

Microsoft Windows HPC Server  
2008 R2

# Installation Guide



# Notes and Cautions



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



**CAUTION:** A CAUTION indicates potential damage to hardware or loss of data if instructions are not followed.

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## Overview

This publication is intended for experienced IT professionals who need to configure the Dell PowerEdge cluster solution, and for trained service technicians who perform upgrade and maintenance procedures.

Microsoft Windows HPC Server 2008 R2 consists of Microsoft Windows Server 2008 R2 HPC Edition operating system and one of the following Microsoft HPC R2 Packs:

- Microsoft HPC Pack 2008 R2 Express
- Microsoft HPC Pack 2008 R2 Enterprise Academic



**NOTE:** Windows HPC Server 2008 R2 Suite Academic includes Microsoft HPC Pack 2008 R2 Enterprise.

## Setting Up Your Hardware

A cluster running Microsoft Windows HPC Server 2008 R2 consists of a single head node and one or more compute nodes. The head node controls the access to the cluster. Figure 1 gives an example of a topology in which the head node and the compute nodes are connected in a network. For more information about network configuration using HPC Server 2008 R2, see [microsoft.com/hpc](http://microsoft.com/hpc).

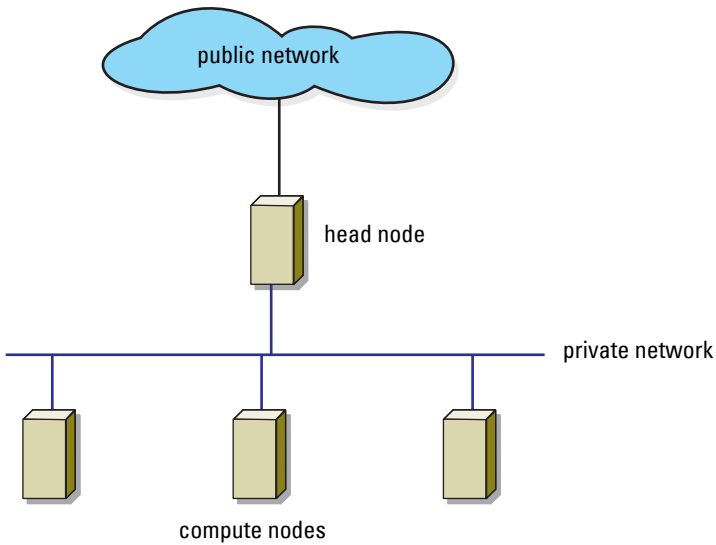
The recommended configurations for the head node are:

- Disabling Pre-boot eXecution Environment (PXE) on both the primary and secondary network interfaces.
- Connecting the primary network interface to the cluster switch.
- Connecting the secondary network interface to the public or enterprise network.

The recommended configurations for the compute nodes are:

- Ensuring that PXE is enabled on the primary network interface card (NIC 1).
- Ensuring that the boot order has the primary network interface before the local hard drive.

**Figure 1. Example of a Topology With Nodes Running HPC Server 2008 R2**



Windows HPC Server 2008 R2 is supported on the following AMD-based systems, storage, and network devices:

- PowerEdge R715 system as the head node and PowerEdge R415, R715, and R815 systems as the compute nodes.
- Embedded Broadcom network devices as both the public interface and the cluster interconnect.

- Mellanox ConnectX and ConnectX-2 DDR and QDR Infiniband network devices as the cluster interconnect.
- Dell PowerVault MD1200, MD1220, MD3200, MD3220, MD 3200i, and MD3220i storage arrays attached to the head node or Dell EqualLogic PS5000 and PS6000 series SAN arrays connected using iSCSI on the head node.

Windows HPC Server 2008 R2 is supported on the following Intel-based systems, storage, and network devices:

- PowerEdge R710 system as the head node and PowerEdge R410, R610, M610, M610x, and M910 systems as the compute nodes.
- Embedded Broadcom network devices as both the public interface and the cluster interconnect.
- Mellanox ConnectX and ConnectX-2 DDR and QDR Infiniband network devices as the cluster interconnect.
- Dell PowerVault MD1200, MD1220, MD3200, MD3220, MD3200i, and MD3220i storage arrays attached to the head node or Dell EqualLogic PS5000 and PS6000 series SAN arrays connected using iSCSI on the head node.

## Setting Up Your Cluster

- 1 Configure the head node. The configuration steps differ depending on the head node installation. The head node of the cluster is either preinstalled with the operating system or is shipped without installing the operating system.
  - If the node is preinstalled with the operating system, see "Configuring Your Factory-Installed Head Node" on page 8.
  - If the operating system is not preinstalled on the head node, or if the head node operating system needs to be reinstalled, see "Installing Windows Server 2008 R2 HPC Edition on a Non-Factory Installed Head Node" on page 9.
- 2 Join the head node to a Microsoft Active Directory domain. For more information, see "Promoting System to Domain Controller and Installing DNS" on page 10.

