Novell Cluster Services™ NetWare to Linux Conversion Guide

Open Enterprise Server 2 SP3

May 2013

Novell.

Contents

About This Guide

This guide describes how to convert Novell Cluster Services cluster nodes and resources from NetWare 6.5 Support Pack (SP) 8 (with the latest patches) to Novell Open Enterprise Server (OES) 2 SP3.

This guide includes the following sections:

Audience

This guide is intended for Novell Cluster Services administrators and other administrators that are responsible for clustered services and data. It is assumed that readers of this guide have a basic understanding of Novell Cluster Services and of the services and file systems that are being clustered.

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 www.novell.com/documentation/feedback.html and enter your comments there.

Documentation Updates

For the most recent version of the *OES 2 SP3: Novell Cluster Services Conversion Guide,* visit the OES 2 SP3 documentation Web site (http://www.novell.com/documentation/oes2).

Additional Documentation

For documentation on Novell Cluster Services and cluster resources management, see the OES 2 SP3 Clustering (High Availability) documentation Web site (http://www.novell.com/documentation/oes2/cluster-services.html).

For information about managing a NetWare cluster, see the "Clustering NetWare Services" list on the NetWare 6.5 SP8 Clustering (High Availability) documentation Web site (http://www.novell.com/documentation/nw65/cluster-services.html#clust-config-resources).

1 What's New for Novell Cluster Services Cluster Conversion from NetWare to Linux

This section describes changes for converting Novell Cluster Services clusters from NetWare 6.5 Support Pack 8 (SP8) to Novell Open Enterprise Server (OES) 2 Support Pack 3 (SP3).

1.1 What's New (May 2013)

In addition to bug fixes, Novell Cluster Services provides the following enhancement and behavior changes in the May 2013 Scheduled Maintenance for OES 2 SP3:

Updated the DHCP PID File Location in the DHCP_Template

In the DHCP_Template for DHCP cluster resources, the PID file location was changed to `/var/lib/dhcp/var/run/dhcpd.pid`. The change applies automatically to any newly created DHCP cluster resources. For information about configuring DHCP cluster resources, see "Configuring DHCP with Novell Cluster Services for the Linux File System" in the *OES 2 SP3: Novell DNS/DHCP Administration Guide*.

1.2 What's New (April 2013)

Upgrade to eDirectory 8.8.7

An upgrade to Novell eDirectory 8.8 SP7 is available in the April 2013 Scheduled Maintenance for OES 2 SP3. For information about the eDirectory upgrade, see TID 7011599 (http://www.novell.com/support/kb/doc.php?id=7011599) in the Novell Knowledgebase.

There will be no further eDirectory 8.8 SP6 patches for the OES platform. Previous patches for Novell eDirectory 8.8 SP6 are available on Novell Patch Finder (http://download.novell.com/patch/finder/#familyId=112&productId=29503).

1.3 What's New (January 2013)

Upgrade to Novell iManager 2.7.6

The January 2013 Scheduled Maintenance for OES 2 SP3 includes a channel upgrade from Novell iManager 2.7.5 to Novell iManager 2.7.6.

Novell iManager 2.7.6 provides the following enhancements:

- Microsoft Internet Explorer 10 certification in the desktop user interface view on Windows 8 (excluding Windows 8 RT) and Windows Server 2012.
- Apple Safari 6.0 certification on Mac OSX Mountain Lion (version 10.8).
- iManager Workstation certification on Windows 8 Enterprise Edition (32-bit and 64-bit).
- Manager 2.7.6 support for Tomcat 7.0.32. and Java 1.7.0_04 versions.

iManager documentation links in this guide have been updated to reflect this change.

iManager 2.7.6 documentation is available on the Web (https://www.netiq.com/documentation/imanager/). For earlier iManager versions, see "Previous Releases" (https://www.netiq.com/documentation/imanager27/#prev).

Novell Client Support for Windows 8 and Server 2012

The January 2013 Scheduled Maintenance for OES 2 SP3 announces the availability of Novell Client 2 SP3 for Windows with support for:

- Windows 8 (32-bit and 64-bit) excluding Windows 8 RT
- Windows Server 2012 (64-bit)

Novell Client 2 documentation links in this guide have been updated to reflect the release of SP3.

Novell Client 2 SP3 for Windows documentation is available on the Web (http://www.novell.com/documentation/windows_client/). Documentation for earlier versions is available under Previous Releases (http://www.novell.com/documentation/windows_client/#previous).

New Novell Cluster Services Plug-in for iManager 2.7.5 and Later

The Clusters plug-in for Novell iManager 2.7.5 or later was released in OES 11 SP1. It supports the management of OES and NetWare clusters and resources. The availability of different cluster management features depends on the version of Novell Cluster Services and the server platform that are installed on the cluster being managed. A comparison of the old and new interface is available in "What's New (January 2013 Patches)" (http://www.novell.com/documentation/oes2/clus_admin_lx/data/ncs_new_jan2013.html) in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux* (http://www.novell.com/documentation/oes2/clus_admin_lx/data/h4hgu4hs.html).

1.4 What's New (January 2012)

The NetWare to Linux conversion of Novell Cluster Services clusters is supported from NetWare 6.5 SP8 (with the latest patches applied) to OES 2 SP3 on the SUSE Linux Enterprise 10 SP4 operating system.

2 Planning the Cluster Conversion

Upgrading a NetWare 6.5 SP8 cluster to Novell Open Enterprise Server 2 SP3 Linux is a multi-phase process referred to as a rolling cluster conversion. This approach lets you keep your cluster up and running and lets your users continue to access cluster resources while the conversion is in progress. During a rolling cluster conversion, one server is converted to OES 2 while the other servers in the cluster continue running NetWare 6.5. Then another server can be converted to OES 2, and then another, until all servers in the cluster have been converted. During the conversion, you can also add OES 2 servers to the cluster, and remove NetWare 6.5 servers from the cluster.

Before you begin a conversion, ensure that your system meets the requirements and caveats described in this section. In addition, your OES 2 Linux nodes and network environment must meet the cluster requirements as described in "Planning for Novell Cluster Services" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

2.1 Supported Conversion Paths

The NetWare to Linux conversion is supported from NetWare 6.5 SP8 (with the latest patches applied) to OES 2 SP3 on the SUSE Linux Enterprise 10 SP4 operating system. The following conversion paths are supported from NetWare to OES 2 Linux:

From this NetWare platform	Interim platform upgrade for all nodes	Before conversion to this platform
NetWare 6.5 SP8	Latest patches applied	OES 2 SP3 on SLES 10 SP4 Linux
NetWare 6.5 SP7 or earlier	NetWare 6.5 SP8 with the latest patches applied	OES 2 SP3 on SLES 10 SP4 Linux
NetWare 6.0	NetWare 6.5 SP8 with the latest patches applied	OES 2 SP3 on SLES 10 SP4 Linux
NetWare 5.1	NetWare 6.5 SP8 with the latest patches applied	OES 2 SP3 on SLES 10 SP4 Linux

Before converting NetWare 6.5 clusters to OES 2 Linux, you must apply all of the latest service packs and patches for that version. For information, see "Upgrading NetWare Clusters" in the *NW6.5 SP8: Novell Cluster Services 1.8.5 Administration Guide*.

If you have a NetWare 6.5 SP7 or earlier cluster, you must upgrade all nodes to NetWare 6.5 SP8 (with the latest service packs and patches) before you convert any nodes to OES 2 Linux or add OES 2 Linux nodes to the cluster. For information, see "Upgrading NetWare Clusters" in the *NW6.5 SP8: Novell Cluster Services 1.8.5 Administration Guide*.

2.2 Supported Mixed-Node Clusters

During the conversion, the intermediate cluster is referred to as a *mixed-node* cluster because the cluster contains both NetWare and Linux nodes. This is a temporary configuration that is supported for the purpose of converting the cluster and is not supported as a long-term operational state of the cluster.

A mixed cluster made up of NetWare 6.5 SP8 nodes and OES 2 SP3 Linux nodes is supported for the purpose of converting the cluster from NetWare 6.5 SP8 (with the latest support packs and patches) to OES 2 SP3 Linux or later.

A mixed cluster made up of NetWare 6.5 SP7 or earlier nodes and OES 2 SP3 Linux nodes is not supported.

2.3 SBD Devices Must Be Marked as Shareable for Clustering

Novell Cluster Services for Linux requires that the devices used for the SBD partition be explicitly marked as Shareable for Clustering. When converting a NetWare cluster, ensure that the SBD device, or both devices for a mirrored SBD, are marked as Shareable for Clustering before you add the first Linux node to the cluster.

2.4 Syntax Translation Issues for Load and Unload Scripts

Executing a script that is valid for the NetWare platform is not necessarily recognized on the OES 2 Linux platform. When cluster migrating a resource from a NetWare node to a OES 2 Linux node, the resource's Load script and Unload script need to be translated in-memory while the cluster contains mixed nodes. It is also translated in-memory when the cluster is finally converted from NetWare to Linux. This translation is done by the Cluster Translation Library script (`/opt/novell/ncs/bin/clstrlib.py`).

IMPORTANT: If the commands in cluster resource's load or unload scripts are not part of the normal translation library, the cluster resource can end up in a comatose state.

Beginning in OES 2 SP2, Novell Cluster Services allows you to customize the translation syntax that is used for load and unload scripts in mixed-node clusters by defining them in the `/var/opt/novell/ncs/customized_translation_syntax` file that you create. The `clstrlib.py` script reads the additional translation syntax from the syntax file. For information, see .

2.5 Case Sensitivity Issues

When adding a Linux node to the existing NetWare cluster, there are two areas where case sensitivity might be an issue:

- **Node name:** After you install the Linux node into the NetWare cluster, the Linux node is unable to join the cluster. To resolve this problem, edit the `/etc/opt/novell/ncs/nodename` file to modify the hostname of the node from lowercase (`clusnode1`) to all uppercase characters (`CLUSNODE1`), reboot the operating system, then run the `rcnovell-ncs start` command. This allows the cluster node to start and join the cluster.

  NOTE: This case sensitivity issue has been resolved for OES 2 SP2 and later.

- **Cluster object name:** The Cluster object name (such as `cn=Clustername,ou=context,o=org`) is also present on the SBD partition. The SBD name (`Clustername.sbd`) matches the case of the object name in eDirectory. Running the `sbdutil -f` command displays the SBD name. If the case used when you enter the Cluster object name and SBD name during the Linux cluster install do not match the case used in eDirectory, the cluster install fails to detect the SBD partition.

2.6 Adding a New NetWare Node to a Mixed-Node Cluster

You cannot add additional NetWare nodes to your cluster after adding a new Linux node or changing an existing NetWare cluster node to a Linux cluster node. If you want to add NetWare cluster nodes after converting part of your cluster to Linux, you must first remove the Linux nodes from the cluster.

2.7 Converting Multiple NetWare Cluster Nodes to OES 2 Linux

If you attempt to concurrently convert multiple NetWare cluster servers to OES 2 Linux, we strongly recommend that you use the old NetWare node IP addresses for your Linux cluster servers. You should record the NetWare node IP addresses before converting them to Linux.

If you must assign new node IP addresses, we recommend that you only convert one node at a time.

If new cluster node IP addresses are required and new server hardware is being used, another option is to shut down the NetWare nodes that are to be removed and then add the new Linux cluster nodes. After adding the new Linux cluster nodes, you can remove the NetWare cluster node-related objects as described in Step 5 of Section 5.1, "Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)," on page 29.

IMPORTANT: Failure to follow these recommendations might result in NetWare server abends and Linux server restarts.

