Novell
Cluster Services

1.6

RESOURCE CONFIGURATION GUIDE

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Contents

Introduction to Resource Configuration

Before running any application on servers in a NetWare Cluster Services cluster, the application must be installed and configured properly to take advantage of shared storage and to achieve high availability. This document provides information to help you set up and configure some of the applications commonly used in a NetWare 5 environment. See the NetWare Cluster Services Overview and Installation documentation for cluster installation and configuration, and your application documentation for specific application installation and setup instructions.

Documentation Conventions

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

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1 Tomcat and Novell Cluster Services

Tomcat is a JSP-supported servlet engine that, by default, is installed with NetWare® 6. Tomcat runs on a Web server and compiles JSP (Java* Server Page) files whose output is HTML code when displayed in a browser.

If your Web server is running Tomcat in a clustered environment, some addtional configuration is required.

This documentation assumes that you already have Novell® Cluster Services™ installed and running on your network. For more information on Novell Cluster Services, see the *Novell Cluster Services Overview and Installation Guide* (http://www.novell.com/documentation/lg/ncs6p/index.html).

Configuring Tomcat

1 Locate the class files that are required to run your Web site, and then copy these files to the same directory on each Web server in the cluster.

This directory can be anywhere that you choose. For example:

SYS:*Your_Web_Site_Name*

2 Choose any Web server in the cluster and edit the SYS:\TOMCAT\33\BIN\TOMCAT33.NCF file by adding a new line to the -classpath parameter. This new line should point to the directory where you copied your class files in Step 1.

For example:

envset TOMCAT CLASSPATH=$TOMCAT CLASSPATH; SYS:*Your_ Web_Site_Name*

3 Copy the edited .NCF file (from Step 2) to the SYS:\TOMCAT\33\BIN directory of *every* Web server in the cluster.

4 Create an NWAPPS-*any_name*.XML file in the SYS:\TOMCAT\33\CONF directory of any Web server in the cluster, and then put the path to your Web site in this file.

> **HINT:** This path sets the Tomcat context. Tomcat will service only those requests that originate at or below this context.

For example, if you put all of your Web and JSP files in the same directory, which you called SYS:*Your_Web_Site_Name*, you would enter a slash for the Context path and **SYS:*Your_Web_Site_Name*** for the docBase.

The context path is the path that you need in order to access your Web files from a browser and the docBase is the path that you need in order to access the Web files on your hard drive.

To see an example of what this XML file should contain, go to the CONF directory of your NetWare 6 server, and then open the APPS-EXAMPLE.XML file. If you need more explanation of how to use the elements in the example .XML file, see the FAQ document located in the SYS:\TOMCAT\33\DOC directory.

5 Copy the .XML file (from Step 4) to the SYS:\TOMCAT\33\CONF directory of *every* Web server in the cluster.

6 At the server console of *every* Web server in the cluster, enter **tomcat33 -stop** to stop the Tomcat service.

7 Wait approximately 15 seconds for the cleanup operations to finish.

8 At the server console of *every* Web server in the cluster, enter **tomcat33** to restart the Tomcat service.

Tomcat is now configured to run with Novell Cluster Services.

2 Apache with Novell Cluster Services

There are obvious advantages to clustering your Apache Web servers. Not only will your customers appreciate the high availability of your Web content, but they will also no longer bear the brunt of a Web server failing or going down for maintenance. With Novell Cluster Services™, if your Web server fails, you can use any of the servers in the cluster to host your Web site, which results in virtually zero down-time for your customers.

Before Apache and Novell Cluster Services can work together, there is additional configuration that needs to take place when you are installing and configuring both Novell Cluster Services *and* Apache.

Apache Configuration

When you install NetWare® 6, Apache is installed by default. There is one exception to this rule: if you select the Pre-Migration server option while installing Netware 6, Apache is *not* installed by default.

Novell Cluster Services Configuration and Setup

1 Create an NSS pool or use an existing pool.

For more information on creating pools, see *Novell Cluster Services Overview and Installation Guide* (http://www.novell.com/documentation/lg/ncs6p/index.html).

2 Create an NSS volume on a pool.

If a pool already exists, make sure there is enough space on the pool for the NSS volume that you plan to make.

For more information on creating NSS volumes, see *Novell Cluster Services Overview and Installation Guide* (http://www.novell.com/documentation/lg/ncs6p/index.html).

3 Cluster enable the pool you created in Step 2.

Cluster enabling the pool automatically custer enables the NSS volume that you created on the pool.

When you cluster enable a pool, this allows you to access the cluster enabled volumes through a NetWare client. This step involves assigning an IP address. Remember this IP address because you will need it later in the configuration.

For more information, see *Novell Cluster Services Overview and Installation Guide* (http://www.novell.com/documentation/lg/ncs6p/index.html) > Installation and Setup > Setting Up Cluster Services.

4 Put your Web content on the cluster-enabled volumes that you enabled in in Step 3.

5 Choose a server in the cluster and edit the HTTPD.CONF file, located in the SYS:\APACHE\CONF directory.

Make the following two modifications to the HTTPD.CONF file:

- Set the value of the ServerRoot parameter to the directory where you placed your Web content in Step 4. (The default value of this parameter is SYS:\APACHE.)

    For example, if you placed your Web content in SYS:/Apache, the ServerRoot parameter would look like this:

    ServerRoot "SYS:\APACHE"

- Uncomment the Listen parameter, and then add the IP address that you assigned to your cluster-enabled volumes in Step 3 to that parameter.

