Oracle 10*g* RAC R2 software. The following topics are covered:

- Installing Oracle Clusterware
- Installing the Oracle Database 10*g* R2 software
- Installing patchset 10.2.0.3 and software updates
- Creating the seed database

Installing Oracle Clusterware Version 10.2.0.1

1. On node 1, insert the *Oracle Clusterware* CD into the CD drive.

   The Oracle Universal Installer (OUI) starts and the **Welcome** window appears.

   If the **Welcome** window does not appear:

   a. Click **Start** and select **Run**.
   b. In the **Run** field, type the following and click **OK**:

      `%CD drive%\autorun\autorun.exe`

      where **%***CD drive***%** is the drive letter of your CD drive.
2. In the **Oracle Clusterware** window, click **Install/Deinstall Products**.
3. In the **Welcome** window, click **Next**.
4. In the **Specify Home Details** window, accept the default settings.

   NOTE: Record the OraCR10g_home (CRS Home) path because you will need this information later.
5. Click **Next**.
6. In the **Product-Specific Prerequisite Checks** window, click **Next**.

7 In the **Specify Cluster Configuration** window, complete the following steps:

a Verify the public, private, and virtual host names for the primary node.

Click **Edit** to change these values, enter the desired values, and click **OK**.

b Click **Add**.

c Enter the public, private, and virtual host names for the second node.

NOTE: Ensure that the network host names do not include a domain name extension.

d Click **OK**.

8 Click **Next**.

The **Specify Network Interface Usage** window appears, displaying a list of cluster-wide network interfaces.

9 In the **Interface Type** drop-down menus, configure the public **Interface Type** as **Public** and the private **Interface Type** as **Private** (if required). To do so:

a Select the **Interface Name**.

b Click **Edit**.

c Select the correct **Interface Type**.

d Click **OK**.

10 Click **Next**.

11 In the **Cluster Configuration Storage** window, perform the following steps for the OCR disk:

a Locate the partition for the OCR that you created in the subsection, "Preparing the OCR and Voting disks for Clusterware."

b Select the partition and click **Edit**.

c In the **Specify Disk Configuration** window, select **Place OCR (Primary) on this partition** and click **OK**.

12 In the **Cluster Configure Storage** window, perform the following steps for the Voting disk:

a Locate the partition for the Voting disk that you created in the subsection, "Preparing the OCR and Voting disks for Clusterware."

b Select the partition and click **Edit**.

c In the **Specify Disk Configuration** window, select **Place Voting disk on this partition** and click **OK**.

13 Click **Next**.

14 Ignore the warning messages and click **OK**.

15 In the **Summary** window, click **Install** to start the installation procedure.

The **Install** window appears, displaying an installation progression bar.

The **Configuration Assistants** window appears and the OUI runs a series of configuration tools.

NOTE: If failures are seen during Configuration Assistant execution, select OK and see the **Troubleshooting** section of this document and the section titled "Working Around Clusterware Installation Failure."

16 Click **Next**.

17 Ignore the warning messages and click **OK**.

The **End of Installation** window appears.

18 Click **Exit** to finish the OUI session.

19 In the **Exit** window, click **Yes**.

Installing Oracle Database 10*g* R2 with Real Application Clusters 10.2.0.1

1 Insert the *Oracle Database 10g Release 2* CD into the CD drive.

The OUI starts and the **Welcome** window appears.

If the **Welcome** window appears, skip to step 2. If not, perform the following steps:

a Click **Start** and select **Run**.

b In the **Run** field, type:

`%CD drive%\autorun\autorun.exe`

where **%***CD drive***%** is the drive letter of your CD drive.

c Click **OK**.

The OUI starts and the **Welcome** window appears.

2 Click **Next**.

3 In the **Select Installation Type** window, click **Standard Edition** and click **Next**.

4 In the **Specify Home Details** window under **Destination**, verify the following:

- In the **Name** field, the Oracle Database home name is `OraDb10g_home1`.
- In the **Path** field, the complete Oracle home path is

  `%SystemDrive%\oracle\product\10.2.0\db_1`

  where `%SystemDrive%` is the drive on which Oracle home is configured.

  NOTE: Record the path because you will need this information later.

  NOTE: The Oracle home path must be different from the Oracle home path that you selected in the Oracle Clusterware installation procedure. You cannot install the Oracle10*g* R2 Standard Edition with RAC and Clusterware in the same home directory.

5 Click **Next**.

6 In the **Specify Hardware Cluster Installation Mode** window, click **Select All** and click **Next**.

7 In the **Product-Specific Prerequisite Checks** window, click **Next**.

8 In the **Select Configuration Option** window, select **Install database Software only** and click **Next**.

9 In the **Summary** window, click **Install**.

10 In the **End of Installation** window, perform the procedure as listed in the window.

NOTE: You must perform the procedures as listed in the window before proceeding to the next step.