2.8 Converting Nodes that Contain the eDirectory Master Replica

When converting NetWare cluster servers to Linux, do not convert the server that has the master eDirectory replica first. If the server with the eDirectory master replica is a cluster node, convert it at the end of the rolling cluster conversion.

2.9 Failing Over Service Cluster Resources on Mixed-Node Clusters

For service cluster resources, the intention is to have a one-time cluster migration of the service from NetWare to OES 2 Linux. After you cluster migrate the resource to an OES 2 Linux node, the relocated resource should be cluster migrated only between nodes running the OES 2 Linux platform.

2.10 Failing Over Data Cluster Resources on Mixed-Node Clusters

Pool cluster resources that were created on NetWare cluster nodes and migrated or failed over to Linux cluster nodes can be migrated or failed back to NetWare cluster nodes.

Cluster resources that were created on Linux cluster nodes cannot be migrated or failed over to NetWare cluster nodes.

If you cluster migrate an NSS pool from a NetWare cluster server to a Linux cluster server, it could take several minutes for volume trustee assignments to synchronize after the migration. Users might have limited access to the migrated volumes until after the synchronization process is complete.

2.11 Managing File Systems in Mixed-Node Clusters

In a mixed cluster of NetWare and OES 2 Linux nodes, Linux POSIX file systems as cluster resources cannot be created until the entire cluster had been successfully converted to OES 2 Linux. Linux POSIX file systems as cluster resources cannot be migrated or failed over to NetWare cluster nodes.

Only NSS pool cluster resources that are created on a NetWare cluster node can be failed over between Linux and NetWare nodes of a mixed-node cluster.

NetWare-to-Linux failover of NSS pool cluster resources requires that the Linux node be configured for NSS and that the version of NSS supports the NSS media format and features that are currently being used by the NSS pool cluster resource on NetWare.

No storage management functions should be executed in a mixed-node cluster unless you are performing documented steps for the conversion. That is, do not create, delete, expand, or modify the properties for partitions, pools, or volumes for shared resources in the cluster unless the conversion instructions specifically guide you to do so.

WARNING: Attempting to reconfigure shared storage in a mixed cluster can cause data loss.

If you need to configure (or reconfigure) existing shared NSS pools and volumes in a mixed-node cluster, you must temporarily bring down all Linux cluster nodes prior to making changes, then make the configuration changes on a NetWare node. Ensure that the resources are working properly on NetWare before having the Linux cluster nodes rejoin the cluster.

2.12   Using Novell iManager in Mixed-Node Clusters

Use Novell iManager 2.7.4 or later for all cluster administration in the mixed-node cluster. Using the Clusters plug-in to iManager is required to manage the cluster after the first OES 2 Linux node is added to the cluster.

The display of node IDs from the NetWare master node might be incomplete if you use other tools like ConsoleOne and Novell Remote Manager in a mixed-node cluster. However, you can use `cat /admin/Novell/Cluster/NodeConfig.xml` on any cluster node to get the node IDs.

2.13   Using Novell Remote Manager Is Not Supported in Mixed-Node Clusters

Do not use Novell Remote Manager when managing mixed-node clusters. Novell Remote Manager is not supported for cluster management on OES 2 Linux.

Because different time formats are used in the NCS Event log for NetWare and Linux, Novell Remote Manager might have difficulty displaying the time of logged events. To avoid this problem in a mixed-node cluster, use iManager to access the NCS Event log.

To reduce any confusion you might have when using Novell Remote Manager, you can unload module `pcluster.nlm` and delete its references in `ldncs` and `uldncs`. This removes the *Cluster* tab in Novell Remote Manager.

2.14   Using ConsoleOne Is Not Supported for Mixed-Node Clusters

Do not use ConsoleOne when managing mixed-node clusters. ConsoleOne is not supported for cluster management on OES 2 Linux.

2.15   Using the Monitoring Function in Mixed-Node Clusters Is Not Supported

In mixed-node clusters, the Monitor function in Novell Cluster Services for Linux is not available. You cannot enable the Monitor function or modify the Monitor script for cluster resources on the Linux nodes until the conversion is finalized and all nodes in the cluster are running OES 2 Linux. Then the monitor scripts are created automatically for each of the converted cluster resources.

3 Planning the Conversion of Cluster Resources

In addition to changing the operating system, the software and file systems for various clustered services must also be considered in your conversion from NetWare 6.5 to Novell Open Enterprise Server (OES) 2. This section provides an overview of the NetWare 6.5 services and their counterparts in OES 2 SP3. Before you begin a conversion, ensure that your system meets the general requirements and caveats described in this section.

Converting cluster resources for OES 2 services from NetWare to Linux might require more than a simple cluster migration from a NetWare node to a Linux node. For example, the service might require that you use Migration Tool to convert the service to Linux. Some services require post-conversion configuration to finalize the conversion. A few services on NetWare are not available on OES 2 Linux, so you must use the standard Linux service instead.

See Table 3-1 for information about converting cluster resources for NetWare 6.5 SP8 services:

Table 3-1 *Guidelines for Converting Service Cluster Resources from NetWare to Linux*

Service on NetWare 6.5 SP8	Cluster Migrate the Resource	Converting the Service to OES 2 Linux
Apache Web Server	Yes	See Chapter 7, "Apache HTTP Server," on page 39.
Apple Filing Protocol (AFP)	Yes	See Chapter 6, "Novell AFP," on page 37.
Archive and Version Services	No, but you can migrate the database	See Chapter 8, "Novell Archive and Version Services," on page 55.
CIFS (Windows File Services)	Yes	See Chapter 10, "Novell CIFS," on page 59.
DFS VLDB (Distributed File Services volume location database)	Yes	See Chapter 11, "Novell Distributed File Services VLDB," on page 61.
DHCP Server	Yes	See Chapter 12, "DHCP Server," on page 63.
DNS Server	Yes	See Chapter 13, "DNS Server," on page 65.
eDirectory	Not clustered, but requires special handling	See Section 2.8, "Converting Nodes that Contain the eDirectory Master Replica," on page 14.

Service on NetWare 6.5 SP8	Cluster Migrate the Resource	Converting the Service to OES 2 Linux
eDirectory Certificate Server	Not clustered, but requires special handling	The Certificate Authority (CA) service is not cluster-enabled for NetWare or OES 2 Linux. There are no cluster-specific tasks for the CA itself. The Server Certificate service issues Server Certificate objects that might need to reside on each node in a cluster, depending on the service that is clustered. NetWare and Linux generate certificates differently, so the NetWare server's certificate is not reused for the OES 2 Linux server. See Chapter 9, "eDirectory Server Certificates," on page 57.
exteNd Application Server and MySQL	Not applicable	The exteNd Application Server was discontinued as an install option for NetWare 6.5 SP3. It is not available for Linux. See also MySQL in this table.
FTP	No	Use the Pure-FTPd service for Linux. For information, see "Novell FTP (Pure-FTPd) and OES 2" in the *OES 2 SP3: Planning and Implementation Guide*.
iFolder	No, but you can migrate the settings and data	Novell iFolder 2.1x is not available on OES 2 Linux. You must use Novell iFolder 3.x. After you add a Novell iFolder 3.x server to the NetWare cluster and before you finalize the cluster conversion, use iFolder migration procedures to migrate the iFolder 2.1x server configuration and user data from the source NetWare node to the target Linux node. For information, see "Migrating iFolder Services" in the *Novell iFolder 3.8 Administration Guide*.
iPrint	Yes	See Chapter 14, "Novell iPrint," on page 67.
MySQL	No	Use the MySQL 5.0.*x* software on OES2 Linux that is offered under the GPL. See Chapter 15, "MySQL," on page 73.
NetStorage	Not tested	Clustering the NetStorage service is supported for OES 2 SP1 Linux and later. For information, see "Configuring NetStorage with Novell Cluster Services" in the *OES 2 SP3: NetStorage Administration Guide*.
NFS	No	Use standard NFS service for Linux.

Service on NetWare 6.5 SP8	Cluster Migrate the Resource	Converting the Service to OES 2 Linux
QuickFinder (Server Synchronization Feature)	No, but you can migrate the settings and data	You must create a new cluster resource. QuickFinder 5.0.x is supported only on OES 2 Linux. NetWare uses QuickFinder 4.2.0. QuickFinder does not support any automated procedure or scripts for a rolling upgrade from Netware to Linux. Instead of converting the resource, you can migrate the settings from NetWare after you set up a QuickFinder resource on Linux. See Chapter 16, "QuickFinder Server," on page 75.
NSS pools and volumes	Yes	See Chapter 17, "Novell Storage Services Pools," on page 79.
Tomcat	No	Use the Novell Tomcat service for Linux.

4 Planning the Conversion of Load and Unload Scripts

You can use a rolling cluster conversion to convert a Novell Cluster Services cluster from NetWare 6.5 SP8 to Novell Open Enterprise Server (OES) 2 SP3 Linux. This section describes how to prepare for and perform the conversion, and how to manage the temporarily mixed cluster during the conversion.

4.1 Translation of Cluster Resource Scripts for Mixed NetWare and Linux Clusters

Novell Cluster Services includes specialized script translation functionality, called the Cluster Translation Library script (`/opt/novell/ncs/bin/clstrlib.py`), to help NetWare and Linux servers coexist in the same cluster. It provides an automatic translation of the Master IP Address resource and cluster-enabled NSS pool resource load and unload scripts from NetWare to Linux. This functionality is also beneficial as you migrate NetWare cluster servers to Linux.

The Cluster Translation Library reads the NetWare load and unload scripts from eDirectory, converts them, and writes them as Linux load and unload script files. The Linux load and unload script files are then searched for NetWare-specific command strings, and the command strings are then either deleted or replaced with Linux-specific command strings. Separate Linux-specific commands are also added, and the order of certain lines in the scripts is also changed to function with Linux.

The Linux load and unload scripts are stored in files on Linux cluster servers, instead of being stored in eDirectory like the NetWare scripts. The cluster resource name is used in the load and unload script filenames. The path to the files is `/var/opt/novell/ncs/`.

IMPORTANT: Use the *Properties > Scripts* page in the Clusters plug-in in iManager whenever you make manual changes to the load and unload scripts. The changes are automatically saved to the files.

The normal translations performed by the Cluster Translation Library are described in the following sections:

-
-
-
-

IMPORTANT: If the commands in cluster resource's load or unload scripts are not part of the translation library, the cluster resource can end up in a comatose state.

Beginning in OES 2 SP2, Novell Cluster Services allows you to customize the translation syntax that us used for load and unload scripts in mixed-platform situations by defining new syntax translations to be used in addition to the normal translations. For information, see .

4.2 Comparing Script Length Limits for NetWare and Linux

Scripts have different size limits on NetWare and OES 2 Linux. In a mixed-node cluster, the scripts for NetWare resources that are cluster migrated to OES 2 Linux nodes are restricted to the NetWare script-size limits until the final `cluster convert` command is issued.

The maximum supported lengths for cluster scripts' content are as follows:

Script	NetWare 6.5 Resources on NetWare Nodes	NetWare 6.5 Resources on OES 2 Linux Nodes	OES 2 Linux Resources and Converted NetWare Resources After the Final Conversion
Load script	924 bytes	924 bytes	3200 bytes
Unload script	924 bytes	924 bytes	3200 bytes
Monitor script	Not supported	Not supported	3200 bytes

In cases where a Linux converted script exceeds the imposed NetWare script size limit, it is best to avoid bringing the resource online on OES 2 Linux nodes until the final cluster convert command has been run.

