Novell Cluster Services™ 1.8.5 Administration Guide

Novell®

NetWare®

6.5 SP8

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Contents

About This Guide

This guide describes how to install, upgrade, configure, and manage Novell® Cluster Services™ for NetWare 6.5 Support Pack 8 (SP8). It is divided into the following sections:

Audience

This guide is intended for intended for anyone involved in installing, configuring, and managing Novell Cluster Services.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the User Comments feature at the bottom of each page of the online documentation, or go to the Novell Documentation Feedback Web page (http://www.novell.com/documentation/feedback.html) and enter your comments there.

Documentation Updates

The most recent version of the *NW 6.5 SP8: Novell Cluster Services Administration Guide* is available on the NetWare 6.5 SP8 Documentation Web site (http://www.novell.com/documentation/nw65).

Additional Documentation

For information about using Novell Cluster Services with Novell Open Enterprise Server 2 for Linux*, see the *OES 2 SP2: Novell Cluster Services 1.8.7 for Linux Administration Guide*.

Documentation Conventions

In Novell documentation, a greater-than symbol (>) is used to separate actions within a step and items in a cross-reference path.

A trademark symbol (®, ™, etc.) denotes a Novell trademark. An asterisk (*) denotes a third-party trademark.

Overview

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Novell® Cluster Services™ is a server clustering system that ensures high availability and manageability of critical network resources including data (volumes), applications, and services. It is a multinode clustering product for NetWare® that is enabled for Novell eDirectory™ and supports failover, failback, and migration (load balancing) of individually managed cluster resources.

Licenses for two cluster nodes are included with NetWare 6.5. Licenses for additional cluster nodes can be purchased separately.

1.1 Product Features

Novell Cluster Services includes several important features to help you ensure and manage the availability of your network resources. These include:

- Support for shared SCSI, iSCSI or Fibre Channel storage area networks.
- Multinode all-active cluster (up to 32 nodes). Any NetWare server in the cluster can restart resources (applications, services, IP addresses, and volumes) from a failed server in the cluster.
- Single point of administration through the browser-based Novell iManager or Novell Remote Manager, or a Java-based ConsoleOne® cluster configuration and monitoring GUI. Both NetWare Remote Manager and iManager also let you remotely manage your cluster.
- The ability to tailor a cluster to the specific applications and hardware infrastructure that fit your organization.
- Dynamic assignment and reassignment of server storage on an as-needed basis.
- The ability to automatically notify administrators through e-mail of cluster events and cluster state changes.

1.2 Product Benefits

Novell Cluster Services allows you to configure up to 32 NetWare servers into a high-availability cluster, where resources can be dynamically switched or moved to any server in the cluster. Resources can be configured to automatically switch or be moved in the event of a server failure, or can be moved manually to troubleshoot hardware or balance the workload.

Novell Cluster Services provides high availability from commodity components. Lower costs are obtained through the consolidation of applications and operations onto a cluster. The ability to manage a cluster from a single point of control and to adjust resources to meet changing workload requirements (thus, manually "load balance" the cluster) are also important benefits of Novell Cluster Services.

An equally important benefit of implementing Novell Cluster Services is that you can reduce unplanned service outages and reduce planned outages for software and hardware maintenance and upgrades.

Reasons you would want to implement Novell Cluster Services include:

- Increased availability
- Improved performance
- Low cost of operation
- Scalability
- Disaster recovery
- Data protection
- Server Consolidation
- Storage Consolidation

Shared disk fault tolerance can be obtained by implementing RAID on the shared disk subsystem.

An example of the benefits Novell Cluster Services provides can be better understood through the following scenario.

Suppose you have configured a three-server cluster, with a Web server installed on each of the three servers in the cluster. Each of the servers in the cluster hosts two Web sites. All the data, graphics, and Web page content for each Web site is stored on a shared disk subsystem connected to each of the servers in the cluster. The following figure depicts how this setup might look.

Figure 1-1   *Three-Server Cluster*
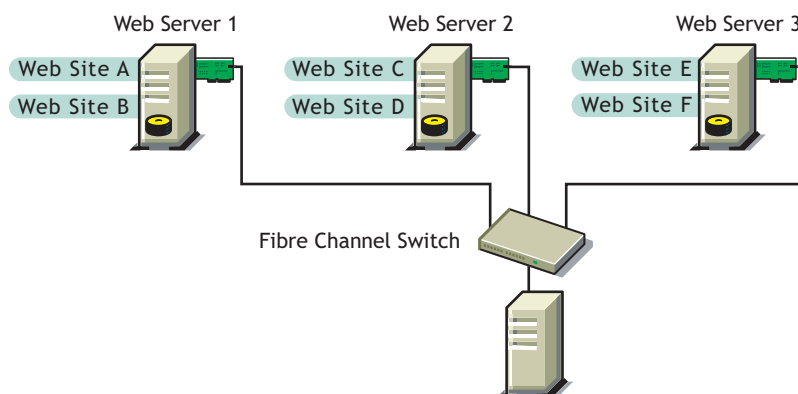
During normal cluster operation, each server is in constant communication with the other servers in the cluster and performs periodic polling of all registered resources to detect failure.

Suppose Web Server 1 experiences hardware or software problems and the users depending on Web Server 1 for Internet access, e-mail, and information lose their connections. The following figure shows how resources are moved when Web Server 1 fails.

Figure 1-2   *Three-Server Cluster after One Server Fails*
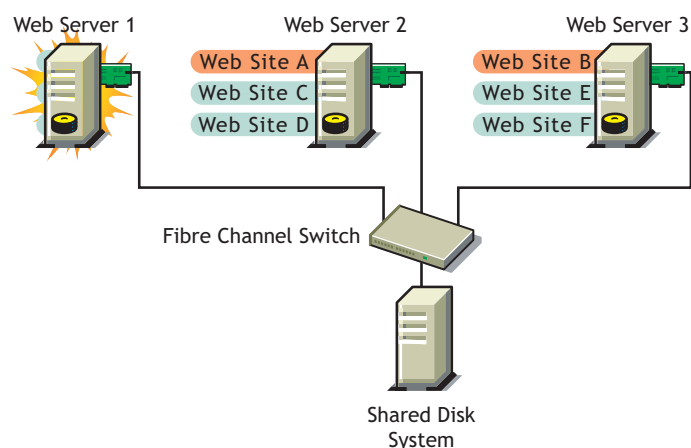
Web Site A moves to Web Server 2 and Web Site B moves to Web Server 3. IP addresses and certificates also move to Web Server 2 and Web Server 3.

When you configured the cluster, you decided where the Web sites hosted on each Web server would go should a failure occur. In the previous example, you configured Web Site A to move to Web Server 2 and Web Site B to move to Web Server 3. This way, the workload once handled by Web Server 1 is evenly distributed.

When Web Server 1 failed, Novell Cluster Services software

- Detected a failure.
- Remounted the shared data volumes (that were formerly mounted on Web server 1) on Web Server 2 and Web Server 3 as specified.
- Restarted applications (that were running on Web Server 1) on Web Server 2 and Web Server 3 as specified.
- Transferred IP addresses to Web Server 2 and Web Server 3 as specified.

In this example, the failover process happened quickly and users regained access to Web site information within seconds, and in most cases, without having to log in again.

Now suppose the problems with Web Server 1 are resolved, and Web Server 1 is returned to a normal operating state. Web Site A and Web Site B will automatically fail back, or be moved back to Web Server 1, and Web Server operation will return back to the way it was before Web Server 1 failed.

Novell Cluster Services also provides resource migration capabilities. You can move applications, Web sites, etc. to other servers in your cluster without waiting for a server to fail.

For example, you could have manually moved Web Site A or Web Site B from Web Server 1 to either of the other servers in the cluster. You might want to do this to upgrade or perform scheduled maintenance on Web Server 1, or just to increase performance or accessibility of the Web sites.

1.3 Cluster Configuration

Typical cluster configurations normally include a shared disk subsystem connected to all servers in the cluster. The shared disk subsystem can be connected via high-speed Fibre Channel cards, cables, and switches, or be configured to use shared SCSI or iSCSI. If a server fails, another designated server in the cluster automatically mounts the shared disk volumes previously mounted on the failed server. This gives network users continuous access to the volumes on the shared disk subsystem.

Typical resources might include data (volumes), applications, and services. The following figure shows how a typical Fibre Channel cluster configuration might look.

Figure 1-3 *Typical Fibre Channel Cluster Configuration*
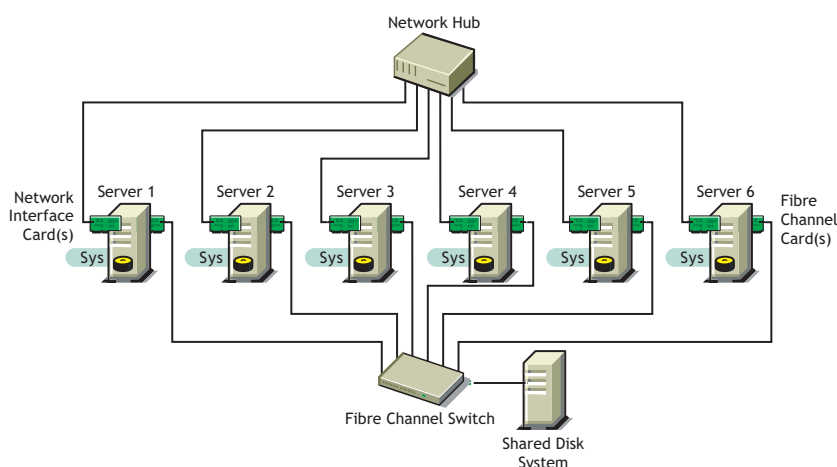
Although Fibre Channel provides the best performance, you can also configure your cluster to use shared SCSI or iSCSI. The following figure shows how a typical shared SCSI cluster configuration might look.

Figure 1-4 *Typical Shared SCSI Cluster Configuration*
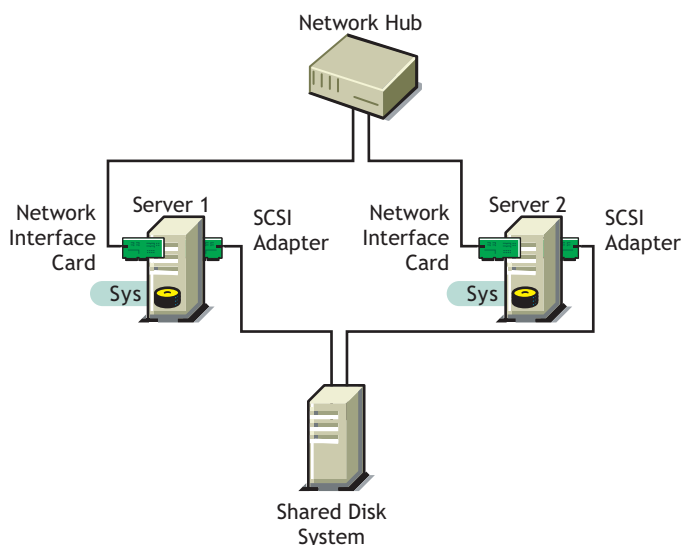
iSCSI software is included with NetWare 6.5. The following figure shows how a typical iSCSI cluster configuration might look.

Figure 1-5 *Typical iSCSI Cluster Configuration*
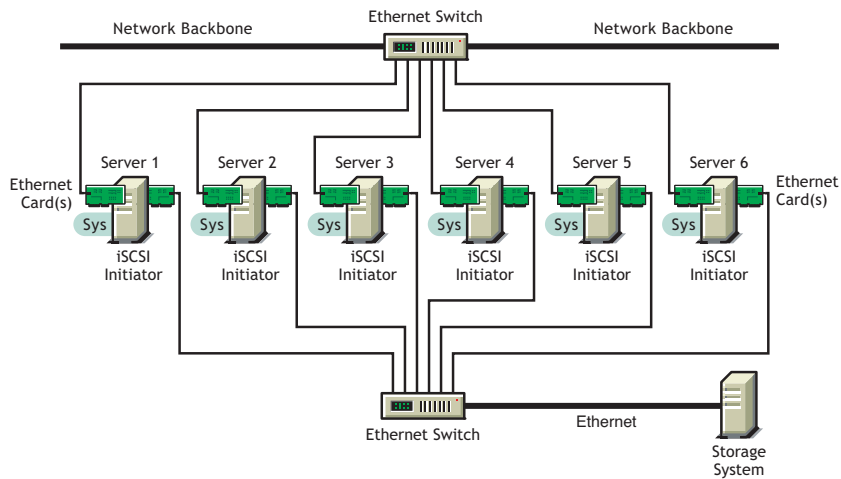
1.3.1 Cluster Components

The following components make up a Novell Cluster Services cluster:

- From 2 to 32 NetWare servers configured to use IP, each containing at least one local disk device (used for a local sys: volume).
- Novell Cluster Services software running on each NetWare server in the cluster.
- A shared disk subsystem connected to all servers in the cluster (optional, but recommended for most configurations).
- High-speed Fibre Channel cards, cables, and switch or SCSI cards and cables used to connect the servers to the shared disk subsystem.

What's New for Novell Cluster Services for NetWare

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This section identifies enhancements and modifications made to Novell© Cluster Services™ for NetWare® in NetWare 6.5 Support Pack 7 and later.

2.1 What's New (NetWare 6.5 SP8)

There are no feature changes in the NetWare 6.5 SP8 release of Novell Cluster Services for NetWare.

2.2 What's New (NetWare 6.5 SP7)

There are no feature changes in the NetWare 6.5 SP7 release of Novell Cluster Services for NetWare.

Installation and Setup

<div style="text-align: right; font-size: 3em;">3</div>

Novell® Cluster Services™ 1.8.5 is installed on existing NetWare® 6.5 SP7 servers.