6 Copy the edited HTTPD. CONF file to the SYS:\APACHE\CONF directory on *every* server in the cluster.

3 Configuring NetWare Enterprise Web Server with Novell Cluster Services

NetWare Enterprise Web Server Installation and Configuration

Before configuring NetWare® Enterprise Web Server with Novell® Cluster Services™, NetWare Enterprise Web Server must be installed on each server in your cluster that will run it. See the NetWare Enterprise Web Server documentation for specific installation and setup instructions. In addition, the following NetWare Enterprise Web Server installation and configuration requirements must be met:

- The same administrator port number and password must be used on all servers in the cluster you install to.

- The default primary IP address (provided in the installation program for each server) must be used.

  A secondary floating IP address is added after the installation.

- It is possible to configure NetWare Enterprise Web Server with no shared storage, but a shared disk system is recommended for all Web site-related information. Cluster enabling shared volumes is not recommended and not necessary for NetWare Enterprise Web Server to function with Novell Cluster Services.

- Running NetWare Enterprise Web Server in the ACTIVE/ACTIVE mode is the recommended configuration because it provides faster recovery after a failure. ACTIVE/ACTIVE mode signifies that NetWare Enterprise Web Server is running simultaneously on multiple servers in the cluster. When a Web server fails, the Web sites on that server fail over to other Web servers in the cluster. Only the Web sites move in ACTIVE/ACTIVE mode.

Although not recommended, NetWare Enterprise Web Server can also be run in ACTIVE/PASSIVE mode. ACTIVE/PASSIVE mode signifies that NetWare Enterprise Web Server runs on only one node at a time in the cluster. When a Web server fails, NetWare Enterprise Web Server starts on other specified nodes in the cluster, and the Web sites that were on the failed server fail over to other nodes in the cluster. This makes ACTIVE/PASSIVE mode slower because NetWare Enterprise Web Server has to load on other servers in the cluster before Web sites can fail over.

Novell Cluster Services Configuration and Setup

Once NetWare Enterprise Web Server is installed, you must create and configure a Web site resource in Novell Cluster Services for each Web site that will run on NetWare Enterprise Web Server. This includes configuring load and unload scripts; setting Start, Failover, and Failback modes; and assigning the Web site resource to specific nodes in your cluster.

Creating a Web Server Cluster Resource

Novell Cluster Services includes a NetWare Enterprise Web Server resource template, which greatly simplifies the process for creating a Web site cluster resource. Much of the Web site cluster resource configuration is perfomed automatically by the resource template.

To create a Web site cluster resource:

1 In ConsoleOne™, browse to and select the Cluster object.

2 Click File > New > Cluster > Cluster Resource.

3 Enter a name for the Web site cluster resource.

4 Enter the Netscape Enterprise Server template name in the Inherit From Template field, or browse and select it from the list.

5 Click Create.

The Netscape Enterprise Server resource template configures the Web site resource by automatically creating load and unload scripts, setting Start, Failover and Failback modes and assigning the Web site as a resource to all nodes in the cluster.

After creating a Web site resource, view or edit the resource to ensure it is configured correctly.

Configuring Web Site Load and Unload Scripts

The Netscape Enterprise Server resource template automatically creates a load and unload script to start and stop the Web site on servers in your cluster. The load and unload scripts both contain commands that you must customize for your specific Web server configuration.

To customize the NetWare Enterprise Web Server load and unload scripts:

1 In ConsoleOne, right-click the Web site Cluster Resource object you created and and select Properties.

2 Click the Scripts tab on the property page and view Cluster Resource load and unload scripts.

The load script should appear as follows (without the comments):

```
nss /poolactivate=POOL

mount VOL

add secondary ipaddress A.B.C.D

nsweb
```

The unload script should appear as follows (without the comments):

```
nswebdn

nss /pooldeactivate=POOL /override=question

del secondary ipaddress A.B.C.D
```

3 In both scripts, edit the IP address, pool-specific and volume-specific commands, and the commands to start and stop NetWare Enterprise Web server.

For example, edit the following lines in the load script:

```
nss /poolactivate=POOL

mount VOL

add secondary ipaddress A.B.C.D

nsweb
```

Replace POOL with the name of the NSS pool on the shared disk system where the Web server volume resides.

Replace VOL with the name of the Web server volume.

Replace A.B.C.D. with the IP address that you want to assign to the Web site resource.

If you plan on running your Web server in ACTIVE/ACTIVE mode, remove the NSWEB line from the load script and the NSWEBDN line from the unload script. In ACTIVE/ACTIVE mode, NSWEB is loaded automatically from the AUTOEXEC.NCF file of each server. If you plan to run your Web server in ACTIVE/PASSIVE mode remove the NSWEB line from the AUTOEXEC.NCF file of every server where NetWare Enterprise Web Server is installed.

Setting Web Server Start, Failover, and Failback Modes

The Netscape Enterprise Server resource template sets the Web site resource Start Mode and Failover Mode to AUTO and the Failback Mode to DISABLE.

If the Web site resource Start Mode is set to AUTO, the Web site automatically starts on a designated server when the cluster is first brought up. If the Web site Start Mode is set to MANUAL, you can manually start the Web site on a specific server when you want, instead of having it automatically start when servers in the cluster are brought up.

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

If the Web site Failback Mode is set to DISABLE, the Web site continues running in an online state on the node it has failed to. If the Web site Failback Mode is set to AUTO, the Web site automatically moves back to its preferred node when the preferred node is brought back online. Set the Web site Failback Mode to MANUAL to prevent the Web site from moving back to its preferred node when that node is brought back online, until you are ready to allow it to happen.

To view or change Web site Start, Failover, and Failback modes, do the following:

1 In ConsoleOne, right-click the Netscape Enterprise Server Resource object and select Properties.

2 Click the Policies tab on the property page.

3 View or change the Start, Failover, or Failback mode for the Web site.

View or Edit Web Server Resource Node Assignments

The Netscape Enterprise Server resource template automatically assigns the Web site resource to all nodes in the cluster. The order of assignment is the order the nodes appear in the resource list. To view or edit Web site resource node assignments or change the Web site failover order:

1 In ConsoleOne, right-click the Netscape Enterprise Server Resource object and select Properties.

2 Click the Nodes tab on the Netscape Enterprise Server resource property page.

3 View the current Web site resource node assignments and, if necessary, click the right or left arrow button to assign or unassign nodes to the Web site resource.