- 3** Install the Microsoft HPC pack 2008 R2 Express or Enterprise. For more information, see "Installing Microsoft HPC Pack 2008 R2" on page 12.
- 4** Install the compute nodes. For more information, see "Installing the Compute Nodes" on page 18.
- 5** If the cluster is equipped with an Infiniband network, you must set up the Infiniband network. For more information, see "Additional Information" on page 22.

## **Configuring Your Head Node**

### **Configuring Your Factory-Installed Head Node**

Turn on the head node and perform the following steps to complete the initial setup on the head node:

- 1** On boot, the **Set Up Windows** window is displayed. Set the local settings on this window.
- 2** Read the license terms, select **I accept the license terms** and click **Start** if you agree to the license terms.
- 3** Enter the new administrator account password.

For information on setting up Active Directory, see "Promoting System to Domain Controller and Installing DNS" on page 10.



## Installing Windows Server 2008 R2 HPC Edition on a Non-Factory Installed Head Node



**CAUTION:** The following installation procedure erases all data on your hard drive. It is recommended that you backup all your data before you begin installation.



**NOTE:** This section also describes the steps required to re-install Windows Server 2008 R2 HPC Edition operating system on the head node.

It is recommended that you install the Windows Server 2008 R2 HPC Edition operating system on the head node using the *Dell Systems Management Tools and Documentation* media.

To install the Windows Server 2008 R2 HPC Edition operating system:

- 1 Boot the head node from the *Dell Systems Management Tools and Documentation* media.
- 2 Select **Dell Systems Build and Update Utility**.  
The update utility creates an unattended installation by requesting information on system resources such as redundant array of independent disk (RAID) configurations.
- 3 Select your language. The **Dell Server Assistant End User License Agreement** is displayed.
- 4 Read the agreement and select **Accept**, if you agree to the terms and conditions.
- 5 In the **Home** window, select **Server OS Installation**.
  - a Set the date, time, and time zone for the system.
  - b Select **Microsoft Windows Server 2008 R2** as the operating system.
  - c If applicable, configure the RAID controller. For internal drives, it is recommended that you configure RAID 1 on the head node.
- 6 In the **Installation Summary** window, confirm installation selections and options before proceeding to install the operating system.
- 7 When prompted, remove the media and click **Finish** to reboot the system. The system reboots to start the operating system installation.


- 8 After reboot, the installer prompts for the Windows Server 2008 R2 media. Insert the *Windows Server 2008 R2 HPC Edition* media into the optical drive and click **OK**. After the installer verifies the operating system media, it prompts for the additional information that is required for the installation.
- 9 Provide the required information and click **Install now** to start the installation. The **License terms** window is displayed.
- 10 Select **I accept the license terms** and click **Next** if you agree to the terms.
- 11 Select **Custom (advanced)** installation option.
- 12 Select the location where you want to install the operating system and click **Next**.


The installer copies the required files, expands the files, and performs the installation.

 **NOTE:** Your system may reboot several times during this process.

After the head node boots, see "Promoting System to Domain Controller and Installing DNS" on page 10 for setting up Active Directory.

## Promoting System to Domain Controller and Installing DNS

 **NOTE:** The network port numbers on the system and the network adapters identified in the **Network Connections** window by the operating system can be reversed. For example, the NIC labeled as Gb 1 can appear as Local Area Connection 2 in the **Network Connections** window. Check the NIC mapping by physically unplugging the network connections one at a time and looking at the **Network Connections** window. Identify which port corresponds to which network connection and proceed with the network configuration accordingly.

 **NOTE:** If a domain network is already installed, join the head node to the domain and skip the steps in this section. For more information on installing the HPC pack, see "Installing Microsoft HPC Pack 2008 R2" on page 12.

- 1 After Windows starts, the **Initial Configuration Tasks** window is displayed.
- 2 In the **Initial Configuration Tasks** window, follow the steps below:
  - a Configure networking and assign a static IP address to the NICs.
  - b Change the host name if required.

- 3** Click **Add roles** in the **Initial Configuration Tasks** window. The **Add Roles Wizard** is activated.
- 4** In the **Add Roles Wizard**, click **Next** and follow the steps below:
  - a** Select **Active Directory Domain Services** and click **Next**.
  - b** In the **Active Directory Domain Services** window, click **Next**.
  - c** In the **Confirm Installation Selections** window, click **Install**.
  - d** Click **Close** when the installation completes.
- 5** After installation, in order to promote the system to domain controller, click **Start**→ **Run** and type `dcpromo.exe`. The **Active Directory Domain Services Installation Wizard** is activated.
- 6** In the **Active Directory Domain Services Installation Wizard**, click **Next** and perform the following steps to complete the installation:
  - a** Read the information in the **Operating System Compatibility** window and click **Next**.
  - b** If the **Configure Domain Name System Client Settings** window is displayed, select **Automatically correct the problem by installing DNS Server service on this computer** and click **Next**.
  - c** In the **Choose a Deployment Configuration** window, select **Create a new domain in a new forest** and click **Next**.
  - d** In the **Name the Forest Root Domain** window, enter the name of the domain and click **Next**.
  - e** In the **Set Forest Functional Level** window, select the required functional level for the domain and click **Next**.
  - f** In the **Additional Domain Controller Options** window, ensure that the DNS server is selected and click **Next**.