11 After completing the required procedures listed in the **End of Installation** window, click **Exit**.

12 In the **Exit** window, click **Yes**.

Installing Oracle 10*g* R2 Patchset 10.2.0.3

1 Ensure that only 10.2.0.1 Clusterware and 10.2.0.1 Database binaries are installed on your system and that the seed database is not created yet.

2 Download the patchset 10.2.0.3 from the Oracle Metalink website at **metalink.oracle.com**.

3 Unzip the patchset to **%SystemDrive%**.

Installing Patchset 10.2.0.3 for Oracle 10*g* Clusterware

Before You Begin

Before you install patchset 10.2.0.3 for Oracle 10*g* Clusterware on your system, perform the following steps:

1 Stop nodeapps on all the nodes. Type the following and press <Enter>:

```
%SystemDrive%\%CRS_HOME%\bin> srvctl stop nodeapps -n <node name>
```

where *%SystemDrive%* is the drive on which Oracle home is configured and *%CRS_HOME%* is the home directory that you created in step 4 in "Installing Oracle Clusterware Version 10.2.0.1."

2 Run the above command for each node in the cluster.

3 Click **Start→ Programs→ Administrator Tools→ Services**.

4 Locate all Oracle services and stop them on both nodes.

Installing the Patchset

NOTE: You must install the patchset software from the node where the RAC 10*g* R2 software was installed. If this is not the node where you are running the OUI, exit and install the patchset from that node.

1 Start the OUI located in the patchset folder, for example:

%SystemDrive%\Oracle_patch\setup.exe

where *%SystemDrive%* is the drive on which you unzipped the Oracle patchset.

2 In the **Welcome** screen, click **Next**.

3 In the **Specify home details** window, select **name** as **OraCr10g_home** from the drop down list and click **Next**.

4 In the **Specify Hardware Cluster Installation Mode** window, click **Next**.

5 In the **Summary** window, click **Install**.

6 Perform all the steps listed in the **End of Installation** window. Do not perform the step instructing you to stop the Oracle services. You should have already stopped the Oracle services before you began installing the patchset as mentioned in "Before You Begin."

7 On the **End of Installation** window, click **Exit**.

8 Click **Yes** to exit from the OUI.

Installing Patchset 10.2.0.3 for Oracle 10*g* Database

NOTE: Before you install the patchset, ensure that all the Oracle services are running.

Complete the following procedures before creating a listener and a seed database.

Installing the Patchset

NOTE: You must install the patchset software from the node where the RAC 10*g* R2 software was installed. If this node is not the one where you are running the OUI, exit and install the patchset from that node.

1 Start the OUI located in the unzipped area of the patchset, for example: **%SystemDrive%\Oracle_patch\setup.exe**

2 In the **Welcome** screen, click **Next**.

3 In the **Specify Home Details** window, select the name as **OraDb10g_home1** from the drop-down list and click **Next**.

4 In the **Specify Hardware Cluster Installation Mode** window, click **Next**.

5 In the **Summary** window, click **Install**.

6 Perform all the steps listed in the **End of Installation** window.

7 In the **End of Installation** window, click **Exit**.

8 Click **Yes** to exit from the OUI.

Downloading the Latest Oracle Patches

Oracle may provide additional patches that were not included when you first downloaded the patchset. To download additional patches:

1 Open a Web browser.

2 Navigate to the Oracle Metalink website at **metalink.oracle.com**.

3 Download any patches appropriate for your installation.

Creating the Seed Database

Perform the following steps to create the seed database using Oracle ASM:

1. On node 1, verify that the Oracle Clusterware is running.
   a. Click **Start** and select **Run**.
   b. In the **Run** field, type `cmd` and press <Enter>.
   c. Type the following and press <Enter>:

      ```
      crsctl check crs
      ```

      The following output appears:

      ```
      CSS appears healthy
      CRS appears healthy
      EVM appears healthy
      ```

   d. If the above output does not appear, type:

      ```
      crsctl start crs
      ```

   e. Close the command prompt.
2. Click **Start** and select **Run**.
3. In the **Run** field, type the following and click **OK**:

   ```
   dbca
   ```

   The **Database Configuration Assistant** starts.
4. In the **Welcome** window, select **Oracle Real Application Clusters database** and click **Next**.
5. In the **Operations** window, click **Create a Database** and click **Next**.
6. In the **Node Selection** window, click **Select All** and click **Next**.
7. In the **Database Templates** window, click **Custom Database** and click **Next**.
8. In the **Database Identification** window, in the **Global Database Name** field, enter a name such as `racdb` and click **Next**.
9. In the **Management Options** window, click **Next**.
10. In the **Database Credentials** window, click **Use the Same Password for All Accounts**, type and confirm a new password in the appropriate fields, and click **Next**.