IMPORTANT: Because the Linux script for GroupWise exceeds the NetWare script limit, we recommend that you do not online GroupWise resources in while running in mixed-node clusters.

4.3 Comparing Script Commands for NetWare and Linux

Table 4-1 identifies some of the NetWare cluster load and unload script commands that the Cluster Translation Library script searches for and the Linux commands that it replaces them with (unless the commands are deleted).

Table 4-1 *Cluster Script Command Comparison*

Action	NetWare Cluster Command	Linux Cluster Command
Replace	`IGNORE_ERROR add secondary ipaddress`	`ignore_error add_secondary_ipaddress`
Replace	`IGNORE_ERROR del secondary ipaddress`	`ignore_error del_secondary_ipaddress`
Replace	`del secondary ipaddress`	`ignore_error del_secondary_ipaddress`
Replace	`add secondary ipaddress`	`exit_on_error add_secondary_ipaddress`
Delete	`IGNORE_ERROR NUDP`	(deletes the entire line)
Delete	`IGNORE_ERROR HTTP`	(deletes the entire line)
Replace	`nss /poolactivate=`	`nss /poolact=`
Replace	`nss /pooldeactivate=`	`nss /pooldeact=`
Replace	`mount volume_name VOLID=number`	`exit_on_error ncpcon mount volume_name=number`
Replace	`NUDP ADD clusterservername ipaddress`	`exit_on_error ncpcon bind --ncpservername=ncpservername --ipaddress=ipaddress`
Replace	`NUDP DEL clusterservername ipaddress`	`ignore_error ncpcon unbind --ncpservername=ncpservername --ipaddress=ipaddress`
Delete	`CLUSTER CVSBIND`	(deletes the entire line)
Delete	`CIFS`	(deletes the entire line)

4.4 Comparing Master IP Address Scripts

IMPORTANT: You can modify the Master IP Address of the cluster only after the cluster conversion is finalized. For information, see "Moving a Cluster or Changing IP Addresses of Cluster Nodes and Resources" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

4.4.1 Master IP Address Resource Load Script

This section provides examples of the master IP address resource load scripts on NetWare and Linux.

- "NetWare" on page 24
- "Linux" on page 24

NetWare

```
IGNORE_ERROR set allow ip address duplicates = on
IGNORE_ERROR CLUSTER CVSBIND ADD BCCP_Cluster 10.1.1.175
IGNORE_ERROR NUDP ADD BCCP_Cluster 10.1.1.175
IGNORE_ERROR add secondary ipaddress 10.1.1.175
IGNORE_ERROR HTTPBIND 10.1.1.175 /KEYFILE:"SSL CertificateIP"
IGNORE_ERROR set allow ip address duplicates = off
```

Linux

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs

ignore_error add_secondary_ipaddress 10.1.1.175 -np

exit 0
```

4.4.2 Master IP Address Resource Unload Script

This section provides examples of the master IP address resource unload scripts on NetWare and Linux.

- "NetWare" on page 24
- "Linux" on page 24

NetWare

```
IGNORE_ERROR HTTPUNBIND 10.1.1.175
IGNORE_ERROR del secondary ipaddress 10.1.1.175
IGNORE_ERROR NUDP DEL BCCP_Cluster 10.1.1.175
IGNORE_ERROR CLUSTER CVSBIND DEL BCCP_Cluster 10.1.1.175
```

Linux

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs
ignore_error del_secondary_ipaddress 10.1.1.175
exit 0
```

4.5 Comparing NSS Pool Resource Scripts

- Section 4.5.1, "NSS Pool Resource Load Script," on page 25
- Section 4.5.2, "NSS Pool Resource Unload Script," on page 25

4.5.1   NSS Pool Resource Load Script

This section provides examples of the NSS pool resource load scripts on NetWare and Linux.

- ◆ "NetWare" on page 25
- ◆ "Linux" on page 25

NetWare

```
nss /poolactivate=HOMES_POOL
mount HOMES VOLID=254
CLUSTER CVSBIND ADD BCC_CLUSTER_HOMES_SERVER 10.1.1.180
NUDP ADD BCC_CLUSTER_HOMES_SERVER 10.1.1.180
add secondary ipaddress 10.1.1.180
CIFS ADD .CN=BCC_CLUSTER_HOMES_SERVER.OU=servers.O=lab.T=TEST_TREE.
```

Linux

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs
exit_on_error nss /poolact=HOMES_POOL
exit_on_error ncpcon mount HOMES=254
exit_on_error add_secondary_ipaddress 10.1.1.180

exit_on_error ncpcon bind --ncpservername=BCC_CLUSTER_HOMES_SERVER
--ipaddress=10.1.1.180

exit 0
```

4.5.2   NSS Pool Resource Unload Script

This section provides examples of the NSS pool resource unload scripts on NetWare and Linux.

- ◆ "NetWare" on page 25
- ◆ "Linux" on page 25

NetWare

```
del secondary ipaddress 10.1.1.180
CLUSTER CVSBIND DEL BCC_CLUSTER_HOMES_SERVER 10.1.1.180
NUDP DEL BCC_CLUSTER_HOMES_SERVER 10.1.1.180
nss /pooldeactivate=HOMES_POOL /overridetype=question
CIFS DEL .CN=BCC_CLUSTER_HOMES_SERVER.OU=servers.O=lab.T=TEST_TREE.
```

Linux

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs

ignore_error ncpcon unbind --ncpservername=BCC_CLUSTER_HOMES_SERVER
--ipaddress=10.1.1.180

ignore_error del_secondary_ipaddress 10.1.1.180
ignore_error nss /pooldeact=HOMES_POOL
exit 0
```

4.6 Comparing File Access Protocol Resource Script Commands

4.6.1 File Access Protocol Resource Load Scripts

This section provides examples of the file access protocol commands for load scripts on NetWare and Linux.

NetWare

Protocol	Script Command for Load Scripts
NCP	`NUDP ADD NCS1_P1_SERVER 10.10.10.194`
Novell AFP	`AFPBIND ADD NCS1_P1_SERVER 10.10.10.204`
Novell CIFS	`CIFS ADD .CN=NCS1_P1_SERVER.O=novell.T=CLUSTER.`

Linux

Protocol	Script Command for Load Scripts

NCP	`# mount the NCP volume`
	`exit_on_error ncpcon mount $NCP_VOLUME=VOL_ID,PATH=$MOUNT_POINT`
	
	`exit_on_error ncpcon bind --ncpservername=NCS1_P1_SERVER --ipaddress=10.10.10.194`

Novell AFP	`exit_on_error cluster_afp.sh add NCS1_P1_SERVER 10.10.10.204`
Novell CIFS	`exit_on_error novcifs --add --vserver=.CN=NCS1_P1_SERVER.O=novell.T=TREE-188. --ip-addr=<virtual_server_ip_address>`

4.6.2 File Access Protocol Resource Unload Scripts

This section provides examples of the Novell AFP commands for unload scripts on NetWare and Linux.

NetWare

Protocol	Script Command for Unload Scripts
NCP	`NUDP DEL NCS1_P1_SERVER 10.10.10.194`
Novell AFP	`AFPBIND DEL NCS1_P1_SERVER 10.10.10.204`
Novell CIFS	`CIFS DEL .CN=NCS1_P1_SERVER.O=novell.T=TREE-188.`

Linux

Protocol	Script Command for Unload Scripts

NCP	`ignore_error ncpcon unbind --ncpservername=NCS1_P1_SERVER --ipaddress=10.10.10.194`
	
	`# dismount the NCP volume`
	`ignore_error ncpcon dismount $NCP_VOLUME`

Novell AFP	`ignore_error cluster_afp.sh del NCS1_P1_SERVER 10.10.10.204`
Novell CIFS	`ignore_error novcifs --remove --vserver=.CN=NCS1_P1_SERVER.O=novell.T=TREE-188. --ip-addr=<`*`virtual_server_ip_address`*`>`

4.7 Customizing the Translation Syntax for Converting Load and Unload Scripts

The syntax for load and unload scripts differs for NetWare and Linux platforms. A script that is valid for the NetWare platform is not necessarily recognized on the OES 2 Linux platform. In a mixed-platform cluster, a cluster resource's load script and unload script must be translated to use the proper syntax when running on the NetWare or Linux nodes. Translation occurs in-memory while the cluster contains mixed-platform nodes, and during the final cluster conversion of the cluster from NetWare to Linux.

The translation between NetWare and Linux versions of the load and unload scripts is performed by the Cluster Translation Library script (`/opt/novell/ncs/bin/clstrlib.py`). The normal translations in the library are described in . If the commands in a cluster resource's load or unload scripts are not part of the translation library, the cluster resource can end up in a comatose state.

Beginning in OES 2 SP2, Novell Cluster Services allows you to customize the translation syntax that is used for load and unload scripts in mixed-platform situations by defining new syntax translations in the `/var/opt/novell/ncs/customized_translation_syntax` file that you create. The `clstrlib.py` script reads the additional translation syntax from the syntax file, and processes them in addition to the normal translations in the Cluster Translation Library.

The customized translation supports using Python regular expressions to search for strings (`(\S+)`), digits (`(\d+)`), and other data types. The search is case insensitive.

NOTE: Refer to information about Python regular expressions to learn how to create searches for other data types.

In a text editor, create the `customized_translation_syntax` file with the additional translation syntax that you need, then copy the file to the `/var/opt/novell/ncs/` folder on each Linux node in the mixed-platform cluster.

The syntax file should contain a four-line command for each type of translation you want to add:

```
<R|D>
search_string
[replacement_data]
[preceding_data]
```

You can have any number of the four-line commands in the file. Use the following guidelines for creating the syntax translation commands:

Line	Description
`<R|D>`	Specify whether to replace (R) all matches or to delete (D) all matches of the data type you are looking for in the load or unload script.
`search_string`	Specify the search string that is used to locate a line in the scripts.
`[replacement_data]`	Specify the replacement data used to replace a line matched by the search performed.
	Leave this line empty if there is no replacement.
`[preceding_data]`	Specify a line to be inserted before the first line that is matched by the search performed.
	Leave this line empty if there is no line to be inserted before the first matching line.

The following four lines are sample code for a search command in the customized_translation_syntax file. The fourth line is intentionally left empty.

```
R
^\s*bind\s+IP\s+(\S+)\s(\S+)\s+address=(\d+\.\d+\.\d+\.\d+)
ignore_error bind IP \1 \2 address=\3\n
exit_on_error ip addr add \3/32 dev \1
```

You can use the `cluster convert preview` command to verify that the customized_translation_syntax file is working as intended for a particular resource.

1 On the master node, open a terminal console as the `root` user, then enter

```
cluster convert preview resource_name
```

4.8 Adding Monitoring Scripts on Linux

The monitoring script is available for cluster resources in Novell Cluster Services for OES 2 Linux. However, in a mixed-node cluster, the cluster resources that you cluster migrate from NetWare to Linux will not have a monitoring script during the conversion process. A monitoring script for each of the former NetWare cluster resources is created automatically after you perform the final cluster conversion step as described in Section 5.4, "Finalizing the Cluster Conversion," on page 35.

Sample monitoring scripts are available in the cluster resource templates for the various services on OES 2 Linux.

There might not be a monitoring script for iPrint. Print Manager has a built-in monitoring and restart capability. Using the cluster resource monitoring script might cause a conflict.

5 Converting NetWare 6.5 Clusters to OES 2 Linux

You can use a rolling cluster conversion to convert a Novell Cluster Services cluster from NetWare 6.5 SP8 to Novell Open Enterprise Server (OES) 2 SP3 Linux. This section describes how to prepare for and perform the conversion, and how to manage the temporarily mixed cluster during the conversion.