A message is displayed regarding DNS delegation.
  - g** Click **Yes**.
  - h** In the **Location for Database, Log Files, and SYSVOL** window, enter the path for database folder, log files folder and SYSVOL folder, and click **Next**.



**NOTE:** It is recommended that you enter the default path for the database, log files, and SYSVOL folders.

- i In the **Directory Services Restore Mode Administrator Password** window, set the password for the Directory Services Restore Mode (DSRM) administrator account and click **Next**.
- j In the **Summary** window, review the settings and click **Next** to start installation.
- k After the installation finishes, click **Finish** and **Restart Now**.

For information on installing the HPC pack, see "Installing Microsoft HPC Pack 2008 R2" on page 12.

## Installing Microsoft HPC Pack 2008 R2

- 1 If the operating system is preinstalled on the head node, the HPC pack setup is placed at `C:\HPCSetup\HPCPack`. Click **Start**→**Run** and type `C:\HPCSetup\HPCsetup.bat`.

The `HPCsetup.bat` script starts the HPC Pack installer. After the installation is complete, the script automatically imports the Dell-provided operating system image and drivers.

If the operating system is not pre-installed on the head node, insert the *Microsoft HPC Pack 2008 R2 Express* or *Enterprise* media. At the command prompt, type `setup.exe` and click **Next**.

- 2 In the **Select Installation Edition** window, select **HPC Pack 2008 R2 Express** or **HPC Pack 2008 R2 Enterprise** and **HPC Pack R2 for Workstation** based on the HPC pack that you want to install and click **Next**.

The **End User License Agreement** window is displayed.

- 3 Read the agreement, select **I accept**, and click **Next** if you agree to the terms and conditions.
- 4 In the **Select Installation Type** window, select **Create a new HPC cluster by creating a head node** and click **Next**.
- 5 In the **Select Installation Location for HPC Databases** window, select the HPC database location as **Head Node** and click **Next**.
- 6 In the **Instance for Local HPC Databases** window, click **Next** to create a new SQL Server 2008 instance for installing the HPC databases.
- 7 In the **Specify Folders for Local HPC Database** window:

- Select **Install all databases in the same folders** if you want to use the same folder for all the HPC databases, specify the location (default recommended) and then click **Next**.
  - Select **Install each database in separate folders** if you want each HPC database in a different folder, and click **Next**. Specify the location for each database in the next windows.
- 8** In the **Select Installation Location** window, select a destination for the software installation (default recommended) and click **Next**.
  - 9** Depending on head node internet connectivity, select **Use Microsoft Update**, if required. Click **Next**.
  - 10** Depending on participation in Customer Experience Involvement Program, select **Yes**, if required and click **Next**.
  - 11** In the **Install Required Components** window, click **Install** to install the required components. The installation process may take a few minutes to complete.
  - 12** After the installation is completed, click **Close**.

If the operating system is pre-installed on the head node, follow the steps in section "Configuring the HPC Pack on a Factory-Installed Head Node" on page 13. If the operating system is not pre-installed on the head node, follow the steps in section "Configuring the HPC Pack on a Non-Factory Installed Head Node" on page 14.

### **Configuring the HPC Pack on a Factory-Installed Head Node**

- 1** Go to the **HPC Cluster Manager** window and perform the tasks listed in the **To-do list** after the installation script completes.
- 2** Configure the Network task in the **To-do list**:
  - a** Click **Configure your network**.
  - b** In the **Network Topology Selection** window, select the network topology of the cluster, for example **Compute nodes isolated on a private network**, and click **Next**.
  - c** In the **Enterprise Network Adapter Selection** window, select the NIC that acts as the public network adapter and click **Next**.
  - d** In the **Private Network Adapter Selection** window, select the network connection that functions as the cluster interconnect and click **Next**.

- e In the **Private Network Configuration** window, the default IP address, and the DHCP scope is displayed. Make any modifications if necessary and click **Next**.
  - f In the **Firewall Setup** window, configure the firewall settings (Default is recommended) and click **Next**.
  - g In the **Review** window, verify the contents and click **Configure**.
  - h In the **Configuration Summary** window, click **Finish**.
- 3** Provide installation credentials task in the **To-do list**:
- a Click **Provide installation credentials**.
  - b Enter the domain administrator user name and password and click **OK**.
- 4** Configure the naming of new node task in the **To-do list**:
- a Click **Configure the naming of new nodes**.
  - b Enter the required compute node name and numbering format (for example: `Compute%001%`). The preview pane of the window displays the names of the nodes to be generated. Click **OK**.