    NOTE: Record your new password because you will need this information later for database administration.
11. In the **Storage Options** window, select **Automatic Storage Management (ASM)** and click **Next**.

12 In the **Create ASM Instance** window, perform the following steps:

a In the **SYS password** field, type and confirm a new password in the appropriate fields.

b Select **Create initialization parameter file (IFILE)**.

c Click **Next**.

13 In the **Database Configuration Assistant** window, click **OK**.

The **ASM Creation** window appears, and the ASM Instance is created.

NOTE: If the warning message `Failed to retrieve network listener resources` appears, click **Yes** to allow Database Configuration Assistant (DBCA) to create the appropriate listener resources.

14 In the **ASM Disk Groups** window, click **Create New**.

15 In the **Create Disk Group** window, enter the information for the database files.

a In the **Disk Group Name** field, enter a name for the new disk group.

For example, *DATABASE*.

b In the **Redundancy** box, select **External**.

c Click **Stamp Disks**.

d Select **Add or change label** and click **Next**.

e In the **Select disks** window, select the disks that you plan to use for the database files. Note that the **Status** is marked as **Candidate device**.

f In the **Generate stamps with this prefix** field, keep the default settings.

g Click **Next**.

h In the **Stamp disks** window, click **Next**.

i Click **Finish** to save your settings.

j Select the check boxes next to the available disks and click **OK**.

16 In the **ASM Disk Groups** window, click **Create New**.

17 In the **Create Disk Group** window, enter the information for the flash recovery area.

a In the **Disk Group Name** field, enter a name for the new disk group.

for example, *FLASH*.

b In the **Redundancy** box, select **External**.

c Click **Stamp Disks**.

d Select **Add or change label** and click **Next**.

e In the **Select disks** window, select the disk that you plan to use for the Flash Recovery Area. Note that the **Status** is marked as **Candidate device**.

f In the **Generate stamps with this prefix** field, type FLASH.

g Click **Next**.

h In the **Stamp disks** window, click **Next**.

i Click **Finish** to save your settings.

j Select the check boxes next to the available disks and click **OK**.

The **ASM Disk Group** window appears indicating that the software is creating the disk group.

When completed, the FLASH disk group appears in the **Disk Group Name** column.

18 Select only the Disk Group Name that you assigned to DATABASE in step 15 and click **Next**.

19 In the **Database File Locations** window, select **Use Oracle-Managed Files** and **Multiplex Redo Logs and Control File**s and click **Next**.

20 In the **Recovery Configuration** window, perform the following steps:

a Select **Specify Flash Recovery Area**.

b Click **Browse**.

c Select the FLASH disk group that you created in step 17 and click **OK**.

d In the **Flash Recovery Area Size** field, type the total size of the flash disk group created in step 17.

e Select **Enable Archiving**.

f Click **Edit Archive Mode Parameters**.

- In the **Edit Archive Mode Parameters** window, change the path listed under the **Archive Log Destinations** to +*FLASH*/

  where *FLASH* is the flash recovery area disk group name that you specified in step 17 a**.**
- Click **OK**.

g Click **Next**.

21 In the **Database Content** window, click **Next**.

22 In the **Database Services** window, click **Next**.

23 In the **Initialization Parameters** window, click **Next**.

24 In the **Database Storage** window, click **Next**.

25 In the **Creation Options** window, click **Finish**.

26 In the **Summary** window, click **OK**.

The **Database Configuration Assistant** window appears, and the Oracle software creates the database.

NOTE: This procedure may take several minutes to complete.

When completed, the **Database Configuration Assistant** window provides database configuration information.

27 Record the information in the **Database Configuration Assistant** window for future database administration.

28 Click **Exit**.

The **Start Cluster Database** window appears and the cluster database starts.

Adding a New Node to an Existing Oracle 10*g* RAC Cluster

The following describes how to add nodes and instances to Oracle RAC databases on Windows.

Preparing the Node to be Added to a Cluster

Perform the following steps on the node(s) that you want to add to an existing cluster:

1. Install and configure the operating system using the *Deployment* CDs.
2. Configure the networking and fiber channel storage subsystem.

Make sure that you can execute the following command from *each* of the existing nodes of your cluster where the *host_name* is the public network name of the new node:

```
NET USE \\host_name\C$
```

You have the required administrative privileges on each node if the operating system responds with:

```
Command completed successfully.
```

NOTE: If you are using ASM, then make sure that the new nodes can access the ASM disks with the same permissions as the existing nodes.

NOTE: If you are using Oracle Cluster File Systems, then make sure that the new nodes can access the cluster file systems in the same way that the other nodes access them.

Now the node(s) is ready to be added to an existing cluster.