5.1 Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)

Performing a rolling cluster conversion from NetWare 6.5 to OES 2 Linux lets you keep your cluster up and running and lets your users continue to access cluster resources while the conversion is being performed.

During a rolling cluster conversion, one server is converted to Linux while the other servers in the cluster continue running NetWare 6.5. Then, if desired, another server can be converted to OES 2 Linux, and then another, until all servers in the cluster have been converted to Linux. You can also leave the cluster as a mixed NetWare and Linux cluster.

IMPORTANT: Before you begin, ensure that you system meets the requirements and caveats in "Planning for Novell Cluster Services" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*. Also verify that your system meets the requirements in Chapter 2, "Planning the Cluster Conversion," on page 11.

If you are converting from NetWare on physical servers to OES 2 Linux on virtual servers (guest operating systems running on Xen virtual machines), you can use the same methods and processes as those used on a physical server. No additional changes or special configuration is required. For information, see "Mixed Physical and Virtual Node Clusters" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

To perform a rolling cluster conversion from NetWare 6.5 to OES 2 Linux:

1 Before you add the first Linux node to the NetWare cluster, if the NetWare cluster uses an SBD, ensure that the device (or devices) being used by the SBD are marked as *Shareable for Clustering*.

   You can use NSSMU or iManager to mark the SBD devices as shareable. It is not necessary to bring the cluster down when changing the device attribute to *Shareable for Clustering*.

Using NSSMU:

   1a Log in to the master node of the NetWare cluster as the administrator user.

   1b Enter nssmu at the server console prompt.

   1c In the NSSMU main menu, select *Devices*.

   1d In the *Devices* list, highlight the device that contains the SBD partition, then press F5 to select it.

   1e Press F6 to mark the device as *Shareable for Clustering*.

   1f If the SBD partition is mirrored, repeat Step 1d and Step 1e to also mark the mirror device as *Shareable for Clustering*.

   1g Press Esc to exit NSSMU.

2 Make a note of the services that are installed on the server you are converting.

   You might want to install the same components on the Linux node if they are available.

3 On the NetWare server that you want to convert to Linux, remove eDirectory.

   You can do this by running NWConfig, then selecting *Product Options > Directory Options <install NDS> > Remove Directory Services from this server*.

4 Bring down the NetWare server you want to convert to Linux.

   Any cluster resources that were running on the server should fail over to another server in the cluster.

   You can also manually cluster migrate the resources to another server in the cluster prior to bringing down the server. This prevents the resources from failing back to the node after you have completed the upgrade.

5 In eDirectory, remove (delete) the Cluster Node object, the Server object, and all corresponding objects relating to the downed NetWare server.

   Depending on your configuration, there could be 10 or more objects that relate to the downed NetWare server.

6 Run DSRepair from another server in the eDirectory tree to fix any directory problems.

   If DSRepair finds errors or problems, run it multiple times until no errors are returned.

7 Install OES 2 Linux on the server, but do not install the Novell Cluster Services option in OES Services at this time.

   You can use the same server name and IP address that were used on the NetWare server. This is suggested, but not required.

   See the *OES 2 SP3: Installation Guide* for more information.

8 Set up and verify SAN connectivity for the Linux node.

   Consult your SAN vendor documentation for SAN setup and connectivity instructions.

9 Install Novell Cluster Services and add the node to your existing NetWare 6.5 cluster.

   9a Log in to the OES 2 Linux server as the root user.

   9b In YaST, select *Open Enterprise Server > OES Install and Configuration*.

   9c On the Software Selection page under *OES Services*, click *Novell Cluster Services*.

      Services that you have already installed are indicated by a blue check mark in the status check box next to the service.

      For information about other install options, see "Installing Novell Cluster Services during a OES 2 Linux Installation" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

   9d Click *Accept* to begin the install, then click *Continue* to accept changed packages.

9e Continue through the installation process until you reach the Novell Open Enterprise Server Configuration page.

9f Reconfigure *LDAP Configuration of Open Enterprise Services* to specify the credentials for the container administrator user (or non-administrator user) who has the eDirectory rights needed to install Novell Cluster Services.

For information about what rights are needed, see "Assigning Install Rights for Container Administrators (or Non-Administrator Users)" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

9f1 On the Novell Open Enterprise Server Configuration page under *LDAP Configuration of Open Enterprise Services*, click the *disabled* link to enable re-configuration.

The sentence changes to *Reconfiguration is enabled*.

9f2 Click the *LDAP Configuration of Open Enterprise Services* link to open the LDAP Configuration page.

9f3 Specify the following values:

- ◆ **Admin name and context:** The user name and context (in LDAP form) of the container administrator user (or non-administrator user) who has the eDirectory rights needed to install Novell Cluster Services.

- ◆ **Admin password:** The password of the container administrator (or non-administrator user).

9f4 Click *Next*.

The install returns to the Novell Open Enterprise Server Configuration page.

9g On the Novell Open Enterprise Server Configuration page under *Novell Cluster Services*, click the *disabled* link to enable configuration.

The sentence changes to *Configuration is enabled*.

9h Click the *Novell Cluster Services* link to open the Novell Cluster Services Configuration page.

9i Click *Existing Cluster*, specify the fully distinguished name (FDN) of the cluster, then click *Next*.

IMPORTANT: Use the comma format illustrated in the example. Do not use dots.

This is the name and eDirectory context of the cluster that you are adding this server to.

9j Select the IP address that Novell Cluster Services will use for this node.

Some servers have multiple IP addresses. This step lets you choose which IP address Novell Cluster Services uses.

9k Deselect *Start Services Now*.

9l Click *Next*, then continue through the rest of the OES installation.

9m After the install is complete, use the Software Updater (or other update methods) to install any patches from the OES 2 Linux patch channel and any EVMS patches from the SUSE Linux Enterprise Server 10 SP4 or later patch channel.

10 If you have a shared disk system on the cluster, enter `sbdutil -f` at the Linux terminal console to verify that the node can see the cluster (SBD) partition on the SAN.

`sbdutil -f` also tells you the device on the SAN where the SBD partition is located.

11 Reboot the operating system.

12 (Optional) Manually migrate the resources that were on the old server nodes to this Linux server.

Some cluster resources for services on NetWare cannot be used on Linux. For information, see Chapter 2, "Planning the Cluster Conversion," on page 11.

The resources can automatically fail back if all of the following apply:

◆ The failback mode for the resources was set to Auto.

◆ You used the same node number for this Linux server that was used for the former NetWare server.

This only applies if this Linux server is the next server added to the cluster.

◆ This Linux server is the preferred node for the resources.

5.2   Adding New OES 2 Linux Nodes to Your NetWare Cluster

You can add new OES 2 Linux cluster nodes to your existing NetWare 6.5 cluster without bringing down the cluster.

1 Before you add the first Linux node to the NetWare cluster, if the NetWare cluster uses an SBD, ensure that the device (or devices) being used by the SBD are marked as *Shareable for Clustering*.

You can use NSSMU or iManager to mark the SBD devices as shareable. It is not necessary to bring the cluster down when changing the device attribute to *Shareable for Clustering*.

Using NSSMU:

1a Log in to the master node of the NetWare cluster as the administrator user.

1b Enter `nssmu` at the server console prompt.

1c In the NSSMU main menu, select *Devices*.

1d In the *Devices* list, highlight the device that contains the SBD partition, then press F5 to select it.

1e Press F6 to mark the device as *Shareable for Clustering*.

1f If the SBD partition is mirrored, repeat Step 1d and Step 1e to also mark the mirror device as *Shareable for Clustering*.

1g Press Esc to exit NSSMU.

2 Install OES 2 Linux on the new node, but do not install the Novell Cluster Services option from OES Services at this time.

See the "*OES 2 SP3: Installation Guide*" for more information.

3 Set up and verify SAN connectivity for the new OES 2 Linux node.

Consult your SAN vendor documentation for SAN setup and connectivity instructions.

4 Install Novell Cluster Services on the OES 2 Linux node.

5 After the install, add the server to the NetWare cluster:

For detailed instructions, see "Adding a Node to an Existing Cluster" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

5a Log in to the OES 2 Linux server as the `root` user.

5b In YaST, select *Open Enterprise Server > OES Install and Configuration*.

5c On the Software Selection page under *OES Services*, verify that *Novell Cluster Services* is selected, then click *Accept* to continue to the configuration.

Services that you have already installed are indicated by a blue check mark in the status check box next to the service.

5d On the Software Configuration page, enable Novell Cluster Services configuration, then click the Novell Cluster Services link.

5e When you are prompted, enter the credentials of the LDAP administrator that is configured for the server.

5f On the Novell Cluster Services Configuration page, add the server to the existing NetWare cluster, then click *Next*.

Parameter	Action
New or Existing Cluster	Select *Existing Cluster*.
Cluster FDN	Browse to select the Cluster object for the NetWare cluster, or type the cluster fully distinguished name.
	For example:
	cn=nwcluster,ou=clusters,o=mycompany

5g On the Proxy User Configuration page, specify one of the following users as the NCS Proxy user, then click *Next*.

  ◆ **OES Common Proxy User:** If the OES Common Proxy User is enabled in eDirectory, the *Use OES Common Proxy User* check box is automatically selected and the *NCS Proxy User Name* and *Specify NCS Proxy User Password* fields are populated with the credentials of the OES Common Proxy User.

  ◆ **LDAP Admin User:** If the OES Common Proxy User is disabled in eDirectory, the *Use OES Common Proxy User* check box is automatically deselected and the *NCS Proxy User Name* and *Specify NCS Proxy User Password* fields are populated with the credentials of the LDAP Admin user. The fields are also automatically populated with the LDAP Admin credentials if you deselect the *Use OES Common Proxy User* check box.

  ◆ **Another Administrator User:** Deselect the *Use OES Common Proxy User* check box, then specify the credentials of an administrator user.

You can reset the default settings by clicking *Back* to return to the Novell Cluster Services Configuration page, then clicking *Next* to continue again to the Proxy User Configuration page.

5h On the Configuration page, specify the following parameters, then click *Finish*.

Parameter	Action
IP address of this node	If the server has multiple network adapters, select the IP address that Novell Cluster Services will use for this node.
Start Cluster Services now	Deselect the check box. You will start Novell Cluster Services software on this node manually for the conversion process.

5i On the OES Server Configuration page, scroll down to the Novell Cluster Services entry to review the summary of the Cluster Services configuration, then click *Next*.

Wait while Novell Cluster Services is configured.

5j After the configuration is completed, click *Finish* to exit the OES Configuration page, then exit YaST.

6 If you have a shared disk system on the cluster, enter `sbdutil -f` at the Linux terminal console to verify that the node can see the cluster (SBD) partition on the SAN.

`sbdutil -f` will also tell you the device on the SAN where the SBD partition is located.

7 Start cluster software by going to the `/etc/init.d` folder and running `novell-ncs start`.

You must be logged in as root to run `novell-ncs start`.

8 Add and assign cluster resources to the new Linux cluster node.

For information, see "Configuring Preferred Nodes for a Resource" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

5.3 Removing NetWare Nodes from the Cluster

After your OES cluster nodes are set up and resources have been migrated to them from the NetWare nodes, you are ready to remove the NetWare nodes from the cluster.

To remove the NetWare nodes from the cluster:

1 Log in to the NetWare node as the administrator user.

2 Check the cluster status and verify that all cluster resources have been migrated to the Linux nodes.

`cluster status`

3 Remove the NetWare node from the cluster by entering

`cluster leave`

4 Stop Novell Cluster Services from running on the NetWare node by entering

`uldncs`

5 Remove the node's Cluster Node object and the NCS attributes from its Server object.

5a In a Web browser, open iManager, then log in to the Novell eDirectory tree that contains the node you want to manage.