**NOTE:** The compute node installation tasks are specified in the node template provided on the head node. The template sets the default local administrator account password randomly on the compute nodes. To change the default settings or add additional installation tasks, edit the node template named **Dell SLP ComputeNode Template** under **Node Templates** in the **Configuration** pane of **HPC Cluster Manager**.

After the HPC pack configuration is complete, follow the steps in "Installing the Compute Nodes" on page 18.

### **Configuring the HPC Pack on a Non-Factory Installed Head Node**

After installing the HPC pack on your cluster, a **To-do list** for the cluster is displayed. Follow the steps described in this section if the head node operating system was not installed in the factory, or if you prefer not to use Dell provided installation scripts.

On a non-factory installed head node perform the following steps in the **HPC Cluster Manager**:

- 1** Configure Network task in the **To-do list**:
  - a** Click **Configure your network**.
  - b** In the **Network Topology Selection** window, select the Network Topology of the cluster, for example: **Compute nodes isolated on a private network**, and click **Next**.
  - c** In the **Enterprise Network Adapter Selection** window, select the NIC that acts as the public network adapter and click **Next**.
  - d** In the **Private Network Adapter Selection** window, select the NIC that functions as the cluster interconnect and click **Next**.
  - e** In the **Private Network Configuration** window, the default IP address, and the DHCP scope are displayed. Make modifications if necessary and click **Next**.
  - f** In the **Firewall Setup** window, configure the firewall settings (default is recommended) and click **Next**.
  - g** In the **Review** window, verify the contents and click **Configure**.
  - h** In the **Configuration Summary** window, click **Finish**.
- 2** Provide installation credentials task in the **To-do list**:
  - a** Click **Provide installation credentials**.
  - b** Enter the domain administrator user name and password and click **OK**.
- 3** Configure the naming of new nodes task in the **To-do list**:
  - a** Click **Configure the naming of new nodes**.
  - b** Enter the required compute node name and numbering format (for example: `Compute%001%`). Click **OK**.
- 4** Create a Node template task in the **To-do list**:
  - a** Click **Create a Node Template**.
  - b** In the **Choose Node Template**, select compute node template and click **Next**.

- c** In the **Specify Template Name** window, enter the name of the template, for example **Dell SLP ComputeNode Template** and click **Next**.
  - d** In the **Select Deployment Type** window, select **With operating system** and click **Next**.
  - e** In the **Select OS Image** window, click **Add Image**. The **Add Operating System Image** window is displayed.
  - f** Insert the *Windows Server 2008 R2 HPC Edition Operating System* media into the optical drive and click **Browse**. Select the optical drive and click **Open**.
  - g** Enter a name for the image and click **OK**. The media contents are copied to the hard drive which may take some time depending on the speed of the drive.
  - h** Select **Windows HPC SERVER 2008 R2** in the image name field. If Multicast is supported by the network switch, select **Multicast the operating system image during deployment** and click **Next**.  
A message is displayed asking if you are sure to create a node template without the product key.
  - i** Click **OK**.
  - j** In the **Specify Local Administrator Password for Compute Node** window, select either **Generate the password automatically** or **Use a specific password** and enter the local administrator password for the compute nodes.
  - k** In the **Specify Windows Updates** window, enter the patches that need to be applied to the compute nodes and click **Next**.
  - l** Review the settings in the **Review** window and click **Create**.
- 5** To complete the configuration of the HPC pack, you must add additional drivers to the Windows image to enable the compute node installation. After the compute node installation is complete, it is recommended that you reinstall the drivers using the installation wizard that comes with the driver package.