For information about upgrading a cluster server from NetWare 6.5 SP6 to NetWare 6.5 SP7, see Chapter 4, "Upgrading NetWare Clusters," on page 41.

For information about converting a cluster server from NetWare 6.5 SP7 and later to OES 2 Linux, see "Converting NetWare 6.5 Clusters to OES 2 Linux" in the *OES 2 SP2: Novell Cluster Services 1.8.7 for Linux Administration Guide*.

- Section 3.1, "Requirements for Novell Cluster Services," on page 19
- Section 3.2, "Novell Cluster Services Licensing," on page 25
- Section 3.3, "Installing Novell Cluster Services," on page 25
- Section 3.4, "Setting Up Cluster Resources for Novell Cluster Services," on page 28
- Section 3.5, "Additional Information," on page 40

3.1 Requirements for Novell Cluster Services

- Section 3.1.1, "Hardware Requirements," on page 19
- Section 3.1.2, "Software Requirements," on page 20
- Section 3.1.3, "Configuration Requirements," on page 22
- Section 3.1.4, "Shared Disk System Requirements," on page 24
- Section 3.1.5, "Rules for Using Disks in a Shared Storage Space," on page 24

3.1.1 Hardware Requirements

The following list specifies hardware requirements for installing Novell Cluster Services. These requirements represent the minimum hardware configuration. Additional hardware might be necessary depending on how you intend to use Novell Cluster Services.

- ❑ A minimum of two NetWare® servers, and not more than 32 servers in a single cluster
- ❑ At least 512 MB of memory on each server in the cluster
- ❑ One non-shared volume for the sys: volume for each server
- ❑ At least one network card per server in the same IP subnet

In addition, each server must meet the requirements for NetWare 6.5 SP7.

NOTE: Although identical hardware for each cluster server is not required, having servers with the same or similar processors and memory can reduce differences in performance between cluster nodes and make it easier to manage your cluster. There are fewer variables to consider when designing your cluster and failover rules if each cluster node has the same processor and amount of memory.

If you have a Fibre Channel SAN, the host bus adapters (HBAs) for each cluster node should be identical.

3.1.2 Software Requirements

Ensure that the following requirements are met:

- "NetWare 6.5 SP7 or Later" on page 20
- "Novell eDirectory 8.8" on page 20
- "Novell iManager 2.7.2" on page 20
- "Novell Storage Services" on page 21
- "NCP Server for NetWare" on page 22
- "Novell AFP for NetWare" on page 22
- "Novell CIFS for NetWare" on page 22
- "SLP" on page 22

NetWare 6.5 SP7 or Later

Novell Cluster Services 1.8.5 for NetWare supports NetWare 6.5 SP7 or later. OES 2 NetWare must be installed and running on each cluster server in the cluster. Novell Cluster Services is a component of the services for NetWare.

You cannot mix two versions of NetWare in a single cluster except to support a rolling cluster upgrade. You cannot mix OES 2 Linux (or later versions) and NetWare 6.5 SP7 (or later versions) in a single cluster except to support a rolling cluster upgrade.

Novell eDirectory 8.8

Novell eDirectory™ 8.8 is required for managing the Cluster object and Cluster Node objects for Novell Cluster Services.

It must be installed somewhere in the same tree as the cluster. It can be installed on the cluster or on a separate server or cluster. For configuration requirements, see "eDirectory" on page 23.

Novell iManager 2.7.2

Novell iManager 2.7.2 or later is required for configuring and managing clusters. iManager must be installed on at least one server in your data center, and the Cluster plug-in and Storage Management plug-in must be installed in iManager.

NOTE: A February 3, 2009 update to the Clusters plug-in for OES 2 SP1 Linux is available that can be used to manage the Novell Business Continuity Clustering (BCC) 1.1 SP2 for NetWare® 6.5 SP8 (same as OES 2 SP1 NetWare) and Novell Business Continuity Clustering 1.2 for OES 2 SP1 Linux. You can download the update from the Novell Downloads Web site (http://download.novell.com/).

To use the Clusters role in iManager, the following storage-related plug-ins must be installed:

- Clusters (`ncsmgmt.npm`)
- Common code for storage-related plug-ins (`storagemgmt.npm`)

The `storagemgmt.npm` contains code in common with other storage-related plug-ins for OES 2 SP1:

Product	Plug-In	NPM File
Novell Archive and Version Services	Archive Versioning	`arkmgmt.npm`
Novell Apple* Filing Protocol (AFP) for OES 2 SP1 Linux and NetWare	File Protocols > AFP	`afpmgmt.npm`
Novell CIFS for OES 2 SP1 Linux and NetWare	File Protocols > CIFS	`cifsmgmt.npm`
Novell Distributed File Services	Distributed File Services	`dfsmgmt.npm`
Novell Storage Services™	Storage	`nssmgmt.npm`

These additional plug-ins are needed when working with the NSS file system. Make sure that you include the common `storagemgmt.npm` plug-in module when installing any of these storage-related plug-ins.

IMPORTANT: If you use more than one of these plug-ins, you should install, update, or remove them all at the same time to make sure the common code works for all plug-ins. Make sure to uninstall the old version of the plug-ins before you overwrite them in the packages folder with the new versions.

These iManager plug-ins support iManager 2.7.2 on all operating systems supported by iManager and iManager Workstation.

The latest Novell storage-related plug-ins can be downloaded as a single zipped download file from the Novell Downloads Web site (http://download.novell.com). For information about installing plug-ins in iManager, see "Downloading and Installing Plug-Ins During Installation"in the *Novell iManager 2.7 Installation Guide*.

To update storage-related plug-ins:

1 In iManager, uninstall the currently installed storage-related plug-ins.

2 Copy the new .npm files into the iManager plug-ins location, manually overwriting the older version of the plug-in in the packages folder with the newer version of the plug-in.

3 In iManager, install all of the storage-related plug-ins, or install the plug-ins you need, plus the common code.

For information about working with storage-related plug-ins for iManager, see "Understanding Storage-Related Plug-Ins" in the *NW 6.5 SP8: NSS File System Administration Guide*.

For information about browser configuration requirements, see "Web Browser" on page 23.

Novell Storage Services

All servers in the cluster must be configured to use the Novell Storage Services™ (NSS) file system. NSS is the only file system supported for Novell Cluster Services for NetWare. For information about managing NSS, see the *NW 6.5 SP8: NSS File System Administration Guide*.

NSS supports the following advertising protocols in concurrent use for any given cluster-enabled NSS pool:

- NetWare® Core Protocol™ (NCP) (default, mandatory). For information, see "NCP Server for NetWare" on page 22.

- Novell Apple* Filing Protocol* (AFP) for NetWare. For information, see "Novell AFP for NetWare" on page 22.
- Novell Common Information File System (CIFS) for NetWare. For information, see "Novell CIFS for NetWare" on page 22.

NCP Server for NetWare

NCP Server for NetWare is integrated in the NetWare operating system. It is installed automatically when you install NetWare.

For information about managing NCP Server for NetWare, see the *NW 6.5 SP8: Novell Remote Manager Administration Guide*.

Novell AFP for NetWare

AFP is the network protocol for Macintosh*. Novell Cluster Services supports using Novell AFP for NetWare as an advertising protocol for shared NSS pools. Novell AFP is installed automatically when you install NetWare.

For information about using Novell AFP for NetWare, see the *NW 6.5 SP8: AFP, CIFS, and NFS (NFAP) Administration Guide*.

Novell CIFS for NetWare

CIFS is the network protocol for Windows*. Novell Cluster Services supports using Novell CIFS for NetWare as an advertising protocol for shared NSS pools.Novell CIFS is installed automatically when you install NetWare.

For information about using Novell CIFS for NetWare, see the *NW 6.5 SP8: AFP, CIFS, and NFS (NFAP) Administration Guide*.

SLP

SLP (Service Location Protocol) must be configured and running on each server. It is required for the `bind` and `unbind` commands.

For information, see "Implementing the Service Location Protocol" (http://www.novell.com/documentation/edir88/edir88/data/ba5lb4b.html) in the *Novell eDirectory 8.8 Administration Guide*.

3.1.3 Configuration Requirements

Ensure that the following configuration requirements are met:

- "IP Addresses" on page 22
- "eDirectory" on page 23
- "Cluster Services Administrator" on page 23
- "Web Browser" on page 23

IP Addresses

❑ All IP addresses used by the cluster servers and its cluster resources must be on the same IP subnet.

❑ Each server in the cluster must be configured with a unique static IP address.

❑ You need additional unique static IP addresses for the cluster and for each cluster resource and cluster-enabled pool.

eDirectory

❑ All servers in the cluster must be in the same eDirectory tree.

If the servers in the cluster are in separate eDirectory containers, the user who administers the cluster must have rights to the cluster server containers and to the containers where any cluster-enabled pool objects are stored. You can do this by adding trustee assignments for the cluster administrator to a parent container of the containers where the cluster server objects reside.

See "eDirectory Rights" (http://www.novell.com/documentation/edir88/edir88/data/ fbachifb.html) in the *eDirectory 8.8 Administration Guide* for more information.

❑ If you are creating a new cluster, the eDirectory context where the new Cluster object will reside must be an existing context. Specifying a new context during the Novell Cluster Services install configuration does not create a new context.

❑ When you install Novell Cluster Services in a tree, the eDirectory schema for the tree is extended to include the following types of objects:

  ◆ Cluster objects (containers)

    ◆ Cluster Node objects

    ◆ Cluster Resource objects

    ◆ Cluster Template objects

    ◆ Volume Resource objects

Cluster Services Administrator

The administrator user who installs Novell Cluster Services must have the eDirectory rights necessary to extend the eDirectory schema for Cluster objects.

Web Browser

The browser that will be used to manage Novell Cluster Services must be set to a supported language.

The Cluster plug-in for iManager might not operate properly if the highest priority Language setting for your Web browser is set to a language other than one of the supported languages. To avoid problems, in your Web browser, click *Tools > Options > Languages*, and then set the first language preference in the list to a supported language.

For a information about supported browsers, see "Using a Supported Web Browser" in the *Novell iManager 2.7.3 Administration Guide*

3.1.4 Shared Disk System Requirements

A shared disk system (Storage Area Network or SAN) is required for each cluster if you want data to be highly available. If a shared disk subsystem is used, ensure the following:

❑ Novell Cluster Services supports the following shared disks:

   ◆ Fibre Channel SAN LUNs

   ◆ iSCSI SAN LUNs

   ◆ SCSI disks (shared external drive arrays)

❑ Before installing Novell Cluster Services, the shared disk system must be properly set up and functional according to the manufacturer's instructions.

   Prior to installation, verify that all the drives in your shared disk system are recognized by NetWare by running the LIST DEVICES command on each server you intend to add to your cluster. If any of the drives in the shared disk system do not show up in the list, consult your NetWare documentation or the shared disk system documentation for troubleshooting information.

❑ If you are using iSCSI for shared disk system access, ensure that you have configured iSCSI initiators and targets prior to installing Novell Cluster Services.

❑ We recommend that the disks contained in the shared disk system are configured to use mirroring or RAID to add fault tolerance to the shared disk system.

❑ If this is a new cluster, the shared disk system must be connected to the first server so that the cluster partition can be created during the Novell Cluster Services install.

❑ The shared disk system must have at least 20 MB of free disk space for creating a special cluster partition.

   If you want to mirror the SBD partition for greater fault tolerance, you need to have at least 20 MB of free disk space on a second shared disk where you want to create the mirror.

   The Novell Cluster Services installation automatically allocates one cylinder on one drive of the shared disk system for the special cluster partition. Depending on the location of the cylinder, the actual amount of space used by the cluster partition may be less than 20 MB.

❑ If you create new partitions that you plan to use during the install for the SBD, you must initialize the partition before installing Novell Cluster Services. This allows the installation software to recognize available partitions and present them for use during the install.

3.1.5 Rules for Using Disks in a Shared Storage Space

When you create a Novell Cluster Services system that utilizes shared storage space, it is important to remember that all servers attached to the shared disks, whether in the cluster or not, have access to all of the data on the shared storage space unless you specifically prevent such access. Novell Cluster Services arbitrates access to shared data for all cluster nodes, but cannot protect shared data from being corrupted by non-cluster servers.

3.2 Novell Cluster Services Licensing

Novell Cluster Services supports up to 32 nodes in a single cluster. NetWare 6.5 customers receive a Novell Cluster Services entitlement that covers an unlimited number of two-node clusters. Customers who want to add nodes to any cluster can purchase a paper license for them for an additional fee. For information, see the Novell Cluster Services for Open Enterprise Server How-to-Buy Web site (http://www.novell.com/products/openenterpriseserver/ncs/howtobuy.html)

Previous versions of Cluster Services required a Cluster User Access License (CUAL). NetWare 6.5 now uses User Access Licensing, which eliminates the need for a CUAL.

3.3 Installing Novell Cluster Services

It is necessary to run the Novell Cluster Services installation program when you

- Create a new cluster
- Add new nodes to an existing cluster
- Upgrade cluster software on servers being upgraded from NetWare 5.1 to NetWare 6.5

If you are running the Novell Cluster Services installation program to create a new cluster, the program automatically

- Creates a new Cluster object in eDirectory
- Installs Novell Cluster Services software on the servers you specify to be part of your cluster

You can install up to 32 nodes in each cluster.

- Section 3.3.1, "Meeting Requirements," on page 25
- Section 3.3.2, "Preparing a Shared Device for the SBD," on page 25
- Section 3.3.3, "Running Novell Deployment Manager," on page 26
- Section 3.3.4, "Running the Installation Program," on page 26
- Section 3.3.5, "Verifying that Cluster Services Is Loaded and Running," on page 28

3.3.1 Meeting Requirements

Before you begin, make sure your solution meets the "Requirements for Novell Cluster Services" on page 19.