IMPORTANT: Log in as an administrator user who has sufficient rights in eDirectory to delete and modify eDirectory objects.

5b Delete the node's Cluster Node object from the cluster container:

5b1 Select *Directory Administration > Delete Objects*.

5b2 Browse to the Cluster container (🔵) of the cluster, locate and select the Cluster Node object (🔵) for the NetWare node in the container, then click *OK*.

5b3 On the Delete Objects page, click *OK*, then click *OK* again to confirm the deletion of the Cluster Node object.

5c Select *Directory Administration > Modify Object*, select the NetWare node's Server object, remove its NCS attributes, then click *OK* to save and apply your changes.

6 Repeat this process to remove each of the remaining NetWare nodes in the cluster.

5.4 Finalizing the Cluster Conversion

After you have converted all nodes in a former NetWare cluster to OES 2 Linux, you must finalize the conversion process by issuing the `cluster convert` command on one Linux cluster node. The `cluster convert` command moves cluster resource load and unload scripts from the files where they were stored on Linux cluster nodes into eDirectory. This enables a Linux cluster that has been converted from NetWare to utilize eDirectory like the former NetWare cluster.

WARNING: After you finalize the cluster conversion, rollback to NetWare is not supported. All of the scripts for the NetWare nodes are deleted and are no longer available.

To finalize the cluster conversion:

1 Run `cluster convert preview` *resource_name* at the terminal console of one Linux cluster node.

The `preview` option lets you view the resource load and unload script changes that will be made when the conversion is finalized. Replace *resource_name* with the name of a resource that you want to preview.

Beginning in OES 2 SP3, you can preview the information for all cluster resources by issuing the command without specifying a resource name.

`cluster convert preview`

2 Run `cluster convert commit` at the terminal console of one Linux cluster node to finalize the conversion.

The `cluster convert commit` command generates or regenerates the cluster resource templates that are included with Novell Cluster Services for Linux. In addition to generating Linux cluster resource templates, this command deletes all NetWare cluster resource templates that have the same name as Linux cluster resource templates.

The cluster resource templates are automatically created when you create a new Linux cluster, but are not created when you convert an existing NetWare cluster to Linux.

3 Update the cluster configuration on all nodes by running the cluster configuration daemon. Enter the following command as the `root` user on every node in the cluster:

`/opt/novell/ncs/bin/ncs-configd.py -init`

This removes the NetWare nodes from the list of nodes in the cluster so they are not displayed in iManager.

6 Novell AFP

Novell Apple Filing Protocol (AFP) for Linux is available beginning in OES 2 SP1 Linux.

After you set up Novell AFP on the Linux node and before you finalize the NetWare-to-Linux conversion, use the AFP function in the Migration Tool to convert the configuration. For information, see "Migrating AFP from NetWare to OES 2 SP3 Linux " in the *OES 2 SP3: Migration Tool Administration Guide*.

The commands in the scripts are also different. After the migration, modify the load and unload scripts on the Linux server. For information, see Section 4.6, "Comparing File Access Protocol Resource Script Commands," on page 26.

AFP on Linux supports NCP cross-protocol file locking, which allows NCP, AFP, and CIFS users to access files on an NSS volume concurrently without data corruption by locking the files across protocols. On Linux, the cross-protocol file locking parameter for NCP Server is disabled by default. It must be enabled on each node in the cluster if you plan to give both NCP users and AFP users access to NSS volume in the cluster. See "Configuring Cross-Protocol File Locks for NCP Server" in the *OES 2 SP3: NCP Server for Linux Administration Guide*.

7 Apache HTTP Server

The Apache HTTP Server is an open source Web server developed by the Apache Software Foundation (http://www.apache.org). On a Novell Open Enterprise Server (OES) 2 SP3 cluster, you can use Novell Cluster Services to cluster the Web content for your personalized Web sites. The Apache service is not cluster aware and must run on each server in the cluster.

This section describes key considerations for configuring the Apache virtual hosts for your personalized Web sites. The scripts for your existing Apache cluster resources and the resource's node preferences must be manually modified to use Apache commands for Linux when you convert a cluster from NetWare to Linux.

7.1 Prerequisites for Reusing NetWare Apache Cluster Resources on Linux

The following setup is required to reuse the Apache cluster resources from your NetWare cluster:

- When you install OES services on the server, Novell-ready versions of Apache 2 (64-bit) and Tomcat 5 are automatically installed and configured. You manually manage Apache services with the Apache configuration files. Use a text editor to create or modify the configuration files, then gracefully restart the Apache HTTP Server daemon (rcapache2 graceful) to apply the changes.

  > **WARNING:** Do not install the Linux *Web and LAMP* pattern. Do not use the *HTTP Server* option in YaST to configure Apache or virtual host settings on an OES server. It overwrites essential OES settings for Apache and breaks the existing setup. For recovery information, see Section 7.4.1, "Apache Server Errors after Using the HTTP Server Option in YaST," on page 53.

- To reuse an NSS pool cluster resource that contains your Web content, you must install Novell Storage Services for Linux on each OES node in the cluster. For information, see "Installing and Configuring Novell Storage Services" in the *OES 2 SP3: NSS File System Administration Guide for Linux*.

- If you host multiple Web sites on a single server on NetWare, you must configure an Apache virtual host for each Web site on one OES node, then copy the configuration files to every OES node in the cluster. For information, see Section 7.2.3, "Creating and Configuring a Virtual Host for Each Web Site," on page 43.

- In a Novell Cluster Services cluster, the directories you specify in the `DocumentRoot` directive and any `Alias` directives for a virtual host should reside on the same cluster resource so they can fail over together. The location that contains the Web content should be a directory on the volume, not the root of the volume. Specify the full Linux path of the directory. Linux paths are case-sensitive.

  For example, Novell Cluster Services scripts assume that the pool's volumes are mounted in the default NSS location of `/media/nss/<volume_name>`. The full Linux path of the `/www/mysite` path on an NSS volume `APACHEVOL` is

  `/media/nss/APACHEVOL/www/mysite`

- The following permissions are required:
  - The user `wwwrun` must be the file owner of the Web site directories and files. The group can be the system `root` or the Apache group `www`.
  - If Web content resides on an NSS volume, the following additional permissions are required:
    - Enable the eDirectory user `wwwrun` and group `www` with Linux User Management (LUM). OES automatically creates and LUM-enables the user and group when you install the first OES server in a Novell eDirectory tree.
    - Assign the eDirectory user `wwwrun` as a file system trustee with Read and File Scan rights for the directory you specify in the `DocumentRoot` directive in the virtual host configuration file.

    These permissions are also required for Web content hosted on an NCP-enabled Linux volume.

For information about the default OES setup for Apache and setting up virtual hosts, see Section 7.2, "Using Apache HTTP Server on OES Servers," on page 40.

7.2 Using Apache HTTP Server on OES Servers

When you set up OES services on the server, Novell-ready versions of Apache 2 HTTP Server software and Tomcat 5 are automatically installed. Apache and the OES Welcome Web site are automatically configured for non-secure port 80 and secure port 443. The Apache HTTP Server daemon (`httpd2`) starts automatically on server restart.

To set up personalized Web sites, you must manually create a virtual host configuration file for each Web site. Templates for secure SSL virtual host and non-secure virtual host configuration files are available in the `/etc/apache2/vhosts.d/` directory. Use a text editor to create or modify the configuration files, then gracefully restart the Apache HTTP Server daemon (`rcapache2 graceful`) to apply the changes.

WARNING: Do not use the *HTTP Server* option in YaST to configure Apache or virtual host settings on an OES server. It overwrites essential OES settings for Apache and breaks the existing setup. For recovery information, see Section 7.4.1, "Apache Server Errors after Using the HTTP Server Option in YaST," on page 53.

7.2.1 Understanding the Default OES Setup of Apache HTTP Server

When you install services from the OES Add-On disk, the following Apache setup is configured:

Apache and Tomcat Installation

Novell-ready versions of Apache 2 HTTP Server software and Tomcat 5 are automatically installed when you set up OES services on a server. OES installs the Apache `prefork` mode or `worker` mode packages, depending on the OES services you install. If OES installs Apache Prefork packages, Apache should run in `prefork` mode rather than `worker` mode. OES sets the preference for Prefork mode with the `APACHE_MPM="prefork"` directive in the `/etc/sysconfig/apache2` global Apache configuration file.

Apache HTTP Server Configuration

OES configures Apache settings in the `/etc/sysconfig/apache2` global configuration file and the `/etc/apache2/conf.d/oes_httpd.conf` configuration file.

The `/etc/sysconfig/apache2` configuration file controls some global settings of Apache, such as modules to load, additional configuration files to include, server flags to apply when the Apache HTTP Server daemon (`httpd2`) is started, and flags that should be added to the command line.

Apache User wwwrun and Group www

Apache uses the user `wwwrun` identity to serve files to clients of your Web site. OES and Apache configure the following during the OES installation:

◆ The Apache installation creates a local group `www` and user `wwwrun` on the server.

You configure the user `wwwrun` as the file owner of the Web site's main directory and files.

◆ OES creates the group `www` and the user `wwwrun` in Novell eDirectory when you install an OES server in an eDirectory tree for the first time. The user `wwwrun` is added as a member of the group `www`. The user `novlxsrvd` is also created and added to the group `www`.

◆ OES enables the group `www` and its member users (`wwwrun` and `novlxsrvd`) for Linux with Linux User Management (LUM).

If your Web site is hosted on an NSS volume or an NCP-enabled Linux volume, you must assign the eDirectory user `wwwrun` as a file system trustee of the Web site's main directory, and give the trustee Read and File Scan rights.

For information about changing the file owner or configuring a file system trustee, see Section 7.2.7, "Configuring Permissions for the Web Site DocumentRoot Directory," on page 47.

Virtual Host for the OES Welcome Web Site

OES automatically configures the OES Welcome Web site in the `/etc/opt/novell/httpd/conf.d/welcome-apache.conf` file. Listening is set up on port 80 in the `/etc/apache2/listen.conf` file. Port 80 is opened in the firewall. The Apache HTTP Server daemon (`httpd2`) starts automatically on server restart.

Apache serves the Welcome page for the OES server at

http://<*server_dns_or_ip_address*>

Secure SSL Virtual Host for the Default Web Site

OES automatically configures a default secure virtual host (`_default_:443`) in the `/etc/apache2/vhost.d/vhost-ssl.conf` file. It sets up listening on port 443 in the `/etc/apache2/listen.conf` file. It opens port 443 in the firewall. The default virtual host configuration is automatically loaded first. It is also used when a domain name does not match a virtual host configuration. The default virtual host defines a custom log `/var/log/apache2/ssl_request_log` to capture events for SSL requests. An `Include` directive in the `/etc/apache2/vhost.d/vhost-ssl.conf` file automatically loads the virtual hosts that are defined in the `/etc/opt/novell/httpd/sslconf.d/*.conf` files.

Secure SSL Virtual Host for the Novell iManager Web Site

If you install Novell iManager on an OES server, the iManager installation automatically configures a secure virtual host for iManager and Novell Portal Services (NPS) in the `/etc/opt/novell/iManager/nps-Apache.conf` file. A symbolic link in the `/etc/opt/novell/httpd/sslconf.d/` directory points to the `nps-Apache.conf` file. This allows the virtual host to be automatically included along with the default secure virtual host when Apache is restarted.