- a Download the latest network drivers from the **Drivers and Downloads** section at [support.dell.com](http://support.dell.com).
  - b Browse for the relevant model of the compute nodes and select **Windows Server 2008 R2** as the operating system.
  - c Download the relevant Broadcom driver and the corresponding Dell driver if the compute nodes have PowerEdge Expandable RAID Controller (PERC) S100 or PERC S300 adapters to the head node.
  - d On the head node, run the downloaded driver package **Bcom\_LAN\_14.X.X\_W2K3\_8\_64\_AXX.exe** and extract the contents to the default location **C:\Broadcom**.
  - e Click **Start** → **Run** and type  
`C:\Broadcom\Driver_Management_Apps_Installer\s  
etup.exe -a.`  
This command extracts the additional plug and play (PnP) device drivers required by some of the models.
  - f In the **InstallShield Wizard**, click **Next** and type `C:\Broadcom` as the network location. Click **Install**.
  - g Click **Finish** and close the installer.
  - h In the **HPC Cluster Manager**, click **Images** in the **Configurations** pane.
  - i Click **Manage Drivers (all images)** on the right side of the window in the **Image Actions** panel.
  - j In the **Manage Drivers** window, click **Add...** and browse to `C:\Broadcom\NX2_W2K3_8_64_RIS_Drivers\b06nd51`.
  - k Select **b06nd.inf** and click **Open**. This file adds the drivers needed for network installation into the compute node pre-install environment.
- 6** Use the **Add** button to add the following driver files to the image:
- **Evnd51.inf** under the location `C:\Broadcom\NX2_W2K3_8_64_RIS_Drivers\evnd51`
  - **Bxdiag.inf** under the location `C:\Broadcom\Program Files 64\Broadcom\BDrv5706\DIAG`
  - **Evbd.inf** under the location `C:\Broadcom\Program Files 64\Broadcom\BDrv5706\EVBD`

- **Bxvbd.inf** under the location **C:\Broadcom\Program Files 64\Broadcom\BDrv5706\VBD**
  - **Bxnd.inf** under the location **C:\Broadcom\Program Files 64\Broadcom\BDrv5706\Win2k8**
  - **B57amd64.inf** under the location **C:\Broadcom\Program Files 64\Broadcom\BDRVINST**
  - **B57nd60a.inf** and **b57ports.inf** under the location **C:\Broadcom\Program Files 64\Broadcom\BDRVINST**
- 7** If a storage driver (PERC S100 or S300) is required for the compute nodes, extract the contents of the driver package to the default location. For example: **C:\dell\drivers\..**
- Use the **Add** button in the **Manage Drivers** window to add the required storage drivers.
- 8** Click **Close** in the **Manage Drivers** window.

After the HPC configuration is complete, follow the steps in "Installing the Compute Nodes" on page 18.

## Installing the Compute Nodes

- 1** On the head node, open **HPC Cluster Manager**. Click **Options**→**Deployment Settings** and select **Respond to all PXE requests**. This enables the head node to initiate the installation of the compute nodes through the network.
- 2** Ensure that the compute nodes are on the same network as the private interface of the head node. Boot the compute nodes through PXE. If this is not the default boot option for the compute nodes, assign PXE as the first boot option in the system BIOS.
- 3** On the head node, open the **Node Management** pane. The nodes that boot over PXE appear in the **Nodes** list. Select the nodes on the list, right-click and select **Assign Node Template...**
- 4** In the **Assign Node Template** window, select **Dell SLP ComputeNode Template** and click **OK**.

After assigning the template, the compute nodes are installed and configured.

- 5 In the **Node management** pane, after the status of the compute nodes changes from **Provisioning** to **Offline**, right-click the node name and select **Bring Online**.

## Reinstalling Compute Node Network Drivers

If you use the Dell provided compute node template, the node reboots a few minutes after the compute node installation is complete. This behavior is normal because an automated script reinstalls the network drivers after the compute node installation finishes.

If you do not use the Dell provided compute node template and if the network drivers were added in "Configuring the HPC Pack on a Non-Factory Installed Head Node" on page 14, the network drivers must be re-installed after compute node installation finishes successfully.

You can re-install the network drivers using the installer that comes with the network driver package. To do so, you can extract the Broadcom drivers under C:\Broadcom\ on the compute nodes and use the following commands:

- `start /B /wait c:\Broadcom\Driver_Management_Apps_Installer\setup /s /v"/qn BACSTRAY=NO"`
- `start /B /wait c:\Broadcom\Driver_Management_Apps_Installer\setup /s /v"/qn BACSTRAY=NO REINSTALL=ALL"`

After the commands are run, you must reboot the system.

After the installation is complete and the compute nodes are online, the cluster is ready. To verify the cluster setup, run some of the diagnostics that are in the **Diagnostics** pane.

For clusters that run Services Oriented Application (SOA) jobs, right-click the desired node and select **Change Role** to create Windows Communications Foundation (WCF) Broker nodes.

## Updating the Head Node and Compute Nodes

Dell Repository Manager (DRM) provides an easy way to update all the drivers and firmware on a system. It is highly recommended to use the DRM utility to update drivers and firmware on the compute nodes. You can download DRM from [support.dell.com](http://support.dell.com).

DRM downloads Dell Update Packages (DUP) into a repository which is then used on a system to automatically detect and upgrade the components that are outdated. If the nodes in the cluster do not have an internet connection, install DRM on a machine that is connected to the Internet to create the update repository.