You can also click the up or down arrow button to change the failover order of the nodes assigned to the Web site.

Hardware Virtual Server Installation and Configuration

If your cluster includes a shared disk system, each server that will run NetWare Enterprise Web Server must have the Hardware Virtual Server configured.

Configuring the Hardware Virtual Server for ACTIVE/ACTIVE Mode

To configure the Hardware Virtual Server for ACTIVE/ACTIVE mode complete the following steps on one server:

1 Start NetWare Web Manager by entering the server's IP address and the NetWare Web Manager port number on the URL line of your Web browser.

The port number for NetWare Web Manager is 2200. So, for example, if the server IP address is 123.45.67.200, you would enter

```
123.45.67.200:2200
```

2 Click a server under the NetWare Enterprise Web Server section.

You might be prompted to log in to the server. If so, log in as a user with administrative rights.

3 In the left column, click the Network Settings link and change the Bind to Address to the IP address and port number of the NetWare Enterprise Web server. Then click OK to save the changes.

4 Click the Content Management button on the button bar at the top of the Web page and change the Primary Directory to the volume on the shared storage system where your Web site will reside. Then click OK to save the changes.

5 In the left column, click the Hardware Virtual Servers link and enter the IP address that will be the dedicated IP address for the Web site.

The dedicated IP address is assigned to the Web site and will move with the Web site to specified servers in the cluster during failover and failback.

6 Enter the Document root using the syntax *vol1:/webroot*, and click OK.

Replace *vol1* with the name of the shared disk volume and *webroot* with the path to the top directory where Web content is located. Be sure to use a forward slash (/) in the syntax instead of a backslash (\).

After configuring the Hardware Virtual Server on one server, some additional configuration is necessary for NetWare Enterprise Web Server to function properly in ACTIVE/ACTIVE mode on each Web server in the cluster.

1 Copy the NOVONYX directory from the server you just configured to the root of SYS: on all other servers in the cluster where NetWare Enterprise Web Server is installed.

2 Add the following lines to the SYS:SYSTEM\NVXWEBUP.NCF file of one Web server:

```
SET ALLOW IP ADDRESS DUPLICATES=ON
ADD SECONDARY IPADDRESS A.B.C.D NOARP
NSS /POOLACTIVATE=POOL
MOUNT VOL
LOAD NSHTTPD -D /NOVONYX/SUITESPOT/HTTPS-CT-NODE1/
  CONFIG
LOAD DELAY.NLM
DELAY 10
NSS /POOLDEACTIVATE=POOL /OVERRIDE=QUESTION
DEL SECONDAY IPADDRESS A.B.C.D
SET ALLOW IP ADDRESS DUPLICATES=OFF
```

Replace A.B.C.D with the IP address you will assign to the Web site. Because each Web site requires its own IP address, you need to repeat the Add and Delete Secondary IP address lines for each Web site hosted on the NetWare Enterprise Web server. Replace POOL with the name of the NSS pool on the shared disk system where the Web server volume resides. Replace VOL with the name of the Web server volume.

The NOARP command at the end of the ADD SECONDARY IPADDRESS line is a new TCP command line option that is available in NetWare 6 or later and NetWare 5.1 Support Pack 4 or later.

NOARP allows the IP address to be bound, but does not send an ARP packet to the network. This prevents Web clients from attempting to reconnect to the wrong server after a server failure and recovery.

The LOAD NSHTTPD line might already be present in the NVXWEBUP.NCF file. DELAY.NLM provides sufficient time for the Netscape daemon to load before the secondary IP addresses are deleted. The delay time required to properly load the Web Server varies according to hardware and server setup. Delay time should be altered to allow the Web Server to load properly.

3 Copy the NVXWEBUP.NCF file to the SYS:SYSTEM directory of the other servers.

4 Run NSWEB.NCF to start NetWare Enterprise Web Server on each server in the cluster that will run the Web server.

You can also reboot each server to have NSWEB.NCF automatically execute from each server's AUTOEXEC.NCF file.

Configuring the Hardware Virtual Server for ACTIVE/PASSIVE Mode

To configure the Hardware Virtual Server for ACTIVE/PASSIVE mode, complete the following steps on each NetWare Enterprise Web server:

1 Start NetWare Web Manager by entering the server's IP address and the NetWare Web Manager port number on the URL line of your Web browser.

The port number for NetWare Web Manager is 2200. So for example, if the server IP address is 123.45.67.200, you would enter

```
123.45.67.200:2200
```

2 Click on a server under the NetWare Enterprise Web Server section.

You might be prompted to log in to the server. If so, log in as a user with administrative rights.

3 In the left column, click the Network Settings link and change the Bind to Address to the IP address and port number of the NetWare Enterprise Web server. Then click OK to save the changes.

4 Click the Content Management button on the button bar at the top of the Web page and change the Primary Directory to the volume on the shared storage system where your Web site will reside. Then click OK to save the changes.

5 In the left column, click the Hardware Virtual Servers link and enter the IP address that will be the dedicated IP address for the Web site.

The dedicated IP address is assigned to the Web site and will move with the Web site to specified servers in the cluster during failover and failback.

6 Enter the Document root using the syntax *vol1:/webroot*, and click OK.

Replace *vol1* with the name of the shared disk volume and *webtoot* with the path to the top directory where Web content is located. Be sure to use a forward slash (/) in the syntax instead of a backslash (\).