Aliases are defined in the `nps-Apache.conf` file to hit the Web site with any of the following URLs:

https://<*server_dns_or_ip_address*>/nps/iManager.html

https://<*server_dns_or_ip_address*>/nps

https://<*server_dns_or_ip_address*>/iManager.html

7.2.2 Manually Configuring Apache

On OES servers and Novell Open Workgroup Suite (NOWS) Small Business Edition (SBE) servers, you must manually configure Apache settings, OES virtual hosts, and virtual hosts for your personalized Web sites. Use a text editor to create or modify the configuration files, then gracefully restart the Apache HTTP Server daemon (`rcapache2 graceful`) to apply the changes.

WARNING: Do not use the *HTTP Server* option in YaST to manage Apache or the virtual host settings on an OES server. It overwrites essential OES settings for Apache and breaks the existing setup. For recovery information, see Section 7.4.1, "Apache Server Errors after Using the HTTP Server Option in YaST," on page 53.

For information about using the configuration files to manage your Apache HTTP Server and virtual hosts, see "Configuring Apache Manually" (https://www.suse.com/documentation/sles11/book_sle_admin/data/sec_apache2_configuration.html#sec_apache2_configuration_manually) in the *SLES 11 Administration Guide* (http://www.suse.com/documentation/sles11/book_sle_admin/data/book_sle_admin_pre.html).

7.2.3 Creating and Configuring a Virtual Host for Each Web Site

On Linux, the Apache HTTP server can serve multiple universal resource identifiers (URIs) from a single instance of Apache running on the server. That is, multiple Web sites, such as www.example.com and www.example.net, can be run from a single Web server. Each Web site is referred to as a *virtual host*. Virtual hosts can be name based, IP based, or port based.

You can set up personalized Web sites by manually creating a virtual host configuration file for each Web site. Templates for secure SSL virtual host and non-secure virtual host configuration files are available in the `/etc/apache2/vhosts.d/` directory.

When you cluster-enable the Web content by using Novell Cluster Services, use the IP address of the cluster resource for the virtual host. This ensures that the Web site traffic is directed to the cluster node where the Web content cluster resource is currently active. Do not use the server node's IP address or the master IP address of the cluster. Specify the Linux file path to the Web content.

On OES servers, you create and configure a separate virtual host configuration file for each Web site that you want to host in the cluster. The following procedure provides basic information about setting up the file. Refer to other sections in this document to learn about the key settings that are available. For detailed information, see the Apache Virtual Host documentation Web site (http://httpd.apache.org/docs/2.2/vhosts/).

1 Choose an OES node in the cluster, then log in as the `root` user.

2 Create a copy of the virtual host template file in the `/etc/apache2/vhosts.d/` directory.

The `/etc/apache2/vhosts.d/` directory contains a basic template (`vhost.template`) for a non-secure virtual host and an SSL template (`vhost-ssl.template`) for a secure virtual host.

3 Rename the file with a name for your virtual host, and add the `.conf` file extension, such as `mysite-Apache.conf`.

4 Open the virtual host file in a text editor and configure the virtual host settings for your personalized Web site:

4a If the Web content is clustered with Novell Cluster Services, set the `VirtualHost` directive to the IP address or DNS host name assigned to the cluster resource:

`<VirtualHost hostname>`

For example, if the DNS name is `mysite.example.com`, specify `mysite` as the `VirtualHost`.

`<VirtualHost mysite>`

4b Set the value of the `DocumentRoot` directive to the Linux path of the directory where you placed your Web content, and specify the directory options for this location.

The target directory must contain an `index.html` file, which is the root document for the virtual host. Specify the Linux path to the directory. For example, if you place your Web content in an NSS volume path `APACHEVOL:\www\mysite`, the Linux path is `/media/nss/APACHEVOL/www/mysite`.

```
DocumentRoot "/media/nss/APACHEVOL/www/mysite"

<Directory  "/media/nss/APACHEVOL/www/mysite">
   # Possible options are "None", "All" or any combination of:
   # Indexes Includes FollowSymLinkx SymLinksifOwnerMatch ExecCGI MultiViews

   Options Indexes MultiViews
   AllowOverride None
   Order allow,deny
   Allow from all
</Directory>
```

4c Configure the host settings as desired for other directives in the file.

The minimum settings for a non-secure Web site are shown in the following example:

```
<VirtualHost mysite>

DocumentRoot "/media/nss/APACHEVOL/www/mysite"

ServerAdmin  mysite-admin@example.com
ServerName   mysite.example.com

ErrorLog     /var/log/apache2/error_log
TransferLog  /var/log/apache2/access_log
#CustomLog   /var/log/apache2/mysite.example.com-access_log combined


HostnameLookups On

UseCanonicalName On

ServerSignature Off

<Directory  "/media/nss/APACHEVOL/www/mysite">
   # Possible options are "None", "All" or any combination of:
   # Indexes Includes FollowSymLinkx SymLinksifOwnerMatch ExecCGI MultiViews

   Options Indexes MultiViews
   AllowOverride None
   Order allow,deny
   Allow from all
</Directory>

</VirtualHost>
```

4d (Optional) Specify alias paths in the virtual host configuration file.

For example, specify an alias for a Support Web location that has a `support` directory at the same level as `mysite`. Include the `Alias` and `Directory` directives before the `</VirtualHost>` close tag.

```
Alias /support "/media/nss/APACHEVOL/www/support"
<Directory "media/nss/APACHVOL/www/support">
   Options Indexes MultiViews
   AllowOverride None
   Order deny,allow
   Allow from all
</Directory>
```

For information about alias paths that require LDAP authentication, see .

4e Save the virtual host configuration file.

5 (Optional) In the `/etc/apache2/listen.conf` file, add a `Listen` directive that specifies the IP address that you assigned to your cluster-enabled pool, and specify the port to use.

OES configures Apache to listen on non-secure port 80 by default. It listens for all traffic.

6 Make the Web sites visible on your network or to the world:

   6a Add the site name and IP address resolution to your DNS server to make them visible.

   6b If you use a non-standard port, open the port in the node's firewall.

   6c If the traffic is from outside the firewall, open the port in the network firewall.

7 Gracefully restart the Apache HTTP Server daemon to apply the virtual host configuration:

```
rcapache2 graceful
```

Each `.conf` file is automatically included in the Apache configuration when you restart Apache.

8 Set up the virtual host for each of the remaining nodes:

   8a Log in to the next node as the `root` user.

   8b Copy the virtual host configuration file (such as `/etc/apache2/vhosts.d/mysite-apache.conf`) to the next node.

   8c Create a local Linux path to the Web site that you specified in the `DocumentRoot` directive and to any paths you specified in `Alias` directives, then make the user `wwwrun` the owner of the directory and its contents.

   When Apache is started or restarted, it looks for the paths specified in your Web site's virtual host configuration file. If a path does not exist, Apache reports an error but it loads the virtual host. Users access the site via the IP address or DNS name of the cluster resource, so Web content is served only on the node where the resource is active.

   When a cluster resource is not active on a node, the volume subdirectory (such as `APACHEVOL`) in the `/media/nss` directory is normally removed, and the path to the Web site does not exist. Creating the local path allows Apache to find the path even when the resource is not active on the node, and no error is reported when Apache loads. When the resource is taken offline, NSS does not remove the volume directory because it is now non-empty (it contains the local paths you create). The local path should not contain files. To add or remove Web content files, access the NSS volume via the IP address of the cluster resource.

   Enter the following commands for the Web site path and alias paths. The `chown` command changes the group to the Apache `www` group unless the group is the `root` user.

```
mkdir -p /media/nss/<volume_name>/<path>
```

```
chown wwwrun:www /media/nss/<volume_name>/<path>
```

   For example, enter

```
mkdir -p /media/nss/APACHEVOL/www/mysite
```

```
chown wwwrun:www /media/nss/APACHEVOL/www/mysite
```

```
mkdir -p /media/nss/APACHEVOL/www/support
```

```
chown wwwrun:www /media/nss/APACHEVOL/www/support
```

   8d Open a terminal console as the `root` user, then gracefully restart Apache:

```
rcapache2 graceful
```

   8e Repeat these steps on each of the remaining nodes in turn.

IMPORTANT: Any time that you make changes to the virtual host configuration file, you must copy the modified file to every node in the cluster, and gracefully restart Apache on each node.

7.2.4 Requiring Strong Ciphers

We recommend that you secure your Web solution by requiring strong ciphers when the client is negotiating the connection in the SSL handshake.

We recommend that you enable only the strongest ciphers: RSA, HIGH, and SSLv2.

To enable strong ciphers and disable weak ciphers:

1 In a text editor, modify the `/etc/apache2/vhosts.d/vhost-ssl.conf` file to require strong ciphers. Modify the default settings by placing a plus sign (+) before RSA, HIGH, and SSLv2, and placing an exclamation mark (!) before the weaker ciphers:

```
# SSL Cipher Suite:
SSLCipherSuite ALL:!ADH:!EXPORT56:RC4+RSA:+HIGH:!MEDIUM:!LOW:+SSLv2:!EXP:!eNULL
```

2 Gracefully restart Apache on the server:

```
rcapache2 graceful
```

3 Repeat this process on every Linux node in the cluster.

You can alternatively copy the Apache SSL configuration file (`/etc/apache2/vhosts.d/vhost-ssl.conf`) to every Linux node in the cluster, and then restart Apache.

7.2.5 Configuring an SSL Certificate for the Server

OES automatically configures secure SSL communications for a default virtual host (`_default_:443`). SSL is enabled in the Apache global configuration file (`/etc/sysconfig/apache2`) with the following directive:

```
APACHE_SERVER_FLAGS="SSL"
```

The default SSL configuration is defined in the `/etc/apache2/vhosts.d/vhost-ssl.conf` file. It uses an `INCLUDE` directive for the `/etc/opt/novell/httpd/sslconf.d/*.conf` files. This target directory contains the configuration files (or symbolic links to them) for OES virtual hosts that require SSL, such as the `nps-Apache.conf` file that is used for the Novell iManager tool.

By default, OES sets up an SSL certificate file and key file for the server by using certificates generated in Novell eDirectory. Table 7-1 identifies the location of the SSL certificate and key files that are referenced by the `SSLCertificateFile` and `SSLCertificateKeyFile` directives in the `/etc/apache2/vhosts.d/vhost-ssl.conf` file.

Table 7-1 *Default OES Server Certificates*

OES Server Certificate File	Location
SSL Certificate File	`/etc/ssl/servercerts/servercert.pem`
SSL Certificate Key File	`/etc/ssl/servercerts/serverkey.pem`

IMPORTANT: If you use SSL, set up a server certificate for each virtual host unless you use a wildcard certificate.

If you modify the content or location of the certificate and key files, gracefully restart the Apache HTTP Server daemon (`rcapache2 graceful`) to apply the new values.

7.2.6 Configuring Apache to Listen on Multiple Ports

The `Listen` directive in the `/etc/apache2/listen.conf` file tells the Apache HTTP Server to accept incoming requests on the specified port or an address-and-port combination. If the directive specifies only a port, the server listens to the given port on all interfaces. If the directive specifies an IP address and port combination, the server listens on the given port and network interface.