The steps to add a node to an existing cluster can be summarized as below:

1. Adding Nodes at the Oracle Clusterware Layer
2. Adding Nodes at the Oracle RAC Database Layer
3. Adding Database Instances to New Nodes

Adding Nodes at the Oracle Clusterware Layer

Perform the following steps:

1. On one of the *existing* nodes, go to the **CRS home\oui\bin** directory. Run the **addNode.bat** script to start the OUI.
2. The OUI runs in the add node mode and the OUI **Welcome** page appears. Click **Next** and the **Specify Cluster Nodes for Node Addition** page appears.
3. The upper table on the **Specify Cluster Nodes for Node Addition** page shows the existing nodes associated with the CRS home from which you launched the OUI. Use the lower table to enter the public and private node names of the new nodes.
4. If all the checks succeed, then the OUI displays the **Node Addition Summary** page.
5. Click **Next** and the OUI displays the **Cluster Node Addition Progress** page.
6. On completion, click **Exit** to end the OUI session. After the OUI displays the **End of Node Addition** page, click **Exit** to end the OUI session.

7 Execute the following command to identify the node names and node numbers that are currently in use:

```
CRS home\bin\olsnodes -n
```

8 Execute the **crssetup.exe** command using the next available node names and node numbers to add CRS information for the new nodes. For example:

```
crssetup.exe add -nn publicnode3,3 -pn pvtnode3,3 –vn vipnode3,3
```

9 Execute the **racgons** utility from the **bin** subdirectory of the CRS home to configure the Oracle Notification Services (ONS) port number as follows:

```
racgons add_config new_node_name:4948
```

After you have completed the procedures in this section for adding nodes at the Oracle Clusterware layer, you have successfully extended the CRS home from your existing CRS home to the new nodes.

Adding Nodes at the Oracle RAC Database Layer

1 From the %ORACLE_HOME%**oui\bin**, run the **addNode.bat** script. This starts the OUI in the add node mode and displays the OUI **Welcome** page. Click **Next** on the **Welcome** page and the OUI displays the **Specify Cluster Nodes for Node Addition** page.

2 The **Specify Cluster Nodes for Node Addition** page has a table showing the existing nodes associated with the Oracle home from which you launched the OUI. A node selection table appears on the bottom of this page showing the nodes that are available for addition. Select the nodes that you want to add and click **Next**.

If all of the checks succeed then the OUI displays the **Node Addition Summary** page.

3 Click **Finish** and the OUI displays the **Cluster Node Addition Progress** page.

4 After the OUI displays the **End of Node Addition** page, click **Exit** to end the OUI session.

5 Execute the **VIPCA** utility from the **bin** subdirectory of the Oracle home using the **-nodelist** option with the following syntax that identifies the complete set of nodes that are now part of your RAC database beginning with Node1 and ending with Node*N*:

```
vipca -nodelist Node1,Node2,Node3,...NodeN
```

6 Add a listener to the new node only by running the **Net Configuration Assistant (NetCA)**.

After completing the procedures in the previous section, the new nodes are defined at the cluster database layer. New database instances can now be added to the new nodes.

Adding Database Instances to New Nodes

Execute the following procedures for each new node to add instances:

1 Choose **Start > Programs > Oracle - HOME_NAME >Configuration and Migration Tools > Database Configuration Assistant.**

2 The DBCA displays the **Welcome** page for RAC. Click **Help** on any DBCA page for additional information.

3 Select **Real Application Clusters database**, click **Next**, and the DBCA displays the **Operations** page.

4 Select **Instance Management**, click **Next**, and the DBCA displays the **Instance Management** page.

5 Select **Add Instance** and click **Next**. The DBCA displays the **List of Cluster Databases** page that shows the databases and their current status, such as ACTIVE, or INACTIVE.

6 From the **List of Cluster Databases** page, select the active RAC database to which you want to add an instance.

7 Click **Next** to add a new instance. The DBCA displays the **Adding an Instance** page.

8 On the **Adding an Instance** page, enter the instance name in the field at the top of this page. Then select the new node name from the list, click **Next**, and the DBCA displays the **Services Page**.

9 Enter the services information for the new node's instance, click **Next**, and the DBCA displays the **Instance Storage** page.

10 Click **Finish**, and the DBCA displays a **Summary** dialog.

11 Review the information on the **Summary** dialog and click **OK**. The DBCA displays a progress dialog showing the DBCA performing the instance addition operation. When the DBCA completes the instance addition operation, the DBCA displays a dialog asking whether you want to perform another operation.

12 Click **No** and exit the DBCA, or click **Yes** to perform another operation.

Supported Software Stack after Deployment

Table 1-10 lists the supported software stack at the time of this release. For the latest supported hardware and software, see the Dell|Oracle Tested and Validated Configurations website at **www.dell.com/10g** and download the version 1.3 Solution Deliverable List.