3.3.2 Preparing a Shared Device for the SBD

If you are installing Novell Cluster Services on the first node of the cluster, you need a shared device where you can create a small partition of 20 MB to use for the split-brain detector during the install. If you plan to mirror the SBD, you need two of them.

If the device is a new uninitialized disk, you must initialize it and enable it for sharing.

WARNING: Initializing a disk destroys all data on it.

1 At the server console prompt of the first node, enter

```
nssmu
```

2 In NSSMU, select *Devices* from the main menu, then press Enter.

3 Select the device, press F3 to initialize the disk, select *Yes* to confirm, then press Enter.

4 Scroll to highlight the device, press F5 to select the device, then press F6 to share the disk.

The *Sharable for Clustering* value changes from *No* to Yes.

5 Press Esc twice, then select *Yes* and press Enter to exit NSSMU.

3.3.3 Running Novell Deployment Manager

Prior to running `nwdeploy.exe` to install Novell Cluster Services, you must have a client connection established from the workstation running the Novell Deployment Manager to each server where Novell Cluster Services will be installed or upgraded.

The easiest way to do this is to use Windows Explorer to browse the eDirectory tree to the `sys:` volume of each server in your cluster to be upgraded or installed. Opening the `sys:` volume folder on a server automatically creates a connection to that server.

3.3.4 Running the Installation Program

The first server that you configure for the cluster automatically becomes the master node in the cluster. Subsequent servers that you add to the cluster become slave nodes.

To install Novell Cluster Services, insert the *NetWare 6.5 Operating System* CD in a NetWare client workstation and run `nwdeploy.exe` from the root of the CD to launch the NetWare Deployment Manager, then complete the following steps:

1 In the NetWare Deployment Manager, open the `Post-Install Tasks` folder, click *Install/ Upgrade Cluster*, and then click *Install* or *Upgrade a Cluster*.

2 Continue through the installation screens until you get to the screen that prompts you to create a new cluster, add new nodes to an existing cluster, or upgrade software in an existing cluster.

3 Click *Create a New Cluster*, *Add New Nodes to Existing Cluster*, or *Upgrade Software in Existing Cluster*, and then click *Next*.

The *Skip File Copy* check box is selected by default and prevents Novell Cluster Services files from being copied during the installation. The NetWare 6.5 installation program automatically copies all Novell Cluster Services files to every NetWare 6.5 server. If you want to refresh Novell Cluster Services files on cluster servers you should deselect the *Skip File Copy* check box. Even though Novell Cluster Services files already exist on each NetWare 6.5 server, you still need to run the Novell Cluster Services installation program to configure and set up cluster nodes.

Leaving the *Skip File Copy* check box deselected causes existing Novell Cluster Services files to be copied over, but will not otherwise affect the installation.

4 Do one of the following:

◆ (If creating) Type the name for the new Cluster object you are creating and specify the Directory tree and context where you want it created. Then click *Next* and continue with .

Cluster names must be unique. You cannot create two clusters with the same name in the same eDirectory tree.

NOTE: Do not use periods in cluster names. NetWare and NetWare clients interpret a period as a delimiter.

You must specify an existing context. Specifying a new context does not create a new context.

- ◆ (If adding new nodes) Specify the eDirectory tree, context, and name of the cluster you will add servers to. If you don't know a cluster name or its context, browse and select one. Then click *Next* and continue with .

- ◆ (If upgrading software) Specify the Directory tree, context, and name of the cluster where software will be upgraded. Then click *Next* and go to .

NOTE: When running the Cluster Services installation, you occasionally might be unable to see the Novell eDirectory tree you want to install into from the installation browser. If this happens, type the name of the tree in the browser address (URL) field: *treename/cluster.context*.

5 Type the name of the server you want to add to the cluster, or browse and select one from the list, then click *Add to Cluster*. Repeat this step for every server you want to add to the cluster, then click *Next*.

You can also remove servers you just added to the cluster by selecting them from the *NetWare Servers in Cluster* list and clicking *Remove*.

When you add a server to a cluster, Novell Cluster Services automatically detects the server's IP address. If the server you are adding has more than one IP address, you will be prompted to select the IP address you want Novell Cluster Services to use.

6 Specify a unique IP address for the cluster.

The cluster IP address is separate from the server IP address and is required for certain external network management programs to get cluster status alerts. The cluster IP address provides a single point of cluster access for NetWare Remote Manager. A Master IP Address resource is created automatically during the Cluster Services installation that makes this possible.

The cluster IP address will be bound to the master node and will remain with the master node regardless of which server is the master node.

7 (Conditional) If you are creating a new cluster, specify whether your cluster has a shared disk system and, if so, select the drive where you want the small cluster partition created. Then click *Next*.

Novell Cluster Services requires a small cluster partition on the shared disk system. You are also given the option of mirroring the partition for greater fault tolerance.

If the disk where you plan to create the cluster partition is not on list, you must abort the installation, initialize the disk, then run the installation program again.

IMPORTANT: You must have at least 20 MB of free space that is not part of an NSS partition on one of the shared disk drives to create the cluster partition. If no free space is available, the shared disk drives can't be used by Novell Cluster Services.

If you previously installed Novell Cluster Services and created a cluster with the same name, the installation program will detect that a cluster partition has already been created and this screen does not appear.

8 Choose whether or not you want the servers you are upgrading or adding to your cluster to start Novell Cluster Services software after the installation. Then click *Next*.

If you choose to not start Novell Cluster Services software on each server that you upgrade or add to your cluster, you will need to manually start it after the installation or you will need to reboot cluster servers to automatically start it.

You can manually start Novell Cluster Services by running LDNCS at the server console on each cluster server.

If you are installing or upgrading a two-node cluster or not adding additional nodes to a two-node cluster, continue with Step 10.

9 (Conditional) Specify the location of the Cluster Server License files or browse and select a path, then click *Add*.

Because licenses for a two-node cluster are included with NetWare 6.5, this screen only appears if you are installing or upgrading a three-node or larger cluster.

You are given the option of installing without licenses. If you choose to install without licenses and you have a cluster with more than two nodes, you will need to manually install the licenses at a later date using iManager. If you install licenses at a later date, after installing the licenses you must reboot each cluster server that you have added a license to. This will ensure that cluster licensing functions properly. Novell Cluster Services will not function without the proper licenses in place.

10 Continue through the final installation screen.

   ◆ If you are creating a new cluster, the installation program will create a new Cluster object in eDirectory and install Novell Cluster Services software on the servers you specified to be part of your cluster.

   ◆ If you are adding new nodes to an existing cluster, the installation program will install Novell Cluster Services software on the servers you are adding to your cluster.

   ◆ If you are upgrading Novell Cluster Services software on an existing cluster, the installation program will upgrade cluster software on all servers in the cluster.

3.3.5 Verifying that Cluster Services Is Loaded and Running

If you chose to have Novell Cluster Services software start automatically after installation, you might encounter a problem with Cluster Services software starting on some servers immediately after the installation. This problem is due to Cluster Services software starting prior to cluster-related eDirectory objects being created and replicated.

To resolve this problem, wait for a few minutes and then manually start Cluster Services software by entering ldncs at the server console.

3.4 Setting Up Cluster Resources for Novell Cluster Services

If you created a new cluster, you now need to create and configure cluster resources. You might also need to create shared disk partitions if they do not already exist and, if necessary, configure all shared disk system pools and volumes to work with Novell Cluster Services. You might also need to cluster enable the shared disk system pools and volumes.

You can use either the server-based NSS Management Utility (NSSMU) or the Storage plug-in for iManager, or Novell Remote Manager for NetWare to create shared disk partitions, NSS pools, and volumes.

3.4.1 Initializing Shared Devices

All uninitialized devices that you want to use in a cluster-enabled pool must be initialized by using NSSMU or iManager before you can create cluster-enabled NSS pools on them.

Initialized devices with available free space are listed when you create an NSS pool. If a device that you want to use does not appear in the list of available devices, it might be because it has not yet been initialized. It might also mean that there is no free space on the device.

WARNING: The initialization process completely removes all the partitions on the device and all the data stored on the device is lost. Do not initialize devices that already contain data unless you intend to remove all data on the device.

To initialize a device:

1 Start NSSMU by entering `nssmu` at the server console of the master node of the cluster.

2 In NSSMU, click *Devices*.

A list of devices appears in the *Devices* list.

3 In the *Devices* list, select a device.

4 Press F3, *Initialize Disk*.

3.4.2 Enabling Sharing on a Device

All devices that you want to use in a cluster-enabled pool must be enabled for sharing by using NSSMU or iManager before you can create cluster-enabled NSS pools on them.

Storage devices must be available via a shared storage area network (SAN) in order to be failed over between servers in the cluster. NSS supports Fibre Channel SAN and iSCSI SAN environments. External SCSI device arrays can also be configured for multiple server access.

Before enabling sharing on shared storage, Novell Cluster Services must be installed and running on your servers. You should carefully plan how you want to configure your shared storage prior to installing Novell Cluster Services.

IMPORTANT: If a device is marked as sharable for clustering, all partitions on that device are automatically sharable.

To enable sharing for a device:

1 Start NSSMU by entering `nssmu` at the server console of the master node of the cluster.

2 In NSSMU, select *Devices* from the NSS main menu.

A list of devices appears in the *Devices* list. Device names are not changeable and might be labeled with names such as `0x2` or `0x1`.

3 In the *Devices* list, select a shared device.

If sharing is disabled, the *Shareable for Clustering* parameter is marked No.

4 Press F6, *Share* to enable sharing for the device.

5 Wait for the device details to refresh, then verify that the *Shareable for Clustering* parameter is now marked Yes.

6 Repeat this process for each shared device you want to enable for sharing.

7 Exit NSSMU.

3.4.3 Creating Shared NSS Pools

You can create a pool on the shared device by using iManager or NSSMU. The shared partition is automatically created for you when you create the pool.

- "Using iManager to Create Shared NSS Pools" on page 30
- "Using NSSMU to Create a Shared NSS Pool" on page 32

Using iManager to Create Shared NSS Pools

1 Start your Internet browser and enter the URL for iManager.

The URL is http://*server_ip_address*/nps/imanager.html. Replace *server_ip_address* with the IP address or DNS name of a server in the cluster that has iManager installed or with the IP address for Apache-based services.

2 Specify your username and password, specify the tree information, then click *Login*.

3 In Roles and Tasks, select *Storage*, then click the *Pools* link.

4 Enter a cluster server name, or browse and select the Cluster object.

5 Click the *New* link to open the New Pool wizard.

6 Specify the new pool name, then click *Next*.

7 Select the check box next to the shared device where you want to create the pool, then specify the size of the pool.

8 Specify whether you want the pool to be activated when it is created.

The *Activate On Creation* option determines if the pool you are creating is to be activated as soon as it is created. The *Activate On Creation* check box is selected (enabled) by default. If you deselect the check box, you must manually activate the pool later before it can be used.

9 Specify whether you want the pool to be cluster-enabled when it is created by doing one of the following:

  ◆ If you want to cluster-enable the pool at the same time it is created, leave the *Cluster Enable on Creation* check box selected, click *Next*, then continue with Step 10.

  ◆ If you want to cluster-enable the pool later, deselect the check box, click *Create*, click *Finish*, then continue with "Configuring a Cluster Resource for (Cluster Enabling) an NSS Pool and Its Volumes" on page 34.

10 If you selected *Cluster Enable on Creation*, an additional page appears that allows you to specify the cluster information.

Specify the following shared pool clustering parameters:

  ◆ **Virtual Server Name:** The name assigned to the virtual server that represents the shared pool in the cluster.

  When you cluster-enable a pool, a virtual Server object is automatically created in Novell eDirectory™ and given the name of the Cluster object plus the name of the cluster-enabled pool. For example, if the cluster name is `cluster1` and the cluster-enabled pool name is `pool1`, then the default virtual server name will be `cluster1_pool1_server`. You can edit the field to change the default virtual server name.

  ◆ **CIFS Virtual Server Name:** The name assigned to the virtual server for handling CIFS requests. This is the name of the server as it appears in a Windows system.

  You can specify a different name for the Novell CIFS Server only when you create the share. User the CIFS iManager plug-in to manage the name of existing CIFS shares.

  ◆ **IP Address:** The IP address that you want to assign the virtual server.

  To specify an IP address, tab between the different entries; no dot is required in the fields. For example, if the IP address is `192.168.1.1`, type the following:

  `192 168 1 1`

  ◆ **Advertising Protocols:** Protocols that give users native file access to data.

  Specify one or more advertising protocols by selecting the check boxes of the protocols you want to enable for data requests to this shared pool.

    ◆ NCP is the Novell networking protocol used by the Novell Client. It is selected by default. Selecting NCP causes commands to be added to the pool-resource load and unload scripts to activate the NCP protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to Novell clients.

    ◆ CIFS is the Windows networking protocol. Selecting CIFS causes commands to be added to the pool-resource load and unload scripts to activate the CIFS protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to CIFS/Samba clients.

    ◆ AFP is the Macintosh networking protocol. Selecting AFP causes commands to be added to the pool-resource load and unload scripts to activate the AFP protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to AFP clients.

11 Click *Finish*.

Typically, the pool creation takes less than a minute, and the volume creation takes less than 10 seconds. However, if you have a large tree or the server does not hold an eDirectory replica, the create time can take up to 3 minutes.