By default, OES configures Apache to listen on non-secure port 80 and secure port 443 in the `/etc/apache2/listen.conf` file. If a firewall is used on the server, port 80 and port 443 are automatically opened in the firewall. The ports are not bound to a particular IP address, so Apache responds to requests on all IP interfaces on the server.

```
Listen 80


<IfDefine SSL>
    <IfDefine !NOSSL>
  <IfModule mod_ssl.c>

      Listen 443

  </IfModule>
    </IfDefine>
</IfDefine>
```

You can configure multiple `Listen` directives to specify multiple IP addresses and ports. The server responds to requests from any of the listed addresses and ports. For information about formats and options for the `Listen` directive, see the *Listen Directive* (http://httpd.apache.org/docs/2.2/mod/mpm_common.html#listen) in the *Apache MPM Common Directives* collection.

If you configure non-standard ports for your personalized Web sites, you must add a `Listen` directive in the `/etc/apache2/listen.conf` file, then gracefully restart the Apache HTTP Server daemon (`rcapache2 graceful`) to apply the changes. Ensure that you open the port in the firewall.

7.2.7 Configuring Permissions for the Web Site DocumentRoot Directory

Apache uses the user `wwwrun` identity to serve files to clients of your Web site. You must configure permissions for the Web site content that allow Apache to serve the files to client users.

- "Setting the User wwwrun as the Owner of the Web Site's Directory and Files" on page 47
- "Setting User wwwrun as a File System Trustee of the Web Site's Directory" on page 48

Setting the User wwwrun as the Owner of the Web Site's Directory and Files

The user `wwwrun` must be the file owner of the Web site's main directory and files.

1 Log in as the `root` user, and open a terminal console.

2 Change directory to go to the directory that contains the main directory of your Web site. This is the directory you specify as the `DocumentRoot` in the virtual host configuration file.

For example, if the `DocumentRoot` is /media/nss/APACHEVOL/www/mysite, enter

```
cd /media/nss/APACHEVOL/www
```

3 Change the owner of the Web site's directory and files to user `wwwrun`. Enter:

```
chown -R wwwrun:www mysite
```

This recursively modifies the owner to user `wwwrun` for the directory and the subdirectories and files it contains. It changes the group to `www` unless the group is set to the `root` user.

4 In a file browser, view the directory's properties to verify that the owner was changed.
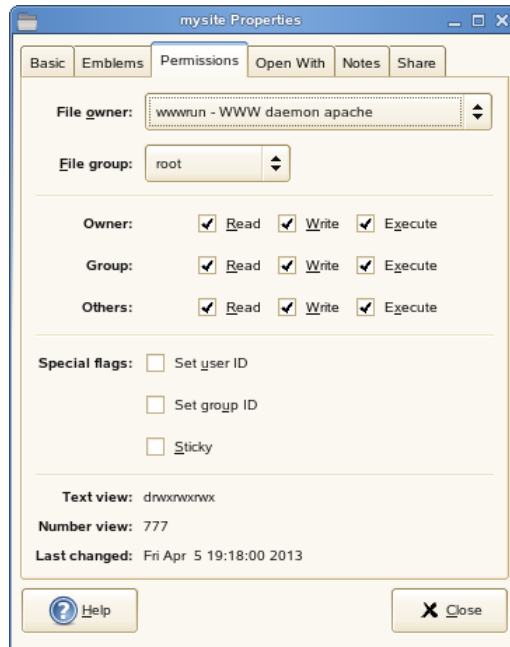
You can also use the `ls -al <path>` command to list the directory and view the owner, group, and permissions.

Setting User wwwrun as a File System Trustee of the Web Site's Directory

OES automatically creates the user `wwwrun` and group `www` in Novell eDirectory. Both are LUM-enabled. You can verify their configuration by using the *Directory Administration* option and *Linux User Management* option in Novell iManager.

If your Web site is hosted on an NSS volume or an NCP-enabled Linux volume, you must assign the eDirectory user `wwwrun` as a file system trustee of the Web site's main directory, and give the trustee Read and File Scan rights. You can also set the `www` group as a trustee with Read and File Scan rights.

1 Log in to Novell iManager as an administrator user.

2 In the iManager toolbar, click the *View Objects* icon.

3 In the Tree view, select the volume, then browse the file system to locate the directory that contains your Web site's content.

4 Select the check box next to the directory, then select *Actions > Properties.*

5 On the Properties page, select *Rights*.

6 Click the *Add Trustee* browse icon to open the *Object Selector*.

7 Locate and select the user `wwwrun`, then click *OK*.

The user `wwwrun` is added as a trustee with the default Read and File Scan rights.
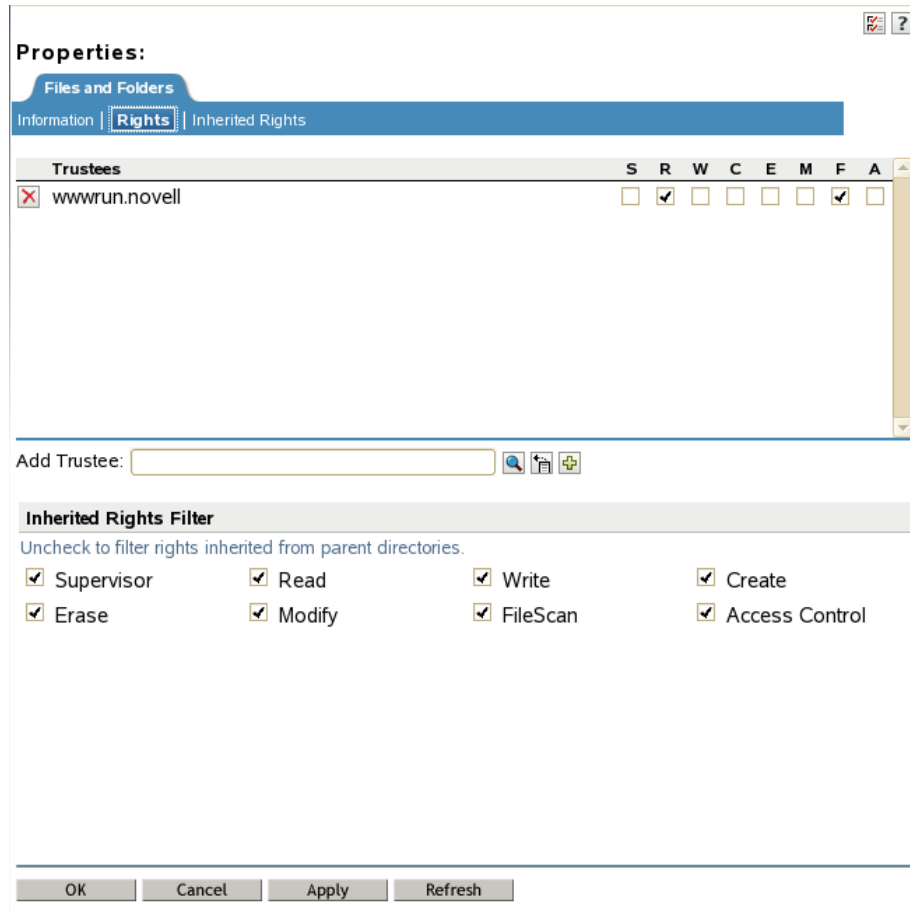
8 Click *Apply* or *OK* to save the changes.

7.2.8 Configuring a Web Location that Requires LDAP Authentication

If you have documents or a location that requires restricted Web access, you can set up Apache to enforce eDirectory authentication and force the authentication to be done over `https`. This solution can be used on individual directories, URLs, or the entire Apache server.

The following example creates a single secure location so that any document that is referenced under the directory requires authentication. For example, the URL www.example.com can have public access, while the URL www.example.com/secure and documents it contains require authentication. Authentication should be done over a secure connection (https) rather than a non-secure connection (http). All `http` attempts are redirected to `https` for the given location.

1 Ensure that the `rewrite` module is enabled in the `/etc/sysconfig/apache2` global configuration file. OES enables this module by default.

Open the `/etc/sysconfig/apache2` file in a text editor, and verify that `rewrite` is listed in the modules defined in the `APACHE_MODULES` directive.

2 Configure the permissions for the user `wwwrun` on the target directory:

2a Change the owner to the Apache user `wwwrun`:

```
chown -R wwwrun:www /media/nss/APACHEVOL/www/secure
```

This changes the group to the Apache group `www` unless the group is the `root` user.

2b For an NSS volume or an NCP-enabled Linux volume, configure the user `wwwrun` as a file system trustee of the `/media/nss/APACHEVOL/www/secure` directory, and give the trustee Read and File Scan rights.

For information, see "Setting User wwwrun as a File System Trustee of the Web Site's Directory" on page 48.

3 In a text editor, create a copy of the `/etc/apache2/vhosts.d/vhosts-ssl.template` file to create a `secure.conf` configuration file.

4 Allow for all `http` requests for the `/secure` alias to be redirected to `https`. Add the following directives to the `secure.conf` file:

```
RewriteEngine On

RewriteRule ^/secure https://%{SERVER_NAME}/secure [L,R]
```

5 If the location that contains secure information exists outside the `DocumentRoot` directory, create an alias to the directory. Add the following line to the `secure.conf` file:

```
Alias /secure "/<path_to_directory>/secure"
```

For a cluster resource, the secure directory ideally resides on the same clustered volume as the Web site, and at the same directory level as `DocumentRoot` for the Web site:

```
Alias /secure "/media/nss/APACHEVOL/www/secure"
```

6 Under the `Alias` directive, add the option for LDAP authentication under the `Directory` directive in the `secure.conf` file. Specify the IP address or DNS name of the Web site's cluster resource.

```
<Directory "media/nss/APACHVOL/www/secure">
  Options Indexes MultiViews
  AllowOverride None
  Order deny,allow
  Allow from all
  AuthType Basic
  AuthName "Protected"
  require valid-user
  AuthLDAPAuthoritative On
  AuthLDAPURL ldaps://<cluster_resource_ip_address_or_dns_name>/o=corp?uid?sub
</directory>
```

7 Save the `/etc/apache/vhosts.d/secure.conf` file.

8 Open a terminal console as the `root` user, then gracefully restart the Apache daemon:

```
rcapache2 graceful
```

9 Verify that Apache is able to start.

If there are errors, make corrections in the configuration file, then restart the Apache daemon.

10 In a Web browser, go to the Web site with `http` and verify that you are redirected to `https`, and that you can authenticate against the `/secure` alias.

7.2.9 Starting, Stopping, or Restarting the Apache Daemon

The Apache HTTP Server program runs as a daemon (`httpd2`) that executes continuously in the background to handle requests. OES configures the daemon to start automatically on system restart. You must restart Apache to apply any changes you make to the Apache or virtual host configuration files, or to add new virtual host configuration files. A graceful restart does not disrupt the service.

In a cluster, you manually copy the virtual host configuration files for clustered personalized Web sites to every node in the cluster. When Apache starts on each node, it reads the configuration file and is available to serve the site when the resource is active on the node. You do not add Apache commands in the resource's load and unload scripts. All requests to a clustered Web site are sent to the DNS name or IP address of the cluster resource, and not to a specific node. The site's requests are served by the Apache process that runs on the node where the cluster resource is currently active.