Table 1-10. Supported Software Versions

Software Component	Supported Versions
Windows Server 2003 SP2	Standard x64 Edition
PowerPath for Windows	4.6.1
QLogic HBA Storport driver	9.1.4.15
Emulex HBA Storport driver	7.1.30.6
PERC 4e/Di and PERC 4e/Si	6.46.3.64
PERC 5/i Integrated RAID Controller	2.8.0.64
SAS 5/e and SAS 5/i	1.24.04.00
Dell PowerVault MD3000 Storage Manager Software	02.17.G6.10

Table 1-10. Supported Software Versions *(continued)*

Software Component	Supported Versions
Intel PRO Gigabit Adapters	8.4.21.0
Intel PRO PCIe Gigabit family of adapters (base driver)	9.6.31.0
Intel PROSet (for NIC teaming)	11.2.0.74
Broadcom NetXtreme Gigabit Ethernet Adapter (BCM5721)	9.26.0.0
Broadcom NetXtreme II Gigabit Ethernet Adapter (BCM5708C)	NDIS = 3.0.5 VBD = 3.0.7
Broadcom Advanced Control Suite (for NIC teaming)	10.0.8.0

Troubleshooting

Working Around Clusterware Installation Failure

Oracle Clusterware Configuration Assistant Fails

In the **Configuration Assistants** window, if the installation fails using the **Oracle Clusterware Configuration Assistant**, then perform the following:

1. Open the file: *%ORA_CLUSTERWARE_HOME%***cfgtoollogs\configToolFailedCommands**

   where *%ORA_CLUSTERWARE_HOME%* is the CRS home directory that you created in "Installing Oracle Clusterware Version 10.2.0.1."
2. Copy and run the first three commands (with the parameters) listed in the file from the DOS command prompt.
3. Follow the procedure provided in "Virtual Private IP Configuration Assistant Fails" to run the failed Virtual Private IP Configuration Assistant (VIPCA).

Virtual Private IP Configuration Assistant Fails

If VIPCA fails during the installation of Oracle Clusterware, the following error message may appear:

```
Virtual Private IP Configuration Assistant failed
```

If this error message appears, use the following steps to work around the error. These steps are detailed in *Metalink Note ID 338924.1*. This error generally occurs if the public interface is configured with an IP address in the 10.0.0.0/8, 172.16.0.0/16, or 192.168.1.0/24 networks.

1. Click **Start** and select **Run**.
2. In the **Run** field, type the following and then click **OK**:

   %SystemDrive%`\Oracle\product\10.2.0\crs\bin\vipca`

3 Follow the steps in VIPCA by selecting the interface appropriate for the public interface, and specifying the correct virtual IP address to be used.

4 When done, click **Finish**.

Uninstalling Oracle Clusterware

You may be required to uninstall Oracle Clusterware to troubleshoot the following issues:

- The Oracle Clusterware installation procedure failed.
- The Oracle Clusterware Configuration Assistant failed to install successfully.

To uninstall Oracle Clusterware, run the OUI on the node, delete any remaining Oracle services, and clean the storage devices.

NOTE: Copy the following files located in the %CRS_HOME%\bin folder to a backup location before uninstalling Oracle Clusterware:

- ExportSYMLinks.exe
- ImportSYMLinks.exe
- LogPartFormat.exe
- oraoobjlib.dll
- orauts.dll

Running the OUI

1 On node 1, open an Explorer window and navigate to the following directory:

%SystemDrive%\oracle\product\10.2.0\crs\oui\bin

2 Double-click **setup.exe** to launch the OUI.

3 In the **Welcome** window, click **Deinstall Products**.

4 In the **Inventory** window, select **OraCr10g_home** and then click **Remove**.

5 In the **Confirmation** window, click **Yes**.

If an error message appears, click **Cancel**.

6 In the **Welcome** window, click **Cancel**.

7 When prompted, click **Cancel**, and then click **Yes**.

Deleting Oracle Services

1 On node 1, launch the **Services** console.

a Click **Start** and select **Run**.

b In the **Run** field, type the following, and click **OK**:

```
services.msc
```

The **Services** window appears.

2 Identify and delete any remaining Oracle services.

To delete a service:

a Click **Start** and select **Run**.

b In the **Run** field, type `cmd` and click OK.

c Open a command prompt, type the following, and press <Enter>:

```
sc delete <oracle_service_name>
```

d Repeat step c for each additional service that you need to remove.