12 Continue with "Creating an NSS Volume on a Shared Pool" on page 33.

Using NSSMU to Create a Shared NSS Pool

1 Start NSSMU by entering `nssmu` at the server console of the master node of the cluster.

2 From the NSSMU main menu, select *Pools*.

3 On the Pools page, press Insert, then type a name for the new pool you want to create.

4 Select the device on your shared storage where you want the pool created.

5 Specify whether you want the pool to be activated when it is created.

The *Activate On Creation* option determines if the pool you are creating is to be activated as soon as it is created. The *Activate On Creation* check box is selected (enabled) by default. If you deselect the check box, you must manually activate the pool later before it can be used.

6 The *Cluster Enable on Creation* feature is enabled by default. Specify whether you want the pool to be cluster-enabled when it is created by doing one of the following:

- ◆ If you want to cluster-enable the pool at the same time it is created, accept the default entry (*Yes*), select *Create*, then continue with Step 7.

- ◆ If you want to cluster-enable the pool at a later date, change the default entry from *Yes* to *No*, select *Create*, then go to Section 3.4.5, "Configuring a Cluster Resource for (Cluster Enabling) an NSS Pool and Its Volumes," on page 34.

7 If you enabled *Cluster Enable on Creation*, an additional page appears that allows you to specify the cluster information.

Specify the following shared pool clustering parameters:

- ◆ **Virtual Server Name:** The name assigned to the virtual server that represents the shared pool in the cluster.

  When you cluster-enable a pool, a virtual Server object is automatically created in Novell eDirectory™ and given the name of the Cluster object plus the name of the cluster-enabled pool. For example, if the cluster name is `cluster1` and the cluster-enabled pool name is `pool1`, then the default virtual server name will be `cluster1_pool1_server`. You can edit the field to change the default virtual server name.

- ◆ **CIFS Virtual Server Name:** The name assigned to the virtual server for handling CIFS (Common Internet File System) requests. This is the name of the server as it appears in a Windows system.

  You can specify a different name for the Novell CIFS Server only when you create the share. User the CIFS iManager plug-in to manage the name of existing CIFS shares.

- ◆ **IP Address:** The IP address that you want to assign the virtual server.

  To specify an IP address, tab between the different entries; no dot is required in the fields. For example, if the IP address is `192.168.1.1`, type the following:

  `192 168 1 1`

- ◆ **Advertising Protocols:** Protocols that give users native file access to data.

Specify one or more advertising protocols by selecting the check boxes of the protocols you want to enable for data requests to this shared pool.

- ◆ NCP is the Novell networking protocol used by the Novell Client. It is selected by default. Selecting NCP causes commands to be added to the pool-resource load and unload scripts to activate the NCP protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to Novell clients.

- ◆ CIFS is the Windows networking protocol. Selecting CIFS causes commands to be added to the pool-resource load and unload scripts to activate the CIFS protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to CIFS/Samba clients.

- ◆ AFP is the Macintosh networking protocol. Selecting AFP causes commands to be added to the pool-resource load and unload scripts to activate the AFP protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to AFP clients.

8 Select *Create* to create and cluster-enable the pool.

9 Continue with .

3.4.4 Creating an NSS Volume on a Shared Pool

You can create an NSS volume on the shared pool by using the Storage plug-in to Novell iManager or the server-based NSSMU tool. For planning and management information, see the *NW 6.5 SP8: NSS File System Administration Guide*.

IMPORTANT: As a best practice, one volume per shared pool is recommended. Using multiple volumes per pool is also supported.

Depending on your configuration, the new volume can be mounted automatically when resources that require them start, or it can be mounted manually on individual servers after the cluster resources are loaded.

- ◆
- ◆

Using iManager to Create an NSS Volume

Repeat the following procedure for each cluster volume that you want to create.

1 Start your Internet browser and enter the URL for iManager.

The URL is http://*server_ip_address*/nps/imanager.html. Replace *server_ip_address* with the IP address or DNS name of a server in the cluster that has iManager installed or with the IP address for Apache-based services.

2 Specify your username and password, specify the tree information, then click *Login*.

3 In Roles and Tasks, select *Storage*, then select the *Volumes*.

4 Specify a cluster server name or browse and select one, then click *New*.

5 Specify the new volume name, then click *Next*.

6 Select the check box next to the cluster pool where you want to create the volume and either specify the size of the volume (*Volume Quota*) or select *Allow the volume to grow to the size of the pool*, then click *Next*.

The volume quota is the maximum possible size of the volume. If you have more than one volume per pool, you can specify a quota for each volume rather than allowing multiple volumes to grow to the pool size.

7 Review and change volume attributes as necessary.

For information about volume attributes, see "Volume Attributes" in the *NW 6.5 SP8: NSS File System Administration Guide*.

8 Choose whether you want the volume activated and mounted when it is created, then click *Finish*.

Using NSSMU to Create an NSS Volume

Repeat the following procedure for each cluster volume that you want to create on the shared NSS pool.

1 From the NSSMU main menu, select *Volumes*.

2 On the Volumes page, press Insert, then type a name for the new volume you want to create.

Each shared volume in the cluster must have a unique name.

3 Select the pool where you want the volume to reside.

4 Review and change volume attributes as necessary.

For information about volume attributes, see "Volume Attributes" in the *NW 6.5 SP8: NSS File System Administration Guide*.

5 Either specify a quota for the volume or accept the default of 0 to allow the volume to grow to the pool size, then select *Create*.

The quota is the maximum possible size of the volume. If you have more than one volume per pool, you can specify a quota for each volume rather than allowing multiple volumes to grow to the pool size.

3.4.5 Configuring a Cluster Resource for (Cluster Enabling) an NSS Pool and Its Volumes

Cluster-enabling a pool or volume allows it to be moved or mounted on different servers in the cluster in a manner that supports transparent client reconnect. If you have a shared disk system that is part of your cluster and you want the pools and volumes on the shared disk system to be highly available to NCP clients, you must cluster-enable those pools and volumes.

Cluster-enabled volumes do not appear as cluster resources. NSS pools are resources, and load and unload scripts apply to pools and are automatically generated for them. Each cluster-enabled NSS pool requires its own IP address. This means that each cluster-enabled volume does not have an associated load and unload script or an assigned IP address.

NSS pools can be cluster-enabled at the same time they are created. If you did not cluster-enable a pool at creation time, the first volume that you cluster-enable in the pool automatically cluster-enables the pool. After a pool has been cluster-enabled, you must also cluster-enable the other volumes in the pool if you want them to be mounted on another server during a failover.

When a server fails, any cluster-enabled pools being accessed by that server fail over to other servers in the cluster. Because the cluster-enabled pool fails over, all volumes in the pool also fail over, but only the volumes that have been cluster-enabled are mounted. Any volumes in the pool that have not been cluster-enabled must be mounted manually. For this reason, volumes that aren't cluster-enabled should be in separate pools that are not cluster-enabled.

If you want each cluster-enabled volume to be its own cluster resource, each volume must have its own pool.

Some server applications don't require NCP client access to NSS volumes, so cluster-enabling pools and volumes might not be necessary.

1 Start your browser and enter the URL for iManager.

The URL is http://*server_ip_address*/nps/imanager.html. Replace *server_ip_address* with the IP address or DNS name of a server in the cluster, or the IP address for Apache-based services.

2 Specify your username and password, specify the tree information, then click *Login*.

3 In *Roles and Tasks*, select *Storage*, then go to the Volumes and Pools pages to verify that the volumes are not mounted and the pool is deactive.

4 In *Roles and Tasks*, select *Clusters*, then click the *Cluster Options* link.

5 Browse to locate and select the Cluster object of the cluster you want to manage.

6 Click the *New* link.

7 Specify Pool as the resource type you want to create by clicking the *Pool* radio button, then click *Next*.

8 Type the name of the pool you want to cluster-enable, or browse and select it.

9 (Optional) Change the default name of the virtual Server object.

When you cluster-enable a pool, a virtual Server object is automatically created and given the name of the Cluster object plus the cluster-enabled pool. For example, if the cluster name is cluster1 and the cluster-enabled pool name is pool1, then the default virtual server name will be cluster1_pool1_server.

10 (Optional) Change the default name of the CIFS server name.

If you select the *CIFS* check box in the *Advertising Protocols* section of this page, the *CIFS Server Name* field will become active. The CIFS server name is the server name CIFS clients see when they browse the network. A default server name is listed, but you can change the server name by editing the text in the field.

11 Specify an IP address for the pool.

Each cluster-enabled NSS pool requires its own IP address. The IP address is used to provide access and failover capability to the cluster-enabled pool (virtual server). The IP address assigned to the pool remains assigned to the pool regardless of which server in the cluster is accessing the pool.

12 Select one or more advertising protocols.

   ◆ NCP is the Novell networking protocol used by the Novell Client. It is selected by default. Selecting NCP causes commands to be added to the pool-resource load and unload scripts to activate the NCP protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to Novell clients.

- ◆ CIFS is the Windows networking protocol. Selecting CIFS causes commands to be added to the pool-resource load and unload scripts to activate the CIFS protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to CIFS/Samba clients.

- ◆ AFP is the Macintosh networking protocol. Selecting AFP causes commands to be added to the pool-resource load and unload scripts to activate the AFP protocol on the cluster. This lets you ensure that the cluster-enabled pool you are creating is highly available to AFP clients.

13 (Optional) Select the *Online Resource after Create* check box.

This causes the volume to automatically mount once it is created.

14 Ensure the *Define Additional Properties* check box is selected, then click *Next*.

15 If desired, modify the cluster load, unload, and monitor scripts.

Cluster resource load, unload, and monitor scripts are automatically generated for a pool when the cluster resource for the pool is created. You can modify the scripts to suit your needs. For examples of the scripts for NSS, see the following:

- ◆ Section 3.4.8, "Configuring Load Scripts," on page 37
- ◆ Section 3.4.9, "Configuring Unload Scripts," on page 38

16 Continue with "Setting Start, Failover, and Failback Modes" on page 38.

3.4.6 Creating Cluster Resource Templates

Templates simplify the process of creating similar or identical cluster resources. For example, templates are helpful when you want to create multiple instances of the same resource on different servers. You can create templates for any server application or resource you want to add to your cluster.

Novell Cluster Services currently provides templates for DHCP, iFolder®, and MySQL*, as well as a generic IP SERVICE template. The generic IP SERVICE template can be used when configuring certain server applications to run on your cluster. You can edit and customize any of the templates for your specific needs.

1 Start your browser and enter the URL for iManager.

The URL is http://*server_ip_address*/nps/imanager.html. Replace *server_ip_address* with the IP address or DNS name of a NetWare 6.5 server in the cluster or the IP address for Apache-based services.

2 Specify your username and password, specify the tree information, then click *Login*.

3 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

4 Type the cluster name or browse and select it, then click the *New* link.

5 Specify *Template* as the resource type you want to create by clicking the *Template* radio button, then click *Next*.

6 Type the name of the template you want to create.

7 Ensure that the *Define Additional Properties* check box is selected, then continue with "Configuring Load Scripts" on page 37.

To finish creating a cluster resource template, you need to configure load and unload scripts, set failover and failback modes and, if necessary, change the node assignments for the resource template.

3.4.7 Creating Cluster Resources

Cluster resources must be created for every resource or application you run on servers in your cluster. Cluster resources can include Web sites, e-mail servers, databases, and any other server-based applications or services you want to make available to users at all times.

1 Start your browser and enter the URL for iManager.

The URL is http://*server_ip_address*/nps/imanager.html. Replace *server_ip_address* with the IP address or DNS name of a NetWare 6.5 server in the cluster or the IP address for Apache-based services.

2 Specify your username and password, specify the tree information, then click *Login*.

3 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

iManager displays four links under *Clusters* that you can use to configure and manage your cluster.

4 Type the cluster name or browse and select it, then click the *New* link.

5 Specify Resource as the resource type you want to create by clicking the *Resource* radio button, then click *Next*.

6 Type the name of the resource you want to create.

IMPORTANT: Do not use periods in cluster resource names. NetWare and NetWare clients interpret a period as a delimiter.

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7 If a template exists for the resource you are creating, type the template name in the *Inherit From Template* field, or browse and select it from the list. If a template does not exist, select the *Define Additional Properties* check box.

8 (Conditional) If you are not using a template for the resource, continue with .

3.4.8 Configuring Load Scripts

A load script is required for each resource, service, or disk pool in your cluster. The load script specifies the commands to start the resource or service on a server, or to mount the volume on a server.

You can use any commands in the load script that would be used in a `.ncf` file run from the server console. If you don't know which commands to add to your load script, consult the documentation for the application or resource.

Load scripts are automatically created for disk pools when you cluster enable them. Because of this, it might not be necessary to configure or change the load script for a pool.

IMPORTANT: Do not comment out commands that are autogenerated for parameters that define the cluster resource, such as the mount point, IP address, container name, file system type, and device.

If you are creating a new cluster resource, the load script page should already be displayed. You can start with .

1 In Roles and Tasks, select *Clusters* and click the *Cluster Options* link.

2 Type the cluster name or browse and select it, select the box next to the resource whose load script you want to edit, then click the *Details* link.

3 Click the *Scripts* tab, then click the *Load Script* link.

4 Edit or add the necessary commands to the script to load the resource on the server.

For more details on load script commands, see the instructions below on configuring load scripts using ConsoleOne.

5 Specify the Load Script Timeout value, then click *Apply* to save the script; or, if you are creating a new cluster resource, click *Next*.

The timeout value determines how much time the script is given to complete. If the script does not complete within the specified time, the resource becomes comatose.

3.4.9 Configuring Unload Scripts

Depending on your cluster application or resource, you can add an unload script to specify how the application or resource should terminate. An unload script is not required by all resources or applications, but it can ensure that during a failback or manual migration, a resource unloads before it loads on another node. Consult your application vendor or documentation to determine if you should add commands to unload the resource.