After installing NetWare Enterprise Server on specified servers in the cluster and configuring it to work with a shared disk system, you must add lines to the NVXWEBUP.NCF file of each Netscape Enterprise server in the cluster. These lines provide a workaround for a known Netscape Enterprise Server problem. Add the following lines to the NVXWEBUP.NCF file of all servers that will be running the WebServer:

```
SET ALLOW IP ADDRESS DUPLICATES=ON
ADD SECONDARY IPADDRESS A.B.C.D
NSS /POOLACTIVATE=POOL
MOUNT VOL
LOAD NSHTTPD -D /NOVONYX/SUITESPOT/HTTPS-CT-NODE1/CONFIG
LOAD DELAY.NLM
DELAY 10
NSS /POOLDEACTIVATE=POOL /OVERRIDE=QUESTION
DEL SECONDAY IPADDRESS A.B.C.D
SET ALLOW IP ADDRESS DUPLICATES=OFF
```

Replace A.B.C.D with the IP address you will assign to the Web site. Because each Web site requires its own IP address, you need to repeat the Add and Delete Secondary IP address lines for each Web site hosted on the NetWare Enterprise Web server. Replace POOL with the name of the NSS pool on the

shared disk system where the Web server volume resides. Replace VOL with the name of the Web server volume.

The LOAD NSHTTPD line might already be present in the NVXWEBUP.NCF file. DELAY.NLM provides sufficient time for the Netscape daemon to load before the secondary IP addresses are deleted. The delay time required to properly load the Web Server varies according to hardware and server setup. Delay time should be altered to allow the Web Server to load properly.

To ensure NetWare Enterprise Web Server runs correctly in ACTIVE/ PASSIVE mode, remove the line that launches NSWEB.NCF from each server's AUTOEXEC.NCF file and make sure lines are added to the NetWare Enterprise Web Server load and unload scripts to start and stop the Web server.

4 Configuring NSS Mirroring with Novell Cluster Services

NSS mirroring is intended as a solution for remote mirroring in installations where disaster recovery is required. If you have a regular RAID drive array, we recommend using hardware-powered drive redundancy instead of NSS mirroring.

Hardware configuration and placement for NSS mirroring can vary depending on geography and fault tolerance requirements. For example, the following figure depicts a simple hardware configuration in which one side of the mirrored NSS volume is located in a separate building from the rest of the cluster hardware. Should a disaster occur in one building, data would still be safe on the mirrored NSS volume in the other building.

Figure 1   Single Cluster with Mirrored NSS Volumes in Separate Buildings
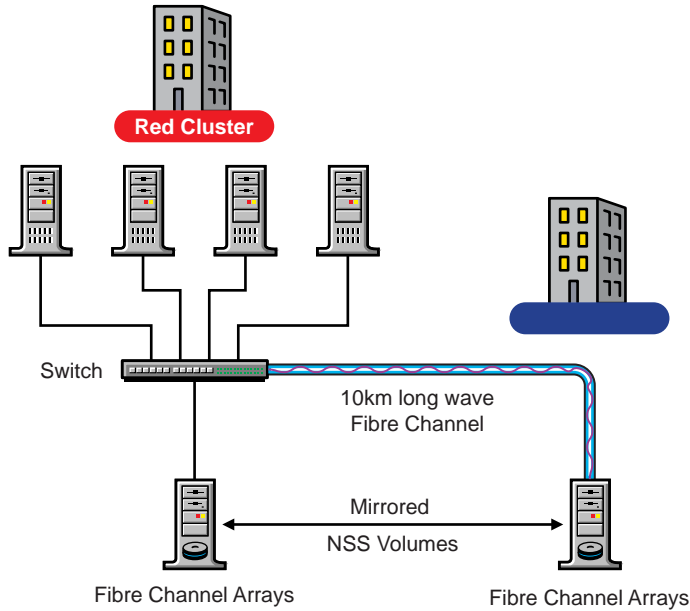
The following figure depicts a more complex hardware configuration in which two clusters are placed in separate buildings, but each has one side of a mirrored NSS volume in the building with the other cluster. Should a disaster occur in one building, data would still be safe and immediately accessible on the mirrored NSS volume in the other building.

Figure 2   Two Clusters with Mirrored NSS Volumes in Separate Buildings
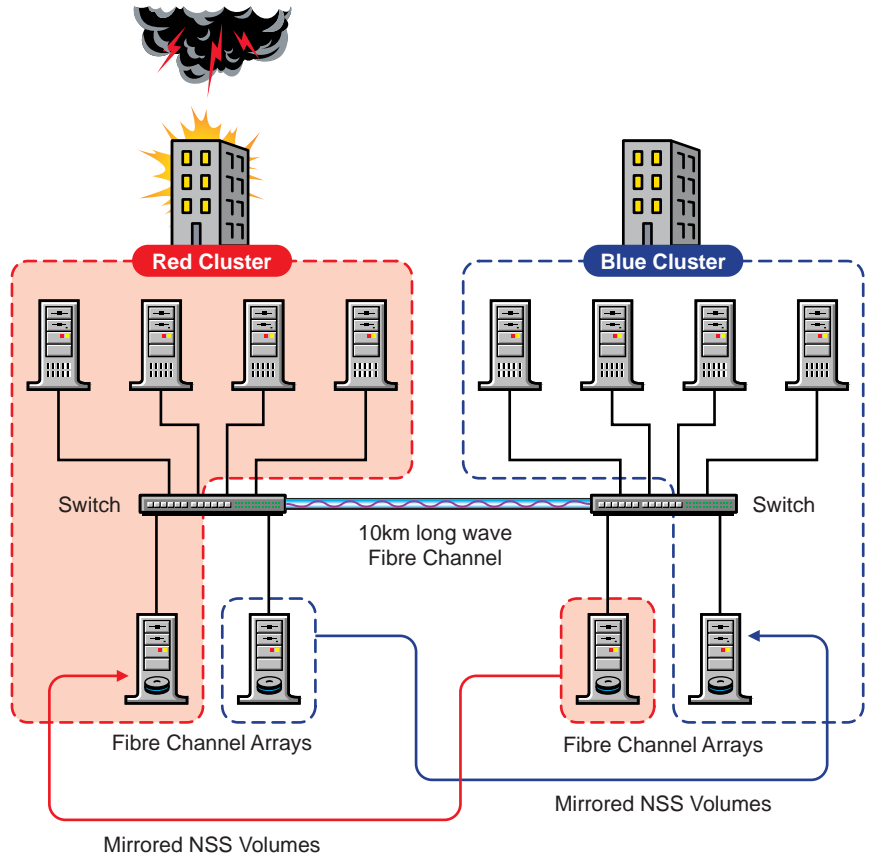
Configure NSS Mirroring