3 Restart node 1 and log in as administrator.

4 Restart node 2 and log in as administrator.

Cleaning the Storage Devices

1 Clean the partitions that will be configured for the OCR registry (OCRCFG) and the Voting disks.

a Click **Start** and select **Run**.

b In the **Run** field, type `cmd` and click **OK**.

c At the command prompt, type the following and press <Enter>:

```
%SystemDrive%\oracle\product\10.2.0\crs\bin\ExportSYMLinks
```

The Oracle Symbolic Link Exporter (ExportSYMLinks) imports the symbolic links to the **SYMMAP.TBL** file to your current directory.

d At the command prompt, type the following and press <Enter>:

```
notepad SYMMAP.TBL
```

2 Ensure that OCRCFG and VOTEDSK1 appear in the file.

If OCRCFG and VOTEDSK1 do not appear in the file, assign OCRCFG and VOTEDSK1 to the appropriate disk and save the file.

Using the Oracle Symbolic Link Importer (ImportSYMLinks), import the symbolic links into the assigned storage disks (OCRCFG and VOTEDSK1).

At the command prompt, type the following and press <Enter>:

```
%SystemDrive%\oracle\product\10.2.0\crs\bin\ImportSYMLinks
```

3 Using the Oracle Logical Partition Formatter (LogPartFormat), format the OCRCFG and VOTEDSK1 partitions on both nodes.

At the command prompt, type the following commands and press <Enter> after each command:

```
%SystemDrive%\oracle\product\10.2.0\crs\bin\LogPartFormat \\.\OCRCFG
%SystemDrive%\oracle\product\10.2.0\crs\bin\LogPartFormat \\.\VOTEDSK1
```

The following message appears:

```
Are you sure you want to continue...(Y/N)?
```

4 Type `y` and press <Enter>.

5 Launch the Oracle GUI Object Manager.

At the command prompt, type the following and press <Enter>:

```
%SystemDrive%\ora_bin_utils\GUIOracleOBJManager.exe
```

The **Oracle Object Manager** window appears.

6 Delete the symlinks for the OCR (OCRCFG) and Voting disks (VOTEDSK1).

a Select **ocrcfg** and **votesdk**.

b Click **Options** and select **Commit**.

If successful, the **ocrcfg** and **VOTEDSK1** entries disappear.

c Click **Options** and select **Exit** to close the Oracle Object Manager.

7 Launch the Computer Management Console.

a On the Windows desktop, click **Start** and select **Run**.

b In the **Run** field, type the following and press <Enter>:

```
compmgmt.msc
```

The **Computer Management Console** appears.

8 Delete the ASM partitions.

a In the **Computer Management Console** window, click **Storage** and select **Disk Management**.

b Right-click the first partition and select **Delete Logical Drive**.

c When prompted, click **Yes**.

d Repeat step b and step c for each remaining partition until all partitions—including the original extended partition—have been deleted.

9 Restart node 1 and log in as administrator.

10 Restart node 2 and log in as administrator.

11 On node 1, launch the Computer Management Console and recreate the ASM partitions.

a On the Windows desktop, click **Start** and select **Run**.

b In the **Run** field, type the following and press <Enter>:

```
compmgmt.msc
```

The **Computer Management Console** window appears.

c Click **Storage** and select **Disk Management**.

d In the **Disk Management** window, right-click on the free space where the previous ASM disk partitions were located and select **New Partition**.

The **New Partition Wizard** appears.

e Click **Next** to continue.

f In the **Partition Type** window, select **Extended Partition** and click **Next**.

g In the **Specify Partition Size** window, select **Entire disk** (default) and click **Next**.

h When prompted, click **Finish**.

12 In the **Computer Management Console** window, use step 11 **c** through step 11 h as a reference to create the following partitions:

- Cluster registry (CRSCFG)
- Voting disk (VOTEDSK1)
- Data disk (two partitions)
- Backup disk (two partitions)
- Any additional partitions as required

When you create the new partitions, the New Partition Wizard launches for each instance.

To create the new partitions:

a Select **New Logical Drive**.

The **New Partition Wizard** appears.

b Click **Next** to continue.

c In the **Partition Type** window, click **Next**.

NOTE: To ensure that your storage device does not reconfigure your existing partitions, change the disk location and size of your OCRCFG and VOTEDSK1 partitions. Create your data, backup, and any additional partitions at the front of the disk, and create your OCRCFG and VOTEDSK1 partitions at the end of the disk.

d In the **Partition Size** window, perform the following steps and then click **Next**.

e In the **Assign Drive Letter or Path** box, select **Do not assign a drive letter or path**.

f In the **Format Partition** box, select **Do not format this partition**.

g When prompted, click **Finish**.

h Repeat step a through step g for each additional drive.