Unload scripts are automatically created for pools when you cluster enable them. Because of this it might not be necessary to configure or change the load script for a pool.

If you are creating a new cluster resource, the unload script page should already be displayed. You can start with Step 4 on page 38.

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, select the box next to the resource whose unload script you want to edit, then click the *Details* link.

3 Click the *Scripts* tab, then click the *Unload Script* link.

4 Edit or add the necessary commands to the script to unload the resource on the server.

You can use any commands used in a `.ncf` file run from the server console. If you don't know which commands to add, consult the documentation for the application or resource you want to unload.

5 Specify the Unload Script Timeout value, then click *Apply* to save the script; or, if you are creating a new cluster resource, click *Next*.

The timeout value determines how much time the script is given to complete. If the script does not complete within the specified time, the resource becomes comatose when migrating to another node.

3.4.10 Setting Start, Failover, and Failback Modes

You can configure the start, failover, and failback of cluster resources to happen manually or automatically. With the resource Start Mode set to AUTO, the resource automatically starts on a server when the cluster is first brought up. If the resource Start Mode is set to MANUAL, you can manually start the resource on a server when you want, instead of having it automatically start when servers in the cluster are brought up.

IMPORTANT: Cluster Services works with NCP user connections so that the user data sessions are resumed after failover. However, non-NCP users might experience service interruption and need to reconnect to the server after the failover. Applications using server based storage must be restarted on the new node even with NCP unless they are NCP reconnect aware.

With the resource Failover Mode set to AUTO, the resource automatically starts on the next server in the Assigned Nodes list in the event of a hardware or software failure. If the resource Failover Mode is set to MANUAL, you can intervene after a failure occurs and before the resource is moved to another node.

With the resource Failback Mode set to DISABLE, the resource does not fail back to its most preferred node when the most preferred node rejoins the cluster. If the resource Failback Mode is set to AUTO, the resource automatically fails back to its most preferred node when the most preferred node rejoins the cluster. Set the resource Failback Mode to MANUAL to prevent the resource from moving back to its preferred node when that node is brought back online, until you are ready to allow it to happen.

The preferred node is the first server in the list of the assigned nodes for the resource.

IMPORTANT: Resources will only failback to the first node in their preferred nodes list. So if a resource has failed over to three servers since it originally ran on its preferred node, and the second server the resource was running on comes back up, the resource will not failback to that second server.

Resources do not automatically move from node to node just because a node higher in the preferred nodes list rejoins the cluster, unless the Failback mode is set to auto and the first node in the preferred nodes list rejoins the cluster.

If you are creating a new cluster resource, the Resource Policies page should already be displayed. You can start with Step 4.

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, select the box next to the resource whose start, failover, or failback modes you want to view or edit, then click the *Details* link.

3 Click the *General* tab.

4 (Conditional) Select the *Resource Follows Master* check box if you want to ensure that the resource runs only on the master node in the cluster.

   If the master node in the cluster fails, the resource will fail over to whichever node becomes the master.

5 (Conditional) Select the *Ignore Quorum* check box if you don't want the cluster-wide timeout period and node number limit enforced.

   The quorum default values were set when you installed Novell Cluster Services. You can change the quorum default values by accessing the properties page for the Cluster object.

   Selecting this box will ensure that the resource is launched immediately on any server in the Assigned Nodes list as soon as any server in the list is brought online.

6 Choose the Start, Failover, and Failback modes for this resource.

The default for both Start and Failover modes is AUTO, and the default for Failback mode is DISABLE.

7 Continue with "Assigning Nodes to a Resource" on page 40, or if you are creating a new cluster resource, click *Next*, then continue with "Assigning Nodes to a Resource" on page 40.

3.4.11 Assigning Nodes to a Resource

When you create a resource on a cluster or cluster enable a volume or pool, the nodes in the cluster are automatically assigned to the resource or the volume or pool. The order of assignment is the order the nodes appear in the resource list. You can assign or unassign nodes to the resource or the volume or pool, or change the failover order.

If you are creating a new cluster resource, the Preferred Nodes page should already be displayed. If you have just set start, failover, and failback modes, the Preferred Nodes page will be displayed as part of the Resource Policies page. You can start with Step 4.

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, select the box next to the resource whose assigned nodes you want to change, then click the *Details* link.

3 Click the *Preferred* tab.

4 From the list of unassigned nodes, select the server you want the resource assigned to, then click the right-arrow button to move the selected server to the *Assigned Nodes* list.

Repeat this step for all servers you want assigned to the resource. You can also use the left-arrow button to unassign servers from the resource.

5 Click the up-arrow and down-arrow buttons to change the failover order of the servers assigned to the resource or volume.

6 Click *Apply* or *Finish* to save node assignment changes.

3.5 Additional Information

For information on managing Novell Cluster Services clusters, see Chapter 7, "Managing Novell Cluster Services Clusters," on page 57.

For information on configuring the cluster behavior by setting policies and priorities, see Chapter 6, "Configuring Cluster Policies and Priorities," on page 47

Upgrading NetWare Clusters

4

This section describes upgrade scenarios for upgrading your NetWare® clusters to NetWare 6.5 SP7 (same as Novell® Open Enterprise Server (OES) 2 NetWare) or later.

- Section 4.1, "Converting NetWare Clusters to Linux," on page 41
- Section 4.2, "Upgrading Novell Cluster Services from NetWare 5.1 to NetWare 6.5," on page 41
- Section 4.3, "Upgrading Novell Cluster Services from NetWare 6 to NetWare 6.5," on page 43
- Section 4.4, "Performing a Rolling Cluster Upgrade from NetWare 6 to NetWare 6.5," on page 43

4.1 Converting NetWare Clusters to Linux

For information about converting NetWare clusters to Linux clusters using Novell Cluster Services for Linux, see the following sections of the *OES 2 SP2: Novell Cluster Services 1.8.7 for Linux Administration Guide*:

- "Comparing Novell Cluster Services for Linux and NetWare"
- "Comparing Clustering Support for OES 2 Services on Linux and NetWare"
- "Guidelines for Converting Clusters from NetWare to OES 2 Linux"
- "Guidelines for Converting NSS Pool Resources from NetWare to Linux"
- "Guidelines for Converting Service Cluster Resources from NetWare to Linux"
- "Converting NetWare 6.5 Clusters to OES 2 Linux"

4.2 Upgrading Novell Cluster Services from NetWare 5.1 to NetWare 6.5

To upgrade NetWare 5.1 servers running Novell Cluster Services to NetWare 6.5 servers running Novell 1.8.5 Cluster Services, you must perform the following tasks:

- Section 4.2.1, "Preparing Cluster Servers for an Upgrade," on page 41
- Section 4.2.2, "Upgrading NetWare 5.1 Servers to NetWare 6.5," on page 42
- Section 4.2.3, "Upgrading Novell Cluster Services Software," on page 42
- Section 4.2.4, "Completing the Cluster Upgrade," on page 42

4.2.1 Preparing Cluster Servers for an Upgrade

If you are upgrading Novell Cluster Services from NetWare 5.1 to NetWare 6.5 and your cluster has shared storage, you must prepare your cluster servers before upgrading them to NetWare 6.5 and before upgrading Novell Cluster Services. This preparation is necessary to ensure existing shared-volume trustee assignments can be used after the upgrade.

NOTE: This is not necessary if you are upgrading from NetWare 6 to NetWare 6.5.

To prepare cluster servers for an upgrade, from a NetWare client run `nwdeploy.exe` from the root of the *NetWare 6.5 Operating System* CD to launch the NetWare Deployment Manager, then complete the following steps:

1 In the NetWare Deployment Manager, open the Network Preparation Folder and then click *Prepare Cluster for Upgrade > Prepare a Cluster*.

2 Continue through the screens until you get to the screen that prompts you to select an existing cluster to prepare for upgrade.

3 Specify the cluster name, eDirectory tree, and context for the cluster you are preparing for upgrade.

4 Choose whether you want the servers you are going to upgrade to go down after completing the preparation for upgrading cluster servers, then click *Next* to run the program for preparing cluster servers for upgrade.

   Bringing down all cluster servers before an upgrade ensures NSS volumes on shared storage (your SAN) are deactivated prior to upgrading to NetWare 6.5.

After you have completed the process for preparing cluster servers for an upgrade, continue with "Upgrading NetWare 5.1 Servers to NetWare 6.5" on page 42.

4.2.2 Upgrading NetWare 5.1 Servers to NetWare 6.5

1 Upgrade your NetWare 5.1 servers to NetWare 6.5 by following the instructions in "Upgrading to NetWare 6.5 SP6" in the *NW65 SP8: Installation Guide*

After upgrading your servers to NetWare 6.5 and rebooting them, continue with "Upgrading Novell Cluster Services Software" on page 42.

4.2.3 Upgrading Novell Cluster Services Software

The same installation program used to install Novell Cluster Services software is also used to upgrade it. To upgrade Novell Cluster Services software, follow the instructions in "Running the Installation Program" on page 26.

After upgrading cluster software, continue with "Completing the Cluster Upgrade" on page 42.

4.2.4 Completing the Cluster Upgrade

Complete the cluster upgrade by using the Cluster View option in ConsoleOne. This automatically edits cluster load and unload scripts to remove upgrade-specific commands that were added during the cluster upgrade. It also automatically renames NSS Pool objects that were created during the upgrade and modifies them to reference virtual server objects instead of physical server objects.

1 Start ConsoleOne and authenticate to the eDirectory tree where the Cluster object resides.

2 Browse and select the Cluster object for the cluster you just upgraded.

3 Go to the Cluster State View by clicking *View > Cluster State* from the menu at the top of the screen.

   The cluster upgrade process will automatically complete when you open the Cluster State View.

4.3 Upgrading Novell Cluster Services from NetWare 6 to NetWare 6.5

To upgrade NetWare 6 servers running Cluster Services to NetWare 6.5 servers running Cluster Services, do the following:

1 Install NetWare 6.5 Cluster Server Licenses on your NetWare 6 cluster servers using iManager prior to upgrading them to NetWare 6.5.

Since licenses for a two-node cluster are included with NetWare 6 and with NetWare 6.5, this is only necessary if you are upgrading a three-node or larger cluster. Additional Cluster Server Licenses can be obtained from Novell or from your Novell Authorized Reseller.

2 Upgrade your NetWare 6 servers to NetWare 6.5. To do this, follow the instructions in "Upgrading to NetWare 6.5 SP6" in the *NW65 SP8: Installation Guide*.

The latest Cluster Services files are automatically copied to each server during the server upgrade process. When each server reboots after being upgraded, new Cluster Services software will automatically load.

4.4 Performing a Rolling Cluster Upgrade from NetWare 6 to NetWare 6.5

Performing a rolling upgrade from NetWare 6 to NetWare 6.5 lets you keep your cluster up and running and lets your users continue to access the network while the upgrade is being performed.

During a rolling cluster upgrade, one server is upgraded to NetWare 6.5 while the other servers in the cluster continue running NetWare 6. Then another server is upgraded to NetWare 6.5, and then another, until all servers in the cluster have been upgraded to NetWare 6.5.

When the last server in the cluster has been upgraded (all the servers in the cluster are running NetWare 6.5) each cluster-enabled pool resource (or any resource on shared storage) is temporarily put into a new resource state called upgrade, and the following process occurs automatically:

1. All cluster resources on shared pools are temporarily brought offline.
2. Media Manager software is called to upgrade disk media on one server. Disk media is then refreshed on all remaining servers in the cluster.
3. All cluster resources on shared storage are moved back to their original nodes.
4. The load scripts for each cluster resource run and each cluster resource is brought online.

The amount of time users lose access to cluster resources is minimal because the process described above happens very quickly.

To perform a rolling cluster upgrade from NetWare 6 to NetWare 6.5

1 Install NetWare 6.5 Cluster Server Licenses on your NetWare 6 cluster servers using iManager prior to upgrading them to NetWare 6.5.

Since licenses for a two-node cluster are included with NetWare 6 and with NetWare 6.5, this is only necessary if you are upgrading a three-node or larger cluster. Additional Cluster Server Licenses can be obtained from Novell or from your Novell Authorized Reseller.

2 Upgrade one NetWare 6 server in the cluster to NetWare 6.5 by following the instructions in "Upgrading to NetWare 6.5 SP6" in the *NW65 SP8: Installation Guide*.

The latest Cluster Services files are automatically copied to the server during the upgrade process. When the server reboots after being upgraded, new Cluster Services software will automatically load.

Cluster pools, volumes, and resources fail over from the server being upgraded to other servers in the cluster. After a cluster server is upgraded and brought back online, the pools, volumes, and resources that failed over to other servers during the upgrade process fail back to the upgraded server.

3 Upgrade another server in the cluster to NetWare 6.5, and continue this process until all servers in the cluster have been upgraded to NetWare 6.5

After a cluster server has been upgraded, you do not need to immediately upgrade another cluster server. The rolling upgrade process allows both NetWare 6 and NetWare 6.5 cluster servers to coexist in the same cluster.

Configuring Novell Cluster Services in a Virtualization Environment

5

Novell® Cluster Services™ is installed and configured in a Xen-based virtualization environment (on guest servers) by using the same methods and processes as those used on a physical server. No additional changes or special configuration is required.

IMPORTANT: All templates except Xen and XenLive are valid in guest servers (DomU) in the virtualization environment. Only the Xen and XenLive templates can be used in the OES 2 Linux (Xen) host environment (that is, in Dom0, but not in DomU).