## Installing Dell Repository Manager

- 1 Double-click on the Dell Repository Manager msi package. Click **Next** on the **Welcome** screen.
- 2 Accept the **License Agreement** and click **Next**.
- 3 In **Customer Information** window, provide the user name and organization. Select the appropriate option for **Install this application for:** and click **Next**.
- 4 In the **Destination folder** window, select the folder location to install DRM (default recommended) and click **Next**.
- 5 In the **Setup type** window, select **complete** and click **Next**.
- 6 Click **Install** to start the installation.
- 7 Click **Finish** after successful completion of installation.

## Creating a Repository

- 1 Open the **Dell Repository Manager** and click **Import Repository** in the **Welcome** screen.
- 2 In the **Create/Load repository** window, select **Create New Repository** and click **Next**.
- 3 In the **Name and Description** window, provide a name and a description for the repository and click **Next** to continue.
- 4 In the **Select Source Repository** window, select **ftp.dell.com** as the repository source and click **Next**.




**NOTE:** If **ftp.dell.com** is disabled, verify that the system is connected to the Internet and try again.

- 5 In the **Select Form Factor** window, select the form factor of the Dell system models you have and click **Next**.
- 6 In the **Select Operating System(s)** window specify the operating system as **Windows** and click **Next**.

- 7** In the **Select System Model(s)** window, choose the **Select Model(s)** option, select the system models for which the update packages are required, and click **Next**.
- 8** In the **Select Bundle(s)** screen, select **ONLY include most recent and custom bundle(s)** and click **Next**.
- 9** The **Additional Component(s)** window is displayed with a message asking if you want your repository to include additional components that are not included in the selected bundles. Select **No** and click **Next** if the components listed under **View Component(s)** are not present in the system.
- 10** In the **Summary** window, review the settings and click **Finish** to create a bundle.


Every system model selected in the **Create Repository** wizard results in a corresponding bundle. After the appropriate bundles are created, perform the following steps to download the required DUP and export the bundle contents to a directory:

- a** Select the required bundles and click **Export**.  
The **Welcome** screen of the **Export bundle(s)** wizard is displayed.
- b** Click **Next**.
- c** In the **Export Destination** window, select **Export to light weight deployment scripts** and click **Next**.
- d** Specify the directory and click **OK**. In the **Export Summary** window, review the summary and click **Finish** to export the bundle contents.

 **NOTE:** The bundle contents takes some time to download and extract.

After the repository is created, copy the repository to a shared location where it is accessible to the cluster.

You can use the **clusrun** command in the command line to run **apply\_components.bat** on the cluster nodes. The script automatically identifies and applies the required updates.

 **NOTE:** For more information on using the DRM, see the Dell Repository Manager documentation at [support.dell.com/manuals](http://support.dell.com/manuals).

# Additional Information

## InfiniBand Configuration

InfiniBand is supported as the cluster application network. This section describes the process of setting up an InfiniBand Interconnect on a Windows HPC Cluster.

### Installing InfiniBand Drivers

- 1 Ensure that the InfiniBand adapters have the latest firmware.



**NOTE:** The minimum recommended version is 2.7 or later.

- 2 Download the 64-bit Windows InfiniBand Drivers (MLNX\_WinOF) for Windows HPC Server 2008 R2 Edition from [mellanox.com](http://mellanox.com).
- 3 Double-click the downloaded **WinOF Windows Installer Package** file to install drivers manually on the head node.

After installing the drivers, InfiniBand ports is discovered as additional network interfaces.

- 4 Open **Network and Sharing Center**, select **Manage network connections** and assign a static IP address to the IP over InfiniBand (IPoIB) interface.
- 5 To install the drivers on the compute nodes, you can use the command line installation.
  - a Place the **WinOF Windows Installer Package** file at a shared location, on the head node.
  - b From the **Node Management** pane in the **HPC Cluster Manager**, select the compute nodes on which you need to install InfiniBand drivers.
  - c Right-click and select **Run Command**.  
The **Run a Command** window is displayed.
  - d Type the following command for unattended installation of the driver:  

```
msiexec /qn /i <Absolute Path to the WinOF MSI package on the network>
```

The drivers are now installed.

## Configuring IPoIB

- 1 Ensure that there is a subnet manager running on the InfiniBand network. This can either be the embedded subnet manager on the switch or Open Subnet Manager (OpenSM) that is packaged with WinOF.


If you decide to run the subnet manager on the head node, ensure that the subnet manager on the switch is disabled, then click

**Start**→ **Administrative Tools**→ **Services** and start the OpenSM service on the head node.


- 2 To set the compute nodes IP addresses automatically, ensure that DHCP service is enabled and running on the head node.


Also ensure that the head node is connected to the InfiniBand fabric.

- 3 Use the **HPC Cluster Manager** to select the desired network topology.

 **NOTE:** The recommended network topology is topology 3, where the compute nodes are isolated on private and application networks.

Enter the IP address range using the **Network Configuration** wizard.