13 Restart node 1 and log in as administrator.

14 After you log in to node 1, restart node 2 and log in as administrator.

15 On node 2, launch the Computer Management Console and remove the drive letters from the new partitions.

NOTE: Typically, node 2 assigns drive letters to the new partitions after you restart both nodes. If the new partition drive letters do not appear when you perform the following steps, perform the following steps on node 1.

a Click **Start** and select **Run**.

b In the **Run** field, type the following and press <Enter>:

```
compmgmt.msc
```

The **Computer Management Console** window appears.

c Click **Navigate** and select **Disk Management**.

d Right-click on the first partition and select **Change Drive Letter and Paths**.

e Click **Remove**.

f When prompted, click **Yes** to remove the drive letter.

g Repeat step d through step f for each ASM partition.

16 Use the **asmtoolg** tool to stamp the new ASM partitions with an ASM header.

On node 2, open an Explorer window and navigate to the following directory:

%SystemDrive%\oracle_install_files\crs\ASM Tool

17 Double-click **asmtoolg.exe** to launch the asmtool tool.

18 In the **asmtool** screen, select **Add or Change Label** and click **Next**.

19 In the **Select Disks** screen, perform the following:

a Press <Ctrl> and select two partitions to stamp as **DATA** disks.

b In the **Stamp disks** screen, click **Next**.

c Click **Finish** to save your settings and exit the tool.

NOTE: If an error message appears, click **OK**.

20 Repeat step 17 through step 19 for each remaining disk.

21 Restart the Oracle Clusterware installation procedure.

See "Installing Oracle Clusterware Version 10.2.0.1."

Additional Troubleshooting Issues

Table 1-11 provides recommended actions for problems that you may encounter while deploying and using your Windows Server 2003 operating system and the Oracle Database 10*g* R2 software.

Table 1-11. Troubleshooting

Category	Problem / Symptom	Cause	Recommended Corrective Action
NIC Teaming	Broadcom NIC teaming fails	The following steps may result in a NIC teaming failure: **1** One of the Broadcom NICs that was used in the NIC teaming fails or is disabled. Due to the availability of the second NIC, the private network is still active on this node through the second NIC. **2** When the first NIC is still down or disabled, the second NIC in the teaming also fails or is disabled. Due to this, the private network goes down completely on this node. The private IP address on this node cannot be pinged. **3** When the second NIC that failed or was disabled becomes enabled, the private network of this node remains inactive. **NOTE:** The only time a private network does not become active is if the second NIC that failed becomes enabled. If the first NIC that failed becomes enabled then the private network becomes active.	The most likely cause of this issue is a Spanning Tree Protocol on your switch. Use one of the following solutions as a workaround for this issue: • Turn off **Spanning Tree** on the switch. • Enable **Port Fast Learning** (or equivalent, it may be called something different depending on the brand of switch) on the ports of the switch to which your teamed NICs are attached. • Use Broadcom's LiveLink feature by right-clicking the team, choosing **Enable LiveLink**, and following the instructions in the window. **NOTE:** Although the suggested solutions may fix the NIC teaming issue, complications or issues may arise by enabling the Port Fast Learning or turning off Spanning Tree on your switches.

Table 1-11. Troubleshooting *(continued)*

Category	Problem / Symptom	Cause	Recommended Corrective Action
Installing Oracle Clusterware	During Oracle Clusterware installation you get the error message, "The specified nodes are not clusterable."	The administrative or the user account used to install Oracle has blank password associated with it.	Perform the following steps: **1** Right click on **My Computer** and select **Manage**. **2** In the Computer Management Window in the left pane expand **System Tools** and **Local Users** and then expand **Groups**. **3** Click **Users** in the left pane. **4** In the right pane, right click on the administrative account being used to install Oracle and select **Set Password**. **5** A warning window displays. Ignore the message and click **Proceed**. **6** In the Set Password window, enter the passwords and click **OK**. **7** Log-off the machine and log back in with the administrative account you just changed/assigned the password for. **8** Restart the Clusterware installation.
Installing Oracle Clusterware	The Oracle Clusterware installation fails. The Configuration Assistant fails to install successfully.	The symlinks for OCRCFG and/or VOTEDSK1 are unavailable. One or more storage devices need to be reformatted.	Perform the following procedures: **1** Uninstall Oracle Clusterware using the OUI. **2** Uninstall any remaining Oracle services. **3** Clean the storage devices. See "Uninstalling Oracle Clusterware" for more information.