For information about using virtualized NetWare guest servers as nodes in a NetWare cluster, see the deployment scenarios in "Configuring Novell Cluster Services in a Xen Virtualization Environment" in the *OES 2 SP2: Novell Cluster Services 1.8.7 for Linux Administration Guide*.

To get started with virtualization, see "Introduction to Xen Virtualization" (http://www.novell.com/documentation/sles10/book_virtualization_xen/data/sec_xen_basics.html) in the *Virtualization with Xen* (http://www.novell.com/documentation/sles10/book_virtualization_xen/data/book_virtualization_xen.html) guide.

For information on setting up NetWare on a Xen-based virtual guest server, see "Installing and Managing NetWare on a Xen-based VM" in the *OES 2 SP2: Installation Guide* guide.

Configuring Cluster Policies and Priorities

<div align="right">6</div>

After installing Novell® Cluster Services™ on one or more nodes in a cluster, you can configure the settings for the cluster to meet your needs and help you manage the cluster effectively. This additional configuration might consist of changing the values on some of the properties for the Cluster object and the Cluster Node objects.

6.1 Understanding Cluster Settings

6.1.1 Cluster Policies

Table 6-1 describes the configurable cluster policies. You can manage cluster policies in iManager by going to the *Clusters > Cluster Options > Policies* page.

Table 6-1 *Cluster Policies*

Property	Description
Cluster IP address	Specifies the IP address for the cluster.
	You specify the IP address when you install Novell Cluster Services on the first node of the cluster. Rarely, you might need to modify this value.
Port	Specifies the port used for cluster communication.
	The default cluster port number is 7023, and is automatically assigned when the cluster is created. You might need to modify this value if there is a port conflict.
Quorum membership	Specifies number of nodes that must be up and running in the cluster in order for cluster resources to begin loading.
	Specify a value between 1 and the number of nodes.

Property	Description
Quorum timeout	Specifies the maximum amount of time in seconds to wait for the specified quorum to be met before cluster resources begin loading on whatever number of nodes are actually up and running.
E-mail notification	Enables or disables e-mail notification for the cluster. If it is enabled, you can specify up to eight administrator e-mail addresses for cluster events notification.

6.1.2 Cluster Protocols Properties

Table 6-2 describes the configurable cluster protocols properties that govern inter-node communication transmission and tolerances. You can manage cluster protocols policies in iManager by going to the *Clusters > Cluster Options > Protocols* page.

Table 6-2 *Cluster Policies*

Property	Description
Heartbeat	Specifies the interval of time in seconds between signals sent by each of the non-master nodes in the cluster to the master node to indicate that it is alive.
Tolerance	Specifies the maximum amount of time in seconds that a master node waits to get an alive signal from a non-master node before considering that node to have failed and removing it from the cluster.
Master watchdog	Specifies the interval of time in seconds between alive signals sent from the master node to non-master nodes to indicate that it is alive.
Slave watchdog	Specifies the maximum amount of time in seconds that the non-master nodes wait to get an alive signal from the master node before considering that the master node has failed, assigning another node to become the master node, and removing the old master node from the cluster.
Maximum retransmits	This value is set by default and should not be changed.

6.2 Configuring Quorum Membership and Timeout Properties

You can edit Quorum Membership and Timeout properties using iManager, ConsoleOne, or Novell Remote Manager.

Using iManager

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, then click the *Properties* button under the cluster name.

3 Click the *General* tab.

   In iManager, the same page used to edit quorum membership and timeout is also used for the cluster IP address and port properties and for cluster e-mail notification.

Using ConsoleOne

1 Right-click the Cluster object.

2 Click *Properties*.

3 Select the *Quorum* tab on the Cluster Object Property page.

Using Novell Remote Manager

1 In the left column, select *Clustering*, then select *Cluster Config*.

2 Select the Cluster object name.

3 Click *Quorum*.

6.2.1 Membership (Number of Nodes)

The Quorum Membership is the number of nodes that must be running in the cluster before resources will start to load. When you first bring up servers in your cluster, Novell Cluster Services reads the number specified in the Membership field and waits until that number of servers is up and running in the cluster before it starts loading resources.

Set the Membership value to a number greater than 1 so that all resources don't automatically load on the first server that is brought up in the cluster. For example, if you set the Membership value to 4, there must be four servers up in the cluster before any resource will load and start.

6.2.2 Timeout

Timeout specifies the amount of time to wait for the number of servers defined in the Membership field to be up and running. If the timeout period elapses before the quorum membership reaches its specified number, resources will automatically start loading on the servers that are currently up and running in the cluster. For example, if you specify a Membership value of 4 and a timeout value equal to 30 seconds, and after 30 seconds only two servers are up and running in the cluster, resources will begin to load on the two servers that are up and running in the cluster.

6.3 Configuring Cluster Protocol Properties

You can use the Cluster Protocol property pages to view or edit the transmit frequency and tolerance settings for all nodes in the cluster, including the master node. The master node is generally the first node brought online in the cluster, but if that node fails, any of the other nodes in the cluster can become the master.

If you change any protocol properties, you should restart all servers in the cluster to ensure that the changes take effect.

Using iManager

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, then click the *Properties* button under the cluster name.

3 Click the *Protocols* tab.

This page also lets you view the script used to configure the cluster protocol settings, but not change it. Changes made to the protocols setting will automatically update the script.

Using ConsoleOne

1 Right-click the Cluster object.

2 Click *Properties*.

3 On the Cluster Object property page, select the *Protocol* tab.

This tab has two pages: Settings and Internals. The Internals page lets you view the script used to configure the cluster protocol settings, but not change it. Use the Settings page to make changes to cluster protocol properties.

Using Novell Remote Manager

1 In the left column, select *Clustering*, then select *Cluster Config*.

2 Select the Cluster object name.

3 Click *Protocol*.

6.3.1 Heartbeat

Heartbeat specifies the amount of time between transmits for all nodes in the cluster except the master. For example, if you set this value to 1, non-master nodes in the cluster send a signal that they are alive to the master node every second.

6.3.2 Tolerance

Tolerance specifies the amount of time the master node gives all other nodes in the cluster to signal that they are alive. For example, setting this value to 4 means that if the master node does not receive an "I'm alive" signal from a node in the cluster within four seconds, that node is removed from the cluster.

6.3.3 Master Watchdog

Master Watchdog specifies the amount of time between transmits for the master node in the cluster. For example, if you set this value to 1, the master node in the cluster transmits an "I'm alive" signal to all the other nodes in the cluster every second.

6.3.4 Slave Watchdog

Slave Watchdog specifies the amount of time the master node has to signal that it is alive. For example, setting this value to 5 means that if the monastery nodes in the cluster do not receive an "I'm alive" signal from the master within five seconds, the master node is removed from the cluster and one of the other nodes becomes the master node.

6.3.5 Max Retransmits

This value is set by default, and should not be changed.

6.4 Configuring Cluster E-Mail Notification

Novell Cluster Services can automatically send out e-mail messages for certain cluster events like cluster and resource state changes or nodes joining or leaving the cluster.

In order for cluster e-mail notification to work, you must first configure e-mail notification for server health status using NetWare Remote Manager. For instructions on how to do this, go to "Configuring E-Mail Notification for Server Health Status" in the *NetWare Remote Manager Administration Guide.*

You can enable or disable e-mail notification for the cluster and specify up to eight administrator e-mail addresses for cluster notification.

IMPORTANT: If you add or delete an administrator e-mail address or change the type of cluster events you want administrators to receive messages for (verbose to XML, etc.), you must reload `cma.nlm` (the Cluster Management Agent) and perform a `cluster join` on each node for the changes to take effect. Reloading the `cma.nlm` on a node causes a cluster migration of all loaded resources on the node to other nodes, and then performs a cluster leave for the node. Loading `cma.nlm` does not automatically cause the node to rejoin the cluster, so you must issue the `cluster join` command afterwards. Repeat this for each node in the cluster.

Another way to do this is to unload `cma.nlm` (the Cluster Management Agent) and run `ldncs` on each node in the cluster. The `ldncs` command automatically loads cma.nlm and runs the `cluster join` command for the node. Repeat this process for each node in the cluster.

Using iManager

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, then click the *Properties* button under the cluster name.

3 Click the *General* tab.

4 Select or deselect the *Enable Cluster Notification Events* check box to enable or disable e-mail notification.

5 If you enable e-mail notification, add the desired e-mail addresses in the field provided.

You can click the buttons next to the field to add, delete, or edit e-mail addresses. Repeat this process for each e-mail address you want on the notification list.

6 If you enable e-mail notification, specify the type of cluster events you want administrators to receive messages for.

To only receive notification of critical events like a node failure or a resource going comatose, click the *Receive Only Critical Events* radio button.

To receive notification of all cluster state changes including critical events, resource state changes, and nodes joining and leaving the cluster, click the *Verbose Messages* radio button.

To receive notification of all cluster state changes in XML format, choose the *XML Messages* option. XML format messages can be interpreted and formatted with a parser that lets you customize the message information for your specific needs.

7 Click the *Apply* button to save changes.

Using ConsoleOne

1 Right-click the cluster object

2 Click *Properties*.

3 On the Cluster Object property page, select the *Notification* tab.

4 Select or deselect the *Enable Cluster Notification Events* check box to enable or disable e-mail notification.

5 If you enable e-mail notification, add the desired e-mail address in the field provided and click the button next to the field to add the address to the list. Repeat this process for each address you want on the notification list.

It is not necessary to add quotes to e-mail address names.

6 If you enable e-mail notification, specify the type of cluster events you want administrators to receive messages for.

To only receive notification of critical events like a node failure or a resource going comatose, click the *Receive Only Critical Events* radio button.

To receive notification of all cluster state changes including critical events, resource state changes, and nodes joining and leaving the cluster, click the *Verbose Messages* radio button.

To receive notification of all cluster state changes in XML format, choose the *XML Messages* option. XML format messages can be interpreted and formatted with a parser that lets you customize the message information for your specific needs.

7 Click the *Apply* button to save changes made.

Using Novell Remote Manager

1 In the left column, select *Clustering*, then select *Cluster Config*.

2 Select the Cluster object name and click *Email Reporting*.

3 Add the desired email addresses in the fields provided.

It is not necessary to add quotes to e-mail address names.

4 Specify the type of cluster events you want administrators to receive messages for.

Specify a 1 or a 0 to disable email notification.

Specify a 2 (Critical) to only receive notification of critical events like a node failure or a resource going comatose.

Specify a 4 (Verbose) to receive notification of all cluster state changes including critical events, resource state changes, and nodes joining and leaving the cluster.

Specify an 8 to receive notification of all cluster state changes in XML format. XML format messages can be interpreted and formatted with a parser that lets you customize the message information for your specific needs.

5 Click the *Apply* button to save your changes.

6.5 Viewing Cluster Node Properties

You can view or edit the cluster node number or IP address of the selected node or view the context for the NetWare Server object.

Using iManager

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, select the box next to the cluster node whose properties you want to view or edit, then click the *Properties* link.

3 View or edit the IP address, then click *Apply* to update the information in eDirectory.

If the IP address changes for this server, the new information is not automatically updated in eDirectory.

Using ConsoleOne

1 Select the Cluster object and right-click the desired cluster node on the right side of the ConsoleOne display screen.

2 Click *Properties*.

3 On the Cluster Node property page, select the *Node* tab.

Using Novell Remote Manager

1 In the left column, select *Clustering*, then select *Cluster Config*.

2 Select the Cluster node name.

3 Click *IP Address* or *Node Number*.

6.5.1 (Node) Number+IP Address

Number+IP Address specifies the cluster node number and IP address for the selected node. If the cluster node number or IP address changes for the selected node, the new information is not automatically updated in eDirectory. Edit the information and click *Apply* to update the information in eDirectory.

6.5.2 NCP Server (Distinguished Name)

This is the eDirectory name and context for the NetWare Server object. This field cannot be edited.

6.6 Modifying Cluster IP Address and Port Properties

The Cluster IP address is assigned when you install Novell Cluster Services. The Cluster IP address normally does need to be changed, but can be if needed.

The default cluster port number is 7023, and is automatically assigned when the cluster is created. The cluster port number does not need to be changed unless a conflict is created by another resource using the same port number. If there is a port number conflict, change the Port number to any other value that doesn't cause a conflict.

Using iManager

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, then click the *Properties* button under the cluster name.

3 Click the *General* tab.

In iManager, the same page used to view or edit the cluster IP address and port properties is also used for quorum membership and timeout and for cluster e-mail notification.

Using ConsoleOne

1 Right-click the cluster object.

2 Click *Properties*.

3 On the Cluster Object property page, select the *Management* tab.

Using Novell Remote Manager

1 In the left column, select *Clustering*, then select *Cluster Config*.

2 Select the Cluster object name.

3 Click *IP Address*.

6.7 Configuring Resource Priority for Startup

The Resource Priority allows you to control the order in which multiple resources start on a given node when the cluster is brought up or during a failover or failback. For example, if a node fails and two resources fail over to another node, the resource priority determines which resource loads first.

This is useful for ensuring that the most critical resources load first and are available to users before less critical resources.

Using iManager

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

2 Type the cluster name or browse and select it, then click the *Properties* button under the cluster name.

3 Click the *Priorities* tab.

4 To change the priority for a resource, select the resource in the list by clicking it, then click the up-arrow or down-arrow to move the resource up or down in the list. This lets you change the load order of the resource relative to other cluster resources on the same node.

5 Click the *Apply* button to save changes made to resource priorities.

Using ConsoleOne

1 Right-click the cluster object.

2 Click *Properties*.

3 On the Cluster Object property page, select the *Resource Priority* tab.

4 To change the priority for a resource, select the resource in the list, then click the *Increase* or *Decrease* button to move the resource up or down in the list.