 **NOTE:** If the InfiniBand network is not discovered by the HPC Cluster Manager, close the application and restart the HPC Management Service by clicking **Start**→ **Administrative Tools**→ **Services**. Run the **HPC Cluster Manager** again.

 **NOTE:** After configuring the topology, it may be necessary to restart the DHCP Server so that the head node will assign IP addresses to the compute nodes through the application network. You can restart the DHCP service using the Services window, by clicking **Start**→ **Administrative Tools**→ **Services**. You may have to wait for a few minutes for DHCP to assign the addresses.

## Installing Network Direct

By default, once the InfiniBand drivers are installed, IPoIB is configured but **Network Direct** is not enabled.

In order to get the maximum performance from the InfiniBand fabric, you must enable the Network Direct Interface. To do so, run the following command on the head node and compute nodes (using clusrun):

```
ndinstall -i
```

## Verifying Installation

In order to ensure the InfiniBand network is setup correctly and to check the connectivity across the cluster, run the HPC Cluster Manager's built-in **Message Passing Interface (MPI) Ping-Pong** utility. This test validates the driver stack, the network protocol, MPI implementation and helps identify any anomalies in the node-to-node connection.

Under the **Diagnostics** pane in the **HPC Cluster Manager**, click **Tests**→**System**→**Performance**→**MPI-Ping-Pong**.



**NOTE:** You can select either or both **Lightweight Throughput** or **Quick Check** tests.

**Lightweight Throughput** test reports the average of the total bandwidth of the cluster and helps identify slow and fast links across nodes. The **Quick Check** test reports the overall latency across the cluster.

## Deploying iSCSI Boot Nodes

iSCSI boot nodes is one of the supported features with Windows HPC Server 2008 R2. This section describes the process of deploying iSCSI boot nodes on Windows HPC clusters.

### Broadcom iSCSI and System BIOS Settings on iSCSI Boot Nodes

For Broadcom iSCSI settings:

- 1 Press <CTRL><S> or <CTRL><K> to access the Broadcom iSCSI BIOS settings.
- 2 Set the TCP and iSCSI parameters via DHCP enabled.
- 3 Set boot to iSCSI target as enabled.
- 4 Set target first HDD as enabled.

For system BIOS settings:

- 1 Press <F2>.
- 2 Disable integrated SAS controller.
- 3 Enable NIC1 with iSCSI boot.



## Installing the iSCSI Provider Software



**NOTE:** iSCSI provider software is provided by the storage vendor.

- 1 Download the iSCSI provider software from the storage vendor's website.
- 2 Double-click the downloaded `setup.exe` and install iSCSI provider software on the master node. Ensure that the **HPC Cluster Manager** is closed before installing the provider software.

## Adding iSCSI Target Arrays

- 1 Open the **HPC Cluster Manager** and click **iSCSI Deployment** in the **Configuration** menu.
- 2 Navigate to **Required iSCSI Deployment Tasks** → **Head node configuration** and click **Add iSCSI storage arrays**.  
The **iSCSI Storage Array** is displayed.
- 3 Add the Target Portal name and IP address.
- 4 Click **Validate iSCSI Storage Array** to verify the storage array connectivity.
- 5 Click **Save**.

## Adding a Base Node

- 1 To add a base node, create an XML file with the node name and MAC address of the compute nodes as described in the example XML file below:

```
<?xml version="1.0" encoding="utf-8"?>
<Nodes xmlns:xsi=
"http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns=
"http://schemas.microsoft.com/HpcNodeConfiguratio
nFile/2007/12">
  <Node
    Name="compute00">
    <MacAddress>0024E855022E </MacAddress>
  </Node>
</Nodes>
```

- 2 Navigate to **HPC Cluster Manager**→ **Configuration** menu and click **iSCSI Deployment**.
- 3 Navigate to **Required iSCSI Deployment Tasks**→ **Base node image creation** and click **Add nodes for iSCSI deployment**.  
The **Add iSCSI Boot Nodes Wizard** is displayed.
- 4 On the **Select Method to Add Nodes** window, select **From a node XML file**.
- 5 Type or browse to the location of the node XML file that you created in step 1 and click **Next**.
- 6 Click **Finish**.