NSS partitions are by default enabled for mirroring (added to a mirror group) when they are created. If you have an existing partition that you chose not to add to a mirror group when you created it, you should back up the data on any volumes on the partition, delete and re-create the partition with mirroring enabled, and then restore the data to the NSS volumes. Consider the following recommendations before configuring NSS mirroring.

- Each server must have a unique ID which can be set with the MM ASSIGN SERVER ID = STRING command. We recommend using the cluster node name for the string.

◆ Mirrored NSS partitions can be active on only one server at a time. Cluster nodes assign and release ownership of mirrored NSS partitions, which is exactly the same as cluster nodes activating or deactivating non-mirrored NSS pools. This means any NSS pool created on a mirrored NSS partition can be active on only one node, which is the node that acquired ownership of the mirrored NSS partition that contains the pool.

Create and Mirror NSS Partitions on Shared Storage

NSS partitions should be mirrored at the time they are created. Prior to creating and mirroring NSS partitions on shared storage, ensure that you have

◆ NetWare 6 installed on all servers that will be part of the cluster

◆ All servers in the cluster connected to a shared storage system

◆ One or more drive arrays configured on the shared storage system

◆ At least 15 MB of free space on the shared storage system for a special cluster partition

All servers in the cluster must also have unique IDs assigned to them before you create and mirror NSS partitions. To assign server IDs, edit the STARTUP.NCF file on each server and add the following lines before any commands to load drivers:

```
mm assign server id=serverid
```

Replace *serverid* with the unique name you want to assign the server. The name has a maximum length of 16 characters. You might want to use the server name or a descriptive name like *ClusterNode 1, ClusterNode 2,* etc.

To create and mirror NSS partitions complete the following:

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

ConsoleOne runs faster on a client than on a server. From a NetWare® client, go to the SYS:PUBLIC\MGMT\CONSOLEONE\1.2\BIN directory on a server in the cluster and run CONSOLEONE.EXE.

We recommend running ConsoleOne from the server that is your primary NetWare connection.

2 In the left pane, right-click the Cluster object or the Server object of a server in the cluster and then click Properties.

3 On the Media tab, click Devices and then select the Device where you want to create the shared partition. Ensure the Sharable for Clustering check box is checked for the device.

If a device is marked as sharable, all partitions on that device will automatically be sharable.

If Cluster Services was previously installed and shared disk partitions were already created, the Partitions List field will include this information.

4 On the Media tab, click Partitions >New, and then select the device where you want to create the partition (the same device you selected in the previous step).

5 Specify the size of the partition.

On this screen you should also ensure NSS is selected as the partition type (this is the default) and ensure the Hot Fix™ and Mirror check boxes are checked and that Create New Mirror Group is selected.

Mirrored partitions must be compatible in data area size. This means the new partition must be at least the same size or slightly larger than the other partitions in the group. The physical size (combined data and Hot Fix size) of the partition must be at least 100 KB larger, but not more than 120 MB larger than the data size of the existing partitions in the mirror group.

6 To mirror the partition, click Mirror and select one of the following options:

- **Create New Mirror** This option means you are making the partition capable of being part of a mirror group. You do not actually create the group until you add another mirrored partition to the partition you are creating.

- **Existing Mirror Group** Displays a list of existing mirror groups that are compatible in data area size and lets you add this new partition to one of the mirror groups in the list. If you select this option you must also select the ID of the mirrored partition.

7 Click OK to create the NSS partition and add it to a mirror group.

Create an NSS Pool and Volumes

Once an NSS partition has been created and mirrored, you must create an NSS pool and volume on that partition. To do this, follow the instructions in "Create NSS Pools" in Installation and Setup chapter of the Novell Cluster Services Overview and Installation documentation.

Novell Cluster Services Configuration and Setup

After configuring NSS mirroring and creating a pool and volume on the mirrored NSS partition, cluster enable the NSS volume on the mirrored partition by following the instructions in the " Installation and Setup chapter of the Novell Cluster Services Overview and Installation documentation.

Edit Mirrored NSS Volume Load and Unload Scripts

When you cluster enable a shared disk volume, certain commands are automatically added to the volume load and unload scripts. For volumes on mirrored NSS partitions, an additional command is required for both the load and unload script.

To edit the NSS mirrored volume load and unload scripts:

1 In ConsoleOne, right-click the NSS volume resource object and select Properties.

2 Click the Load Script tab on the property page and add the following line at the beginning of the load script:

```
mm remirror shared pool poolname=ON
```

Replace *poolname* with the name of the pool you created on the mirrored NSS partition.

The volume load script should now appear similar to the following example:

```
mm remirror shared pool nssmirror=ON
nss /activate=nssmirror
trustmig nssmirror watch
nudp add cluster1_nssmirror_server 123.45.67.120
add secondary ipaddress 123.45.67.121
```

3 Click the Unload Script tab on the property page and add the following line to the end of the unload script:

```
mm remirror shared pool poolname=OFF
```

Replace *poolname* with the name of the pool you created on the mirrored NSS partition.