This lets you change the load order of the resource relative to other cluster resources on the same node.

You can also select a resource and then click the *Selected* button to reset the resource back to its default load order.

5 Click the *Apply* button to save changes made to resource priorities.

Using Novell Remote Manager

1 In the left column, select *Clustering*, then select *Cluster Config*.

2 Select the Cluster object name.

3 Click *Resource Priorities*.

4 To change the priority for a resource, assign it a number between 0 and 65535.

65535 is the maximum value and 0 is the minimum value. Setting a resource priority to 65535 ensures the resource loads before other resources with lower priority settings. Setting the resource priority to 0 ensures the resource loads last after all other resources have loaded. The default resource priority setting is 0.

If you assign multiple resources the same priority, the start order of those resources is random.

5 Click the *Apply* button to save changes made to resource priorities.

Managing Novell Cluster Services Clusters

7

After you have installed, set up, and configured Novell® Cluster Services™ for your specific needs, some additional information can be useful to help you effectively manage your cluster. This information consists of instructions for migrating resources, identifying cluster and resource states, customizing cluster management, as well as some additional cluster operating instructions.

For information about using console commands to manage a cluster, see Appendix A, "Console Commands for Novell Cluster Services," on page 69.

- ◆ Section 7.1, "Migrating Resources," on page 57
- ◆ Section 7.2, "Identifying Cluster and Resource States," on page 58
- ◆ Section 7.3, "Installing NetWare on a Server to be Added to an Existing Cluster," on page 60
- ◆ Section 7.4, "Re-Adding a Node to a Cluster That Was Previously in the Cluster," on page 60
- ◆ Section 7.5, "Cluster-Enabled Volume Connection Is Required for Some Utilities," on page 60
- ◆ Section 7.6, "Some Applications Do Not Fail Over," on page 61
- ◆ Section 7.7, "Starting and Stopping Novell Cluster Services," on page 61
- ◆ Section 7.8, "Preventing Cascading Failovers," on page 61
- ◆ Section 7.9, "Cluster Maintenance Mode," on page 63
- ◆ Section 7.10, "Unload Cluster Services Software When Servicing Shared Storage," on page 63
- ◆ Section 7.11, "Displaying Bound Virtual IP Addresses," on page 63
- ◆ Section 7.12, "Customizing Cluster Services Management," on page 63
- ◆ Section 7.13, "Renaming a Pool and Pool Cluster Resource," on page 64

7.1 Migrating Resources

You can migrate resources to different servers in your cluster without waiting for a failure to occur. You might want to migrate resources to lessen the load on a specific server, to free up a server so it can be brought down for scheduled maintenance, or to increase the performance of the resource or application by putting it on a faster machine.

Migrating resources allows you to balance the load and evenly distribute applications among the servers in your cluster.

Using iManager

1 In Roles and Tasks, select *Clusters*, then click the *Cluster Manager* link.

2 Enter the cluster name or browse and select it, select the box next to the resource you want to migrate, then click Migrate.

A page appears, displaying a list of possible servers that you can migrate this resource to.

3 Select a server from the list to migrate the resource to, then click *OK* to migrate the resource to the selected server.

Using ConsoleOne

1 Browse and select the Cluster object that contains the resource you want to migrate.

Resources must be in a running state to be migrated.

2 Ensure that the right half of ConsoleOne® displays the Cluster State View by selecting *View > Cluster State* from the menu at the top of the screen.

3 From the *Cluster Resource* List, select the resource you want to migrate.

The Cluster Resource Manager screen appears, displaying the server the selected resource is currently running on and a list of possible servers that you can migrate resources to.

4 Select a server from the list, then click *Migrate* to move the resource to the selected server.

Using Novell Remote Manager

1 In the left column, select *Clustering*, then select *Cluster Management*.

2 Select the cluster resource you want to migrate.

3 Select a server from the list, then click *Migrate* to move the resource to the selected server.

If you select a resource and click *Offline*, the resource will be unloaded from the server. It will not load on any other servers in the cluster and will remain unloaded until you load it again. This option is useful for editing resources because resources can't be edited while loaded or running on a server.

7.2 Identifying Cluster and Resource States

The Cluster State view in ConsoleOne, the Cluster Management link in Novell Remote Manager, and the Management link in iManager give you important information about the status of servers and resources in your cluster.

Cluster servers and resources display in different colors, depending on their operating state. When servers and resources are green, they are in a normal operating condition. When a server that has been part of the cluster is red with a break in the icon, it has failed. When a resource is red, it is waiting for administrator intervention. When a server is gray with no break in the icon, either that server is not currently a member of the cluster or its state is unknown. When a resource is blank or has no colored icon, it is unassigned, offline, changing state, or in the process of loading or unloading.

The yellow ball in the middle of the server icon designates the master server in the cluster. The master server is initially the first server in the cluster, but another server can become the master if the first server fails.

The Epoch number indicates the number of times the cluster state has changed. The cluster state will change every time a server joins or leaves the cluster.

Clicking the *Event Log* tab in ConsoleOne gives you a detailed history of your cluster. Every time the cluster state changes, a new event is added to the event log. You can sort the events in the log by clicking the column headings of the table. You can reverse the sort order by pressing the Shift key while clicking a column heading. The event log is stored on the special cluster partition that was created during the Novell Cluster Services installation, which ensures it is always available. You can also save the event log to a file.

Clicking the HTML Report tab in ConsoleOne in the Cluster State view screen launches a more detailed report of the state of your cluster. You can view this report or save it to an HTML file for printing or viewing with a browser.

The following table identifies the different resource states and gives descriptions and possible actions for each state. The possible actions describe steps for using ConsoleOne to complete each action. You can also use iManager or Novell Remote Manager to perform the same actions. In Novell Remote Manager, in the left column, select *Clustering*, select Cluster Management and then select the desired resource. In iManager, click Clusters, then click Cluster Manager to view a list of resources and resource states.

Table 7-1 *Cluster Resource States and Actions*

Resource State	Description	Possible Actions
Alert	Either the Start, Failover, or Failback mode for the resource has been set to Manual. The resource is waiting to start, fail over, or fail back on the specified server.	Click the Alert status indicator. Depending on the resource state, you will be prompted to start, fail over, or fail back the resource.
Comatose	The resource is not running properly and requires administrator intervention.	Click the Comatose status indicator and offline the resource. After resource problems have been resolved, the resource can be put back online (returned to the running state).
Loading	The resource is in the process of loading on a server.	None.
NDS_Sync	The properties of the resource have changed and the changes are still being synchronized in Novell eDirectory™.	None.
Offline	Offline status indicates the resource is shut down or is in a dormant or inactive state.	Click the Offline status indicator and, if desired, click the Online button to load the resource on the best node possible, given the current state of the cluster and the resource's preferred nodes list.
Quorum Wait	The resource is waiting for quorum to be established so it can begin loading.	None.
Running	The resource is in a normal running state.	Click the Running status indicator and choose to either migrate the resource to a different server in your cluster or unload (offline) the resource.
Unassigned	There isn't an assigned node available that the resource can be loaded on.	Click the Unassigned status indicator and, if desired, offline the resource. Offlining the resource will prevent it from running on any of its preferred nodes should any of them join the cluster.
Unloading	The resource is in the process of unloading from the server it was running on.	None.

Resource State	Description	Possible Actions
Upgrade	The cluster is in a temporary upgrade state. This is a normal part of the rolling upgrade process from NetWare® 6 to NetWare 6.5.	None.

7.3 Installing NetWare on a Server to be Added to an Existing Cluster

1 Install Fibre Channel hardware.

NetWare will automatically detect and load the proper drivers when it installs.

2 Install NetWare, including the latest Service Pack, on the new server.

3 Reboot the server.

4 Install Novell Cluster Services on the new server.

5 (Conditional) If you have changed the failover order, add the new server to the failover list.

By default, Novell Cluster Services will include all nodes on the failover list, including newly added nodes.

7.4 Re-Adding a Node to a Cluster That Was Previously in the Cluster

Previously, if you were reinstalling a cluster node and using the same server name, you had to reconfigure Novell Cluster Services on that node and restart cluster software on all nodes in the cluster prior to adding the node back into the cluster. An option now exists in iManager to automate the process for re-adding a node to a cluster.

1 If necessary, install NetWare, including the latest Service Pack on the server using the same node name and IP address.

2 In Roles and Tasks, select *Clusters*, then click the *Cluster Options* link.

3 Type the cluster name or browse and select it, then click the *Repair* button under the cluster name.

This will automatically configure Novell Cluster Services on the server. This lets you keep the existing cluster nodes running and in the cluster while reinstalling a failed cluster node.

4 After clicking the *Repair* button to automatically configure Novell Cluster Services on the new cluster node, copy the `ldncs.ncf` and `uldncs.ncf` files from the `sys:\system` directory on one of the other cluster servers to the sys:\system directory of the new cluster server.

7.5 Cluster-Enabled Volume Connection Is Required for Some Utilities

Because Novell Cluster Services uses eDirectory™ to find objects and resolve names, you must first establish a client connection to a cluster-enabled volume for it to be visible to certain utilities.

Do this by browsing to and selecting the eDirectory Volume object using Windows Explorer.

7.6 Some Applications Do Not Fail Over

Although all NetWare 6.5 applications will run on a cluster node, not all applications are capable of being configured as a cluster application and failed over to a new node.

7.7 Starting and Stopping Novell Cluster Services

Novell Cluster Services starts automatically by default after it is installed and on server reboot.

To manually start Novell Cluster Services:

1 At the server console, enter

    ldncs

To stop Novell Cluster Services:

1 At the server console, enter

    uldncs

7.8 Preventing Cascading Failovers

Cascading failover occurs when a bad cluster resource causes a server to fail, then fails over to another server causing it to fail, and then continues failing over to and bringing down additional cluster servers until possibly all servers in the cluster have failed.

Novell Cluster Services now incorporates functionality that detects if a node has failed because of a bad cluster resource and prevents that bad resource from failing over to other servers in the cluster.

This functionality is enabled by default when you install Novell Cluster Services. Cascading failover prevention can be disabled by adding the /hmo=off parameter to the `clstrlib` command in the `sys:\system\ldncs.ncf` file.

After adding the parameter, the line should appear as follows:

`clstrlib /hmo=off`

If you disable cascading failover prevention on one cluster server, you must do it on all servers in the cluster.

You must manually unload and reload Novell Cluster Services software on every cluster server in order for this change to take effect. To do this, use the `uldncs` command to unload cluster software and the `ldncs` command to reload cluster software.

Resource Quarantine

If cascading failover protection is enabled, a resource might be put into quarantine if it causes server abends for a three-day period. If Novell Cluster Services software determines that the resource is likely responsible for abends, and loading the resource will put the cluster in grave danger, it will cause the resource to go into a comatose state (quarantine it) rather than letting it load on (and potentially cause to fail) other cluster nodes.

The resource can still be manually brought online and manually migrated to other cluster nodes. To get the resource out of quarantine, you can disable cascading failover prevention. Cascading failover prevention can then be re-enabled by removing the `clstrlib /hmo=off` line from the `sys:\system\ldncs.ncf` file, then unloading and reloading Novell Cluster Services software.

Novell Cluster Services does the following to determine if a resource should be put into quarantine:

1. Traces back the history of node failures for the suspected bad resource. This includes

   ◆ What node the resource was running or loading on.

   ◆ If the node failed.

   ◆ The state the resource was in when the node failed.

   ◆ If there were other resources trying to load when the node failed.

2. Repeats the above process until one of the following happens

   ◆ The end of the cluster log file is reached

   ◆ Enough node failures are found

   ◆ Found that the node did not fail

   ◆ The entries in the log file are more than three days old

If the resource attempts to load on a node where it was previously loaded and there are additional nodes still available in the cluster, it will not be quarantined and will be allowed to load. Also, a resource is not quarantined when it is initially brought online.

Factors that might contribute to a resource being quarantined include:

◆ A large number of node failures

◆ No other resources are causing node failures

◆ The resource never reaches a running state

Factors that might help prevent a resource from being quarantined include:

◆ A small number of node failures

◆ Other resources are causing node failures

◆ The resource reaches a running state

◆ There is one node left up and running in the cluster

Resource quarantine is disabled if

◆ Cascading failover prevention is turned off.

   This is done by adding the /hmo=off parameter to the `clstrlib` command in the `sys:\system\ldncs.ncf` file.

◆ There is no shared storage (SAN) or SBD partition

◆ There are enough nodes in the cluster to form a quorum

7.9 Cluster Maintenance Mode

Cluster maintenance mode lets you temporarily suspend the cluster heartbeat while hardware maintenance is being performed. This is useful if you want to reset or power down the LAN switch without bringing down cluster servers. See Appendix A, "Console Commands for Novell Cluster Services," on page 69 for more information.

If the master server in the cluster goes down while the cluster is in cluster maintenance mode, you must enter `cluster maintenance off` on all remaining cluster servers to bring the cluster out of maintenance mode. This is only necessary if the master server in the cluster goes down. If the master server in the cluster is up, you can enter `cluster maintenance off` on one server in the cluster to bring the entire cluster out of maintenance mode.

7.10 Unload Cluster Services Software When Servicing Shared Storage

If you need to power down or recycle your shared storage system, you must unload Cluster Services software prior to doing so. You can unload the software using the `uldncs` command at the server console of each cluster server.

7.11 Displaying Bound Virtual IP Addresses

To verify that a virtual IP address is bound, enter `display secondary ipaddress` at the server console of the cluster server where the virtual IP address is assigned. This will display all bound virtual IP addresses. A maximum of 256 virtual IP addresses can be bound.