Table 1-11. Troubleshooting *(continued)*

Category	Problem / Symptom	Cause	Recommended Corrective Action
Oracle Clusterware	The node restarts with a blue screen.	The node cannot communicate with the storage disks.	Perform the following steps: **1** Restart the node. **2** During POST, press <F8>. **3** In the **Windows Advanced Options Menu** screen, select **Safe Mode**. **4** Select the appropriate operating system. **5** Log on to the system. **6** In the **Desktop** screen, click **OK**. **7** On the Windows desktop, right-click **My Computer** and select **Manage**. **8** In the **Computer Management** window, expand **Services and Applications**. **9** Click **Services**. **10** Right-click on the first Oracle service and select **Properties**. **11** Click the **Startup** drop-down menu and record the default startup type for this service. **12** In the Startup drop-down menu, select **Disabled**. **13** Repeat step 10 through step 12 for all remaining Oracle services. **14** Verify the following: • The storage system is functioning properly. • All fiber-optic cables are connected and secure. • The node can access the shared storage disks. See "Verifying the Storage Assignment to the Nodes" and "Verifying Multi-Path Driver Functionality." **15** Repeat step 1 through step 14 and reset each Oracle service back to its original setting.

Table 1-11. Troubleshooting *(continued)*

Category	Problem / Symptom	Cause	Recommended Corrective Action
System blue screen	The nodes generate a blue screen.	The nodes cannot access the Voting disk.	Ensure that the HBA connection mode firmware settings are configured properly for your storage configuration. If your nodes and storage system are configured in a direct-attached configuration, configure the **Connection** mode as: **0 - loop only**. If your nodes and storage system are connected to each other through a Fibre Channel switch, configure the **Connection** mode as **2 - loop preferred, otherwise point-to-point**.
VIPCA	The VIPCA configuration fails.	The public network adapter interface (or the network interface assigned for VIP in case 4 network interfaces) name is not identical on both the nodes.	Ensure that the public network adapter interface name is identical on both the nodes. To verify the public network adapter interface name: **1** On node 1, click **Start** and select **Settings→ Control Panel→Network Connections**. **2** In the **Network Connections** window, right-click the public network adapter that you want to rename and select **Rename**. **3** Repeat step 1 and step 2 on node 2.
Storage	Disks appear as unreachable.	On the Windows desktop, when you right-click **My Computer**, select **Computer Management**, and then click **Disk Management**, the disks appear unreachable. Causes: • The LUNs are not assigned to the nodes. • Improper cabling. • The HBA drivers are not installed on the node(s).	Ensure that the storage LUNs are assigned to both the nodes. Ensure that the fiber-optic cables connected to the nodes and storage system are installed correctly. See "Cabling Your Dell | EMC Fibre Channel Cluster" for more information.

Table 1-11. Troubleshooting *(continued)*

Category	Problem / Symptom	Cause	Recommended Corrective Action
Storage	SCSI disk devices do not appear.	On the Windows desktop, when you right-click **My Computer**, select **Computer Management**, and then click **Disk drivers**, the SCSI disk devices do not appear. Causes: • The LUNs are not assigned to the nodes. • Improper cabling. • The HBA drivers are not installed on the node(s).	Ensure that the storage LUNs are assigned to both the nodes. Perform the following steps. **1** On the Windows desktop, right-click **My Computer** and select **Manage**. **2** In the **Manage** window, expand **Device Manager**. **3** In the right window pane, right-click the host computer name and select **Scan for hardware changes**. **4** Repeat step 3 until the disk devices appear. **5** Restart the system (if required). Ensure that the fiber-optic cables connected to the nodes and storage system are installed correctly. See "Cabling Your Dell | EMC Fibre Channel Cluster" for more information.

Getting Help

Dell Support

For more information about your system, see the documentation that came with your system components. For white papers, Dell supported configurations, and general information, see the Dell|Oracle Tested and Validated Configurations website at **www.dell.com/10g**. For Dell technical support for your hardware and operating system software and to download the latest updates for your system, see the Dell Support website at **support.dell.com**. Information about contacting Dell is provided in your system *Installation and Troubleshooting Guide*.

Dell Enterprise Training and Certification is now available; see the Training and Certification website at **www.dell.com/training** for more information. This training service may not be offered in all locations.

Oracle Support

For training information for your Oracle software and application clusterware, see the Oracle website at **www.oracle.com** or your Oracle documentation for information on contacting Oracle.

Technical support, downloads, and other technical information are available at the Oracle MetaLink website at **metalink.oracle.com**.

Obtaining and Using Open Source Files

The software contained on the *Dell Deployment* CD is an aggregate of third-party programs as well as Dell programs. Use of the software is subject to designated license terms. All software that is designated as "under the terms of the GNU GPL" may be copied, distributed, and/or modified in accordance with the terms and conditions of the GNU's Not Unix (GNU) General Public License, Version 2, June 1991. All software that is designated as "under the terms of the GNU LGPL" (or "Lesser GPL") may be copied, distributed, and/or modified in accordance with the terms and conditions of the GNU Lesser General Public License, Version 2.1, February 1999. Under these GNU licenses, you are also entitled to obtain the corresponding source files by contacting Dell at 1-800-WWW-DELL. Please refer to SKU 420-4534 when making such request. You may be charged a nominal fee for the physical act of transferring a copy.

Index