### **Deploying the Base Node**

- 1 Navigate to **HPC Cluster Manager**→ **Configuration** menu and click **iSCSI Deployment**.
- 2 Navigate to **Required iSCSI Deployment Tasks**→ **Base node image creation** and click **Deploy the base node**.  
The **Deploy Base Node Wizard** is displayed.
- 3 On the **Select Computer** window, select the base node from the list of nodes, and then click **Next**.
- 4 On the **Specify Template Name** window, type a name for the base node template and type a description for it (optional). Click **Next** to continue.
- 5 On the **Select Operating System Image** window→ **Image Name** list:
  - a Select the operating system image that you want to use to deploy the base.
  - b Check the **Include a product key to activate the operating system on the compute nodes** check box, and then enter the product key for the operating system image in **Image Name**. Click **Next** to continue.
- 6 On the **iSCSI Boot Configuration** window, select the option **private network adapters are configured for iSCSI boot**.
- 7 On the **iSCSI Qualified Name Configuration** window, select **Use a template string to assign each IQN** and enter the following **IQN Template** string:

```
iqn.1995-05.com.broadcom.%MAC-NO-  
DELIMITERS%.%HOSTNAME%
```

- 8** On the **Specify Local Administrator Password for Compute Node** window, select **Use a specific password** if you want to specify a password for the local administrator account on the compute nodes, and then click **Next**.
- 9** On the **Specify Windows Updates** window, select **Include a step in node template to download and install updates for my cluster using Microsoft Update or the Enterprise Windows Server Update Services (WSUS)** if you want to install updates on the nodes.

Alternatively, select **Add specific updates to the template** and type the name of the specific update.

- 10** Click **Next** to continue.
- 11** On the **Review** window, click **Deploy**.
- 12** Use the following procedure to determine the correct time to turn on the base node computer:
  - a** In **Node Management**, click **Nodes**.
  - b** In the list of nodes, click the **Base Node**. It must be listed with **Transitional** node health.
  - c** In the **Detail Pane**, click **Provisioning Log**. The provisioning log for the base node is visible.
  - d** Review the provisioning log until you see the following entry:  
Waiting for node to boot into WINPE.
  - e** After you see the entry, turn on the base node computer.

### **Create a Base Node Image**

- 1** Navigate to **HPC Cluster Manager**→**Configuration** menu and click **iSCSI Deployment**.
- 2** Navigate to **Required iSCSI Deployment Tasks**→**Base node image creation** and click **Create a base node image**.

The **Create Base Node Image** dialog box is displayed.

- 3** Select the base node from the list of nodes. Only nodes that are already deployed on an iSCSI target are listed.

- 4 Type a name for the base node image.
- 5 Click **Create image** to create a base node image.

### Create a Node Template for iSCSI Boot Nodes

- 1 Navigate to **HPC Cluster Manager**→ **Configuration** menu, click **iSCSI Deployment**.
- 2 Navigate to **Required iSCSI Deployment Tasks**→ **Base node image creation** and click **Create a node template for iSCSI boot nodes**.  
The **Create Node Template Wizard** is displayed.
- 3 On the **Choose Node Template Type** window, select the kind of node template that you want to create, and then click **Next**.
- 4 On the **Specify Template Name** window, type a name for the new template, and optionally type a description for it. Click **Next** to continue.
- 5 On the **Select Operating System Image** window, select the **Image Name** from the list and click **Next**.
- 6 On the **iSCSI Storage Array Selection** window, select the storage arrays to which you want to deploy iSCSI boot nodes by using the node template, and then click **Next**.
- 7 On the **iSCSI Boot Configuration** window, select **The private network adapters are configured for iSCSI boot**.
- 8 On the **iSCSI Qualified Name Configuration** window, select *Use template string to assign each IQN* and enter the following string:  

```
iqn.1995-05.com.broadcom.%MAC-NO-  
DELIMITERS%.%HOSTNAME%
```
- 9 On the **Review** window, click **Create**.

### Deploy iSCSI Boot Nodes

- 1 Navigate to **HPC Cluster Manager**→ **Configuration** menu and click **iSCSI Deployment**.
- 2 In the **Required iSCSI Deployment Tasks** list, under **iSCSI boot node deployment**:
  - a Click **Deploy iSCSI boot nodes**.  
The **Deploy iSCSI Boot Node Wizard** is displayed.

- b** Click **Next** on the **Welcome** screen.
- 3** On the **Assign Node Template** window:
  - a** Select the node template you created in "Create a Node Template for iSCSI Boot Nodes" on page 28.
  - b** Select the nodes you want to deploy as iSCSI boot nodes.
  - c** Click **Next**.
- 4** On the **Initiate Deployment** window, click **Deploy** to initiate iSCSI deployment.
- 5** Use the following procedure to determine the correct time to turn on the iSCSI boot node computers:
  - a** Navigate to **Node Management**→**Nodes**→**By Health**, click **Transitional**. All the iSCSI boot nodes you deployed must be listed.
  - b** Navigate to **Actions**→**Tab Actions** and click **Customize**.
  - c** In the list of available columns, click **Progress**, and then click **Add**.
  - d** Review the **Progress** column until you see the following entry for all nodes:  
Waiting for iSCSI boot nodes to boot and start Windows setup.
  - e** After you see the entry for all nodes, turn on the iSCSI boot node computers.

For additional information on Microsoft Windows HPC Server 2008 R2, see [microsoft.com/hpc](http://microsoft.com/hpc).