The volume unload script should now appear similar to the following example:

```
del secondary ipaddress 123.45.67.121
nudp del cluster1_nssmirror_server 123.45.67.120
trustmig nssmirror unwatch
dismount nssmirror /force
nss /forcedeactivate=nssmirror
mm remirror shared pool nssmirror=OFF
```

Check NSS Volume Mirror Status

Once you have configured NSS mirroring with Novell Cluster Services, you should check to ensure that it is working properly in a cluster environment.

1 Ensure that the volume is mounted on an assigned server by entering **volume** at the server console.

2 Check the mirror status of the volume by entering **mirror status** at the server console.

Mirror status should be 100 percent.

3 Migrate the volume to another server in the cluster and again check to ensure the volume is mounted by entering **volume** at the server console.

4 Check the mirror status of the volume again by entering **mirror status** at the server console.

Additional Novell Cluster Services Configuration Information

For additional information on setting up and configuring Novell Cluster Services, see Novell Cluster Services Overview and Installation.

5 Configuring DHCP with Novell Cluster Services

Benefits of Configuring DHCP for High Availability

A NetWare® 6 DHCP server automatically assigns IP addresses and other configuration information to clients upon request or when the clients are restarted. If for some reason the NetWare 6 DHCP server is not accessible, clients lose their ability to connect to the network because they cannot obtain an IP address. Configuring DHCP with Novell® Cluster Services™ ensures the IP address range required by users to connect to the network is highly available. This is possible because DHCP configuration information and IP address ranges are stored in NDS® and the DHCP server is automatically started, stopped, and restarted on different servers in the cluster by Novell Cluster Services.

DHCP Installation and Configuration

Novell Cluster Services (NCS) 1.6 must be installed before configuring DHCP. NCS 1.6 provides a DHCP resource template, which facilitates configuring DHCP in a cluster environment. NetWare 6 includes NCS 1.6 and licenses for two cluster nodes.

Before running DHCP with Novell Cluster Services, DHCP must be configured properly on one server in the cluster. To see DHCP documentation for instructions on installing and configuring DHCP with NetWare 6, go to (http://www.novell.com/documentation/lg/dns_dhcp/index.html).

DHCP server software is included with NetWare 6. You must select the Custom installation option and check the DNS/DHCP component check box to install DHCP during the NetWare 6 installation. You cannot install DHCP

during an Express installation. You will need to configure DHCP after your NetWare 6 server is installed. And, as stated earlier, you should configure DHCP on only *one* server in the cluster.

Because all DHCP configuration information and IP address ranges are stored in eDirectory™, no shared storage is required to run DHCP with Novell Cluster Services.

Any server in the cluster that will run DHCP must have at least a Read/Write eDirectory replica. This allows Novell Cluster Services to modify DHCP-specific eDirectory objects regardless of which server in the cluster holds the objects.

Novell Cluster Services Configuration and Setup

Once DHCP is properly configured on one server in your cluster, you must create and configure a DHCP resource in Novell Cluster Services. This includes configuring DHCP load and unload scripts, setting DHCP Failover and Failback modes, and assigning the DHCP resource to specific servers in your cluster.

Creating a DHCP Cluster Resource

Novell Cluster Services includes a DHCP resource template, which greatly simplifies the process for creating a DHCP cluster resource. Much of the DHCP cluster resource configuration is perfomed automatically by the DHCP resource template.

To create a cluster resource:

1 In ConsoleOne™, browse to and select the Cluster object.

2 Click File > New > Cluster > Cluster Resource.

3 Enter a name for the DHCP cluster resource.

4 Enter the DHCP template name in the Inherit from Template field, or browse and select it from the list.

5 Check the Define Additional Properties check box, click Create, and then continue with "Editing DHCP Load and Unload Scripts" on page 33.

The DHCP resource template configures the DHCP resource by automatically creating DHCP load and unload scripts, setting failover and failback modes, and assigning DHCP as a resource to all nodes in the cluster.

Editing DHCP Load and Unload Scripts

The DHCP resource template automatically creates a load and unload script to start and stop the DHCP service on servers in your cluster. The load script contains a command that you must customize for your specific DHCP configuration.

To edit the DHCP load script:

1 In ConsoleOne, right-click the DHCP Resource object and then click Properties.

   If you just created the DHCP resource object and checked the Define Additional Properties check box, the DHCP Resource object should already be displayed.

2 Click the Scripts tab on the property page and select Cluster Resource Load Script.

   The load script will appear similar to the following example:

   CLUSTER DHCP CN=SERVER.O=ORG.T=TREE
   DHCPSRVR

   The CLUSTER DHCP command is necessary to pass DHCP-specific configuration information to another server in the cluster if the server where DHCP is running fails.

   The DHCPSRVR command is used to start the DHCP server (DHCPSRVR.NLM) on a NetWare server.

3 Edit the CLUSTER DHCP command to add the context of the Server object for the server in your cluster that has DHCP configured.

   For example, if the server context is CN=PROD1.O=SALES.T=ACME_TREE, the load script would appear as follows:

   CLUSTER DHCP CN=PROD1.O=SALES.T=ACME_TREE
   DHCPSRVR

   The server context specified in the load script does not change even though the load script will run on another server in the cluster during a failover.

4 Click the Unload Script tab on the property page to view the unload script.

   The UNLOAD DHCPSRVR command is by default the only command in the unload script.

Setting DHCP Start, Failover, and Failback Modes

The DHCP resource template sets the DHCP resource Start Mode and Failover Mode to AUTO, and the Failback Mode to DISABLE.

If the DHCP resource Start Mode is set to AUTO, the DHCP server automatically loads on a designated server when the cluster is first brought up. If the DHCP Start Mode is set to MANUAL, you can manually start DHCP on a specific server when you want, instead of having it automatically start when servers in the cluster are brought up.