7.12 Customizing Cluster Services Management

Some portions of Novell Cluster Services management can be performed and customized using virtual XML files that exist on the `_admin` volume. These files are created automatically on each server when cma.nlm is loaded. See Managing Novell Cluster Services Through XML (http://developer.novell.com/ndk/doc/cluster/ncss_enu/data/bs5dd3i.html) for more information on virtual files and the _admin volume.

The cluster-related virtual XML files (management access points) are created on each server's `_admin` volume and on the `_admin` volume of the cluster's virtual NCP™ server when `cma.nlm` is loaded. These files let you manage the cluster from any node in the cluster and also from the cluster's virtual NCP server (which is dynamically created on the current master node in the cluster). Using the cluster's virtual NCP server ensures cluster management is possible regardless of which physical servers happen to be available at the time. This means that as long as the cluster is running, you can always access the cluster-related XML virtual files in the `\\cluster\_admin\manage_cluster` directory.

There are two types of virtual files in the `_admin:\manage_cluster` directory, XML files and CMD files. The XML files are read-only and contain cluster configuration or cluster state information. The CMD files are write-then-read command files that are used to issue commands to the cluster and retrieve resulting status.

A customizable PERL script named cluster.pl is included with NetWare 6.5 and is located in the sys:perl\scripts directory. This script can be used with node.cmd, cluster.cmd, and resource.cmd to perform custom cluster management. See Using Command Line Perl to Manage Cluster Services (http://developer.novell.com/ndk/doc/cluster/ncss_enu/data/bp8fopd.html) for more information on creating and using PERL scripts with NetWare.

The following table lists the cluster-related virtual XML files and gives a brief description of each.

Table 7-2   *Cluster-Related Virtual XML Files*

Virtual XML Filename	Description
Config.xml	Provides the combined information from ClusterConfig.xml, NodeConfig.xml, ResourceConfig.xml, and PoolConfig.xml.
ClusterConfig.xml	Provides cluster configuration information.
NodeConfig.xml	Provides node configuration information for all nodes in the cluster that were active at the time the cluster was brought up.
ResourceConfig.xml	Provides resource configuration information for each resource in the cluster.
PoolConfig.xml	Provides cluster-enabled pool and volume configuration information for each pool and volume.
State.xml	Provides the combined information from NodeState.xml, ResourceState.xml, and PoolState.xml.
NodeState.xml	Provides current information on the state of each node in the cluster (cluster membership).
ResourceState.xml	Provides current information on the state of each resource in the cluster.
PoolState.xml	Provides current information on the state of each cluster-enabled pool in the cluster.
Node.cmd	Write-then-read command file used in conjunction with a PERL script to issue node-specific commands to the cluster and retrieve resulting node status and configuration information.
Cluster.cmd	Write-then-read command file used in conjunction with a PERL script to issue cluster-specific commands to the cluster and retrieve resulting cluster status and configuration information.
Resource.cmd	Write-then-read command file used in conjunction with a PERL script to issue resource-specific commands to the cluster and retrieve resulting resource status and configuration information.

7.13 Renaming a Pool and Pool Cluster Resource

When a cluster-enabled pool is used as a Novell Cluster Services cluster resource, special steps must be followed if you decide to rename the pool.

1 Offline the pool cluster resource.

2 Activate the pool by using iManager or NSSMU.

3 Rename the pool.

After the rename, the pool is in a deactive state.

4 Online the pool cluster resource.

Novell Cluster Services automatically updates the pool resource load and unload scripts to reflect the name change. Also, NSS automatically changes the Pool Resource object name in eDirectory.

Troubleshooting Novell Cluster Services

8

This section describes known issues for managing Novell® Cluster Services™.

8.1 Cluster Resource Goes Comatose Immediately After Migration or Failover

When SLP is not installed and running on a cluster node, any cluster resource that contains the `bind` command goes comatose when it is migrated or failed over to the node because the bind cannot be executed without SLP.

For information, see "SLP" on page 22.

8.2 Device Name Is Required to Create a Cluster Partition

If you are planning to work with shared-disk NSS pools and volumes, you must install a shared-disk cluster by entering a device name for the cluster Split Brain Detector (SBD) partition at cluster creation (new cluster) time. If you don't enter a device name, you won't be able to cluster-enable NSS Pools.

8.3 Problem Deleting a Cluster Resource or Clustered Pool

If you attempt to delete a cluster resource or clustered pool without first offlining the cluster resource, deletion errors occur, and the data associated with the clustered pool is not recoverable.

To avoid this problem, offline the cluster resource before attempting to delete either the cluster resource or the clustered pool.

Console Commands for Novell Cluster Services

Novell® Cluster Services™ provides several server console commands to help you perform certain cluster-related tasks. Table A-1 lists the cluster-related server console commands and gives a brief description of each command.

To execute a cluster console command, enter `cluster` followed by the command. For example, if you want to display cluster statistics, enter `cluster stats display` at the server console. You can also enter `help cluster` at the console prompt to get information on the commands and their functions.

The functions of many of the commands can also be performed using iManager. See the other sections of this document for additional information.

Table A-1 *Cluster Console Commands*

Cluster Console Command	Description
`ALERT` {resource}{YES|NO}	The resource start, failover, or failback mode is set to manual and the resource is waiting to start on a node, or fail over or fail back to another node. Specify the resource name in the command and use the YES or NO switch to specify whether you want the resource to fail over, fail back, or start.
`CLUSTER SCAN FOR NEW DEVICES`	Equivalent of running scan all, scan for new devices, and scan for new partitions on 0xffff on every node in the cluster. Running this command will cause the cluster to discover new LUNs, devices, and partitions on shared media.
`CVB REBUILD`	Causes Cluster Services to disregard the current Cluster Volume Broker (CVB) database. Rebuilds the CVB database to allow the use of duplicate pool names.
`CVSBIND` {ADD, DEL}{resource}{IP address}	Enables applications that rely on the bindery or bindery emulation to access a virtual server on the cluster. Specify the virtual server name for the cluster resource and the IP address for the virtual server. Use the ADD or DEL switch to enable or disable bindery access to the virtual server.
`DHCP` {context}	Specifies the eDirectory context where DHCP configuration information is stored. This command is useful if you have problems getting DHCP to function properly on a cluster.
`DOWN`	Removes all cluster nodes from the cluster. Has the same effect as executing the CLUSTER LEAVE command on every server in the cluster.

Cluster Console Command	Description
JOIN	Adds the node where the command is executed to the cluster and makes the node visible to other servers in the cluster. Cluster Services software must already be installed on a node for it to join the cluster.
LEAVE	Removes the node where the command is executed from the cluster. The node will not be visible to other servers in the cluster.
MAINTENANCE {ON/OFF}	Turning this switch on lets you temporarily suspend the cluster heartbeat while hardware maintenance is being performed. This is useful if you want to reset or power down the LAN switch without bringing the cluster servers down. Turning this switch on from one cluster server puts the entire cluster in maintenance mode.
MIGRATE {resource}{node name}	Migrates the specified resource from the node where it is currently running to the node you specify in the command. The node you migrate the resource to must be running in the cluster and also be in the resource's assigned nodes list.
OFFLINE {resource}	Unloads the specified resource from the node where it is currently running.
ONLINE {resource}{node name}	Starts the specified resource on the most preferred node that is currently active. You can start the resource on a different node by specifying that node in the command.
POOLS	Lists the NSS pools on the shared disk system that are accessible by Novell Cluster Services.
RESOURCES	Lists all resources that currently exist in the cluster. The resources do not need to be online or running.
RESTART {seconds}	Restarts Cluster Services software on all servers in the cluster.
STATS {Display, Clear}	Reports the node number, node name, and heartbeat information. You must switch to the log console screen to see cluster statistics.
STATUS {resource}	Reports the status of the specified resource. This includes the number of times the resource has been migrated or failed over to another server, the resource state, and the node where the resource is currently running.
VIEW	Displays the node name, cluster epoch number, master node name, and a list of nodes that are currently members of the cluster.

Documentation Updates

This section contains information about documentation content changes made to the *Novell Cluster Services 1.8.5 for NetWare Administration Guide* since the initial 1.8.5 release for Novell® NetWare® 6.5 SP7. If you are an existing user, review the change entries to readily identify modified content. If you are a new user, simply read the guide in its current state.

Refer to the publication date, which appears on the title page, to determine the release date of this guide. For the most recent version of the *Novell Cluster Services 1.8.5 for Linux Administration Guide,* see the Clustering/High Availability Documentation Web site (http://www.novell.com/documentation/nw65/cluster-services.html).

In this section, content changes appear in reverse chronological order, according to the publication date. Within a dated entry, changes are grouped by chapter, and sequenced alphabetically. Each change entry provides a link to the related topic and a brief description of the change.

This document was updated on the following dates:

- Section B.1, "December 14, 2009," on page 71
- Section B.2, "November 9, 2009," on page 71
- Section B.3, "May 6, 2009," on page 72
- Section B.4, "March 3, 2009," on page 72
- Section B.5, "February 3, 2009," on page 72
- Section B.6, "December 2008 (NetWare 6.5 SP8)," on page 73

B.1 December 14, 2009

Updates were made to the following section. The changes are explained below.

- Section B.1.1, "Managing Novell Cluster Services Clusters," on page 71

B.1.1 Managing Novell Cluster Services Clusters

Location	Change
"Renaming a Pool and Pool Cluster Resource" on page 64	This section is new.

B.2 November 9, 2009

This guide has been modified for publication on the NetWare 6.5 SP8 Documentation Web site.

B.3 May 6, 2009

Updates were made to the following section. The changes are explained below.

◆ Section B.3.1, "Installation and Setup," on page 72

B.3.1 Installation and Setup

Location	Change
"Creating Shared NSS Pools" on page 30	You can specify a different name for the Novell CIFS Server only when you create the share. User the CIFS iManager plug-in to manage the name of existing CIFS shares.
"Configuring Unload Scripts" on page 38	The following sentence in Step 11d was modified for clarification: If the script does not complete within the specified time, the resource becomes comatose when migrating to another node.
"Setting Start, Failover, and Failback Modes" on page 38	The following statement was added for clarification. There is no behavior change. **IMPORTANT:** Cluster Services works with NCP user connections so that the user data sessions are resumed after failover. However, non-NCP users might experience service interruption and need to reconnect to the server after the failover. Applications using server based storage must be restarted on the new node even with NCP unless they are NCP reconnect aware.

B.4 March 3, 2009

Updates were made to the following section. The changes are explained below.

◆ Section B.4.1, "Configuring Cluster Policies and Priorities," on page 72

B.4.1 Configuring Cluster Policies and Priorities

Location	Change
"Configuring Cluster E-Mail Notification" on page 51	After reloading `cma.npm` on a node, a cluster join is required for the changes to take effect.

B.5 February 3, 2009

Updates were made to the following sections. The changes are explained below.

◆ Section B.5.1, "Installing Novell Cluster Services on OES 2 Linux," on page 73

B.5.1 Installing Novell Cluster Services on OES 2 Linux

Location	Change
"Novell iManager 2.7.2" on page 20	Added information about changes to the storage-related plug-ins for OES 2 SP1 NetWare (same as NetWare 6.5 SP8). Added the following note: **NOTE:** A February 3, 2009 update to the Clusters plug-in for OES 2 SP1 Linux is available that can be used to manage the Novell Business Continuity Clustering (BCC) 1.1 SP2 for NetWare® 6.5 SP8 (same as OES 2 SP1 NetWare) and Novell Business Continuity Clustering 1.2 for OES 2 SP1 Linux. You can download the update from the Novell Downloads Web site (http://download.novell.com/).

B.6 December 2008 (NetWare 6.5 SP8)

Updates were made to the following sections. The changes are explained below.

- Section B.6.1, "Configuring Novell Cluster Services in a Virtualization Environment," on page 73
- Section B.6.2, "Console Commands for Novell Cluster Services," on page 73
- Section B.6.3, "Installation and Setup," on page 73
- Section B.6.4, "Troubleshooting Novell Cluster Services," on page 74
- Section B.6.5, "Upgrading NetWare Clusters," on page 74
- Section B.6.6, "What's New for Novell Cluster Services," on page 74

B.6.1 Configuring Novell Cluster Services in a Virtualization Environment

This section is new.

B.6.2 Console Commands for Novell Cluster Services

This information was relocated from "Managing Novell Cluster Services Clusters".

B.6.3 Installation and Setup

Location	Change
Section 3.1, "Requirements for Novell Cluster Services," on page 19	Reorganized requirements under this topic.
Section 3.1.1, "Hardware Requirements," on page 19	Added an advisory about using similar hardware on each cluster.

Location	Change
Section 3.1.3, "Configuration Requirements," on page 22	This section is new. Information was reorganized from "Software Requirements".
Section 3.1.4, "Shared Disk System Requirements," on page 24	Changed SBD partition size from 15 MB to 20 MB. If you added new disks to the server that you want to use during the install, make sure to initialize them before you begin the install.
Section 3.3.2, "Preparing a Shared Device for the SBD," on page 25	This section is new.
Section 3.3.3, "Running Novell Deployment Manager," on page 26	This section is new. Information was reorganized from "Running the Installation Program".
Section 3.3.4, "Running the Installation Program," on page 26	If the disk where you plan to create the cluster partition is not on list, you must abort the installation, initialize the disk, then run the installation program again.

B.6.4 Troubleshooting Novell Cluster Services

This section is new.

B.6.5 Upgrading NetWare Clusters

This information was relocated from "Installation and Setup".

Location	Change
Section 4.1, "Converting NetWare Clusters to Linux," on page 41	This section is new.

B.6.6 What's New for Novell Cluster Services

Location	Change
Section 2.1, "What's New (NetWare 6.5 SP8)," on page 17	This section is new.