If the DHCP Failover Mode is set to AUTO, the DHCP server automatically moves to the next server in the Assigned Nodes list in the event of a hardware or software failure. If the DHCP Failover Mode is set to Manual, you can intervene after a failure occurs and before the DHCP server is started on another node.

If the DHCP Failback Mode is set to DISABLE, the DHCP server will continue running on the node it has failed to. If the DHCP Failback Mode is set to AUTO, the DHCP server automatically moves back to its preferred node when the preferred node is brought back online. Set the DHCP Failback Mode to MANUAL to prevent the DHCP server from moving back to its preferred node when that node is brought back online, until you are ready to allow it to happen.

To view or change DHCP Start, Failover, and Failback modes, do the following:

1 In ConsoleOne, right click the DHCP Resource object and select Properties.

2 Click the Policies tab on the property page.

3 View or change the Start, Failover, or Failback modes for DHCP.

View or Edit DHCP Resource Server Assignments

The DHCP resource template automatically assigns the DHCP resource to all nodes in the cluster. The order of assignment is the order the nodes appear in the resource list. To view or edit DHCP resource node assignments or change the server failover order:

1 In ConsoleOne, right-click the DHCP Resource object and select Properties.

2 Click the Nodes tab on the property page.

3 View the current DHCP resource server assignments and, if necessary, click the right or left arrow button to assign or unassign servers to the DHCP resource.

You can also click the up or down arrow button to change the failover order of the servers assigned to DHCP.

Additional Novell Cluster Services Configuration Information

If you have DHCP clients that are located on a separate LAN segment or IP subnet from the servers in your cluster, some additional configuration is necessary. This additional configuration consists of adding and deleting a secondary IP address on the cluster server where DHCP is running and setting up your router to forward DHCP requests.

To add a secondary IP address:

1 Edit the DHCP cluster resource load script and add the following line:

```
ADD SECONDARY IP ADDRESS A.B.C.D
```

Replace A.B.C.D with a unique IP address. Your router will forward DHCP requests from other LAN segments to this address.

2 Edit the DHCP cluster resource unload script and add the following line:

```
DEL SECONDARY IP ADDRESS A.B.C.D
```

Replace A.B.C.D with the same IP address you added in the load script.

To configure a router to forward DHCP requests, see your router documentation. If you are using a NetWare server as a router, ensure the following line is added to the AUTOEXEC.NCF file of the server acting as a router:

```
BOOTPFWD SERVER=A.B.C.D
```

Replace A.B.C.D with the secondary IP address you specified in the load and unload scripts above.

For additional information on setting up and configuring Novell Cluster Services, See Novell Cluster Services Overview and Installation.

6 Configuring Novell Distributed Print Services and iPrint with Novell Cluster Services

Benefits of High Availability Printing

Running Novell® Distributed Print Services™ (NDPS®) and iPrint on a NetWare cluster provides the following benefits:

- Centralized management

    - By configuring the Print Management Database to reside on a shared disk cluster volume, you no longer need to replicate information to achieve high availability.

    - The cluster console GUI allows you to monitor and control the location of cluster volumes with the Broker and Print Manager services using them from a single management workstation.

    - Because cluster volumes are tightly consistent and highly available, distributed print management tasks are simplified.

- Automatic restart of print services

    - If a server fails, the cluster volume containing the Print Management Database and spool area automatically remount on a surviving server in the cluster. The Broker and Print Manager NLMs will also automatically restart without user intervention.

    - On restart, the Broker and Print Manager will discover the Print Management Database on a cluster volume mounted on their server. Because the cluster volume is the same regardless of which server it is mounted on, no print related information is lost or out of date.

Ensure NDPS Is Installed

iPrint/NDPS must be installed before installing NetWare Cluster Services. During the installation of NetWare 6, you must select to install iPrint/NDPS. iPrint/NDPS must be installed before installing Novell Cluster Services.

Create and Configure NDPS Broker and Print Manager

Before running NDPS in a cluster environment, you must create a NDPS Broker and Manager on the cluster-enabled volume. You should dedicate a volume for printing.

To create a NDPS Broker and Manager, you will use iManage, a Web-based management utility to administer eDirectory.

Prepare the print volume for a print broker.

1 Using Windows Explorer, browse and select the Print volume in the NDS tree.

This creates a client connection to the server currently hosting the volume.

2 From a server's local volume, copy the SYS:NDPS directory and subdirectories to the root directory of the cluster volume for printing.

Ensure \NDPS is the top level directory at the root of the Print volume.

Create an NDPS Broker using iManage. For more information, see Creating NDPS Brokers.

1 From iManage, click iPrint Management > Create Broker.

2 Fill in the fields.

For the RMS Volume, select the *Cluster_Volume* where *Cluster* is the name of your cluster and *Volume* is the name of the dedicated print volume.

NOTE: You cannot create a Broker object until you have copied the resource directory as explained in"Prepare the print volume for a print broker." on page 38 above.

Create an NDPS Print Manager. For more informaiton, see Creating NDPS Manager.

1 From iManage, click iPrint Management > Create Print Service Manager.

2 Fill in the fields.

For the Database Volume select the print volume's corresponding virtual server object.

Configure the NDPS Cluster Volume

Once you have created an NDPS Broker and Manager, you must configure the following:

- "Configuring the NDPS Volume Load and Unload Scripts" on page 39
- "Setting NDPS Volume Server Assignments" on page 41
- "Setting NDPS Start, Failover, and Failback modes" on page 41

Configuring the NDPS Volume Load and Unload Scripts

Load and unload scripts are required by Novell Cluster Services to start and stop NDPS and mount the NDPS volume on servers in the cluster.

Before adding commands to the NDPS cluster volume's load and unload scripts, you should test to ensure the NDPS Broker and Print Manager will run with the cluster volume.

To configure the NDPS volume load and unload scripts:

1 In ConsoleOne, select NDPS Cluster Volume Object

2 Right-click the Virtual server object and select Properties.

3 Click the Load Script tab on the property page and add the following lines to the *end* of the load script.

```
NSS /TRANSACTION =Cluster Volume

LOAD BROKER.broker_name.broker_context /ALLOWDUP

LOAD NDPSM .manager_name.manager_context /DBVOLUME=NOCHECK /
IPADDRESS=secondary_cluster_address

HTTPBIND secondary_cluster_address /KEYFILE:"SSL CertificateIP"
```

Replace *Cluster Volume* with the name of the clustered print volume; replace *broker_name* and *broker_context* with the name of the NDPS Broker Object name and context; replace the *manager_name* and *manager_context* with the NDPS Manager's name and context; and replace the *secondary_cluster_address* with the IP address that printing should use. This is the address defined previously in the **Add Secondary Address** line.

The /TRANSACTION enables transaction tracking on the print volume to protect the NDPS database integrity.

IMPORTANT: The Transaction Tracking System cannot be enabled on Traditional and NSS volumes at the same time. If you upgraded from NetWare 5, and you kept SYS: as a Traditional volume, then you will need to disable TTS on your Traditional volumes, like SYS:, using the **disable tts** command at the server console.

To enable TTS on an NSS volume type **nss /transaction=*volume_name*** at the serer console.

The /ALLOWDUP command line switch instructs the NDPS Broker to avoid its check for duplicate Brokers at start-up. Because Novell Cluster Services ensures only one Broker NLM runs and references the same NDS Broker configuration object at a time, this option allows the Broker to start faster without human intervention by avoiding a communication timeout based check for an existing Broker.

The /DBVOLUME=NOCHECK command line switch instructs the NDPS Print Manager to avoid checking whether its database volume is local or remote. This switch allows the Print Manager to simply open the cluster volume identified in its NDS configuration object.

The /IPADDRESS command line assigns one of the clusters secondary IP address to NDPS Manager.

4 Click the Unload Script tab on the Property page and add a line to dismount the NDPS volume from a server. In addition, add the following lines to the *beginning* of the unload script.

```
UNLOAD NDPSM

UNLOAD BROKER

HTTPUNBIND secondary_cluster_address
```

Replace the *secondary_cluster_address* with the IP address that was bound in the load script. This is the address defined previously in the **Add Secondary Address** line.

Setting NDPS Volume Server Assignments

Novell Cluster Services by default assigns the NDPS volume resource to all nodes in the cluster. The order of assignment is the order the nodes appear in the resource list. To view or edit NDPS volume resource node assignments or change the server failover order, do the following:

1 In ConsoleOne, right click the NDPS volume resource object and select Properties.

2 Click the Nodes tab on the property page.

3 View the current NDPS volume resource server assignments, and if necessary, click the right or left arrow button to assign or unassign servers to the NDPS volume resource.

You can click the up or down arrow button to change the failover order of the servers assigned to the NDPS volume.

IMPORTANT: In order for the Broker to load and enable the Resource Management Service properly you must ensure the IP address of the NDPS cluster volume is added to the \ETC\HOSTS file of each server in the cluster that will host the NDPS volume.

Use a text editor to open the HOSTS file and if necessary add the IP address you assigned to the NDPS volume resource when you cluster-enabled it. For example, if the NDPS cluster volume is named CLUSTER_NDPSVOL_SERVER and the IP address for that cluster volume is 137.65.119.70, you would add the following line:

```
137.65.119.70 CLUSTER_NDPSVOL_SERVER
```

Setting NDPS Start, Failover, and Failback modes

Novell Cluster Services by default sets the NDPS Cluster volume Start Mode and Failover Mode to AUTO, and the Failback Mode to DISABLE. If the NDPS volume Start Mode is set to AUTO, NDPS automatically starts on a server when the cluster is first brought up. If the NDPS volume Start Mode is set to MANUAL, you will manually start NDPS on a server when you want, instead of having it automatically start when servers in the cluster are brought up.

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

If the NDPS volume Failback Mode is set to DISABLE, NDPS will not failback to its most preferred node when the most preferred node rejoins the cluster. If the NDPS volume Failback Mode is set to AUTO, NDPS will automatically failback to its most preferred node when the most preferred node rejoins the cluster. Generally, you want a failback to a preferred node to occur after business hours.You can set the NDPS volume Failback Mode to MANUAL to prevent NDPS from moving back to its preferred node when that node is brought back online, until you are ready to allow it to happen.

IMPORTANT: Default settings for Start, Failover and Failback Mode are recommended.

To view or change NDPS volume Start, Failover, and Failback modes:

1 In ConsoleOne, right-click the NDPS Volume Resource object and select Properties.

2 Click the Policies tab on the property page.

3 View or change the Start, Failover or Failback modes for the NDPS volume.

Using iPrint/NDPS in a Clustered Environment

If you are using the default iPrint configurations or are embedding URLs in your iPrint Web pages, you need to be aware of the following:

- If you are using custom map files that are saved in the SYS:LOGIN\IPPDOCS directory, you will need to copy the maps to each fileserver in the cluster that is hosting print. This will make the maps available if a failover occurs.

- Links to the default iPrint page or other custom pages in the \IPPDOCS directory should use the secondary IP address or DNS name of the cluster volume. This address moves with the volume to other serverse in the cluster during a failover.

- When adding drivers to RMS, make sure that the files in the NDPS\RESDIR directory are not flagged as read-only. This is not an issue when copying the \RESDIR to SYS:; however, if you extract the files from the .ZIP files on the *Operating System* CD, the directories may be flagged read-only.