To start, stop, or restart the Apache daemon, use the `/usr/sbin/rcapache2` commands in Table 7-2:

Table 7-2   */usr/sbin Commands*

Command	Description
rcapache2 start	Starts the `httpd2` parent process. The parent process reads its configuration files and opens log files, and then spawns the child processes to serve hits. OES configures the Apache daemon to start automatically on server restart.
rcapache2 stop	Causes the parent process to immediately attempt to kill all of its child processes. This can take several seconds. The parent exits after all child processes have exited. Any requests in progress are terminated, and no further requests are served.
rcapache2 graceful-stop	Causes the parent process to advise its child processes to exit after their current request (or to exit immediately if they are not serving anything). The parent removes its PID file and ceases listening on all ports. The parent continues to run, and monitors child processes that are handling requests. The parent exits after the child processes complete the pending requests and exit, or when a timeout period has elapsed (as specified by the `GracefulShutdownTimeout`). If the timeout is reached, any remaining child processes are automatically sent the TERM signal to force them to exit, and any requests in progress are terminated.
rcapache2 restart	Causes the parent process to immediately kill its child processes like the `stop` option, but the parent does not exit. It re-reads its configuration files, and re-opens any log files. Then it spawns a new set of child processes and continues serving hits.
rcapache2 graceful	Causes the parent process to advise the child processes to exit after their current request (or to exit immediately if they are not serving anything). The parent re-reads its configuration files and re-opens its log files. As each child dies, the parent replaces it with a child from the new generation of the configuration, which begins serving new requests immediately.

7.2.10 Viewing the Apache Log Files

The following Apache log files are located in the `/var/log/apache2/` directory:

`access_log`

```
error_log
rcapache2.out
rewrite_log
ssl_request_log
```

You can also specify custom logs by adding the `CustomLog` directive to your virtual host configuration file. For information about formatting the custom log, see *Apache Module mod_log_config* (http://httpd.apache.org/docs/2.2/mod/mod_log_config.html).

7.3 Converting the Apache Cluster Resource

Before you convert the Apache Cluster Resource to run on Linux servers, ensure that your servers meet the Prerequisites for Reusing NetWare Apache Cluster Resources on Linux.

1 Configure the virtual hosts for your personalized Web sites on each Linux node in the cluster as described in Section 7.2, "Using Apache HTTP Server on OES Servers," on page 40.

2 In iManager, offline the NSS pool cluster resource from a NetWare node.

3 In iManager, modify the load and unload scripts to remove the Apache start and stop commands.

4 In iManager, cluster migrate the cluster resource to a Linux node. The new load script applies when the resource loads.

5 Offline the Apache cluster resource.

Leave the resource offline until all Linux nodes have been added and the cluster conversion has been finalized.

6 In iManager, set up the preferred nodes for the Apache cluster resource to include only Linux nodes in the cluster.

7 Finalize the steps to complete the cluster conversion, then commit the conversion.

8 Online the Apache cluster resource.

```
cluster online <resource_name> [node_name]
```

9 In a Web browser, access your Web site to ensure that the files are available.

If you get permission errors, check the following:

- ◆ The user `wwwrun` should be set as a file system trustee of the directory that is used as the `DocumentRoot` for the Web site. Assign Read and File Scan rights to the trustee.
- ◆ The user `wwwrun` should be set as the file owner of the Web content.

For information, see Section 7.2.7, "Configuring Permissions for the Web Site DocumentRoot Directory," on page 47.

10 Cluster migrate the resource to each node in the cluster in turn, and access the Web site from a Web browser to ensure the site is accessible from each of its preferred nodes.

11 Cluster migrate the resource to its most preferred node.

7.4 Troubleshooting the Apache HTTP Server

This section describes some issues you might experience with Apache HTTP Server and provides suggestions for resolving or avoiding them. For additional troubleshooting information, see the Novell Technical Support Knowledgebase (http://www.novell.com/support).

- Section 7.4.1, "Apache Server Errors after Using the HTTP Server Option in YaST," on page 53
- Section 7.4.2, "Files Downloaded from NetStorage Are 0 Bytes," on page 53

7.4.1 Apache Server Errors after Using the HTTP Server Option in YaST

If you use the *HTTP Server* option in YaST to manage Apache or virtual hosts, the option can overwrite essential OES settings and load the wrong modules, which breaks the default Apache HTTP Server setup. For information, see TID 7002562 (http://www.novell.com/support/kb/doc.php?id=7002562) in the Novell Knowledgebase.

If you have used the *HTTP Server* option in YaST and Apache is no longer working, recover the OES default Apache HTTP Server setup by doing the following:

1 As the `root` user, open the `/etc/sysconfig/apache2` file in a text editor and modify the following directives:

- **Proxy module:** In the `APACHE_MODULES=` line in the file, ensure that the `proxy` module is listed before the `proxy_ajp` module. For example (some modules are not listed for ease of reading the example):

  `APACHE_MODULES="cgi dir rewrite ssl proxy proxy_ajp ssl"`

- **SSL module:** In the `APACHE_MODULES=` line in the file, ensure that the `ssl` module is listed. For example (some modules are not listed for ease of reading the example):

  `APACHE_MODULES="cgi dir rewrite ssl proxy proxy_ajp ssl"`

- **Prefork mode:** If OES installs Apache Prefork packages, Apache should run in `prefork` mode rather than `worker` mode. To force this, ensure that the `APACHE_MPM=""` line is set to `"prefork"`. For example:

  `APACHE_MPM="prefork"`

- **SSL:** Ensure secure communications by enabling the SSL flag. For example:

  `APACHE_SERVER_FLAGS="SSL"`

2 Gracefully restart Apache to apply the changes. As the `root` user, enter the following command at a console prompt:

`rcapache2 graceful`

7.4.2 Files Downloaded from NetStorage Are 0 Bytes

After you lock down ciphers for an Apache HTTP Server to use only the strongest SSL ciphers, all of the files downloaded from NetStorage are 0 bytes in size.

NetStorage might not work as expected if you lock down Apache HTTP Server to disallow low and medium SSL ciphers. Try allowing medium SSL cipher settings to see if that is sufficient, then add back low cipher settings if necessary.

For other SSL cipher configuration options, see *SSL/TLS Strong Encryption: How-To* (http://httpd.apache.org/docs/2.2/ssl/ssl_howto.html) at Apache.org.

7.5 Additional Information

The latest Apache documentation is available on the Apache HTTP Server Version 2.2 Documentation Web site (http://httpd.apache.org/docs-2.2/).

8 Novell Archive and Version Services

On NetWare, Archive and Versioning Services uses a MySQL database. On Novell Open Enterprise Server (OES) 2 Linux, it uses a PostgreSQL database. You can migrate the data from the MySQL database to the PostgreSQL database on Linux. You must configure a new cluster resource on a shared Linux POSIX file system for the PostgreSQL database.

The load script commands are also different on OES 2 Linux. For information, see "Archive Load and Unload Scripts" in the *OES 2 SP3: Novell Archive and Version Services 2.1 Administration Guide for Linux*.

- ◆ Section 8.1, "Prerequisites," on page 55
- ◆ Section 8.2, "Copying Database Files from MySQL to PostgreSQL," on page 55

8.1 Prerequisites

Mixed-node operations are not supported by Novell Archive and Version Services. Before you begin the conversion, ensure that Archive and Version Services is not running on the NetWare servers in the cluster.

8.2 Copying Database Files from MySQL to PostgreSQL

1 Install Archive and Version Services on an OES 2 Linux node in the cluster.

2 Install Archive and Version Services on a a second OES 2 Linux node in the cluster.

3 Using database migration tools, migrate the data in the MySQL database on NetWare to the PostgreSQL database on of the Linux nodes.

4 Cluster migrate the shared NSS pool resource that contains the volumes that were being archived from the NetWare server to a Linux node.

5 Remove the NetWare nodes from the cluster and finish the cluster conversion process.

6 On the OES 2 Linux cluster, set up Archive and Version Services as described in "Configuring Archive and Version Service for Novell Cluster Services" in the *OES 2 SP3: Novell Archive and Version Services 2.1 Administration Guide for Linux*.

7 On the Linux node where the primary NSS pool resources are active, use the *Clusters* plug-in in iManager to create an Archive Versioning cluster resource.

8 Copy the database files from the single-server location (`/var/opt/novell/arkmanager/data`) to the shared Linux POSIX volume that you created when you set up Archive and Version Services for clustering in Step 7.

   Use the `cp -a` command at a terminal console prompt to copy all files and retain the permissions.

9 Change the ownership of the new database location on the shared volume by entering the following at a terminal console prompt:

   ```
   chown -R arkuser:arkuser_prggrp  /shared/datapath
   ```

10 Edit the `/etc/opt/novell/arkmanager/conf/arkdatadir.conf` file to change the database location to new shared path.

11 Edit the `/opt/novell/arkmanger/bin/pg_restart.sh` file to change the line that starts the PostgreSQL database to the following:

```
su arkuser -c "postmaster -D /shared/datapath -h 127.0.0.1 -p 5432 -i"
```

12 Start Archive and Version Services by entering

```
rcnovell-ark start
```

You should see Archive and Version Services and the PostgreSQL database starting.

9 eDirectory Server Certificates

Novell Certificate Server provides two categories of services: Certificate Authority (CA) and Server Certificates. The Certificate Authority services include the Enterprise CA and CRL (Certificate Revocation List). Only one server can host the CA, and normally that same server hosts the CRLs if they are enabled (although if you move the CA to a different server, the CRLs usually stay on the old server). The CA and CRL services are not cluster-enabled in either NetWare or OES 2 Linux, and therefore, there are no cluster-specific tasks for them.

Novell Certificate Server provides a Server Certificates service for NetWare and Linux. The service is not clustered. However, clustered applications that use the server certificates must be able to use the same server certificates on whichever cluster node they happen to be running. Use the instructions in the following sections to set up Server Certificate objects in a clustered environment to ensure that your cryptography-enabled applications that use Server Certificate objects always have access to them.

The eDirectory Server Certificate objects are created differently in OES 2 Linux and cannot be directly reused from the NetWare server. The differences and alternatives for setting up certificates on Linux are described in the following sections:

- Section 9.1, "Server Certificate Changes in OES 2 Linux," on page 57
- Section 9.2, "Using Internal Certificates in a Cluster," on page 58
- Section 9.3, "Using External Certificates in a Cluster," on page 58

9.1 Server Certificate Changes in OES 2 Linux

When you install NetWare or OES 2 Linux in an eDirectory environment, the Server Certificate service can create certificates for eDirectory services to use. In addition, custom certificates can be created after the install by using iManager or command line commands.

For NetWare, all applications are integrated with eDirectory. This allows applications to automatically use the server certificates created by Novell Certificate Server directly from eDirectory. In a NetWare cluster, you might have copied the Server Certificate objects to all nodes in the cluster using backup and restore functions as described in "Server Certificate Objects and Clustering" (http://www.novell.com/documentation/crt33/crtadmin/data/a2ebopb.html#acebe5n) in the *Novell Certificate Server 3.3.2 Administration Guide* (http://www.novell.com/documentation/crt33/crtadmin/data/a2ebomw.html).

For OES 2 Linux, many applications (such as Apache and Tomcat) are not integrated with eDirectory and therefore, cannot automatically use the certificates created by Novell Certificate Server directly from eDirectory. By default, these services use self-signed certificates, which are not in compliance with the X.509 requirements as specified in RFC 2459 and RFC 3280.

To address the difference, Novell Certificate Server offers an install option for OES 2 Linux called *Use eDirectory Certificates* that automatically exports the default eDirectory certificate *SSL Certificate DNS* and its key pair to the local file system in the following files:

```
/etc/ssl/servercerts/servercert.pem
/etc/ssl/servercerts/serverkey.pem
```

9.2   Using Internal Certificates in a Cluster

Recent versions of Novell Certificate Server create default certificates that allow you to specify an alternative IP address or DNS address by adding it in the Subject Alternative Name extension. This requires that your DNS service be configured to reflect the cluster IP/DNS address as the default (or first) address. If the DNS service is set up correctly, the cluster applications can use the default certificates without needing any administration.

IMPORTANT: If the DNS service is not set up correctly, then you must use the process described for external certificates in "Using External Certificates in a Cluster" on page 58.

For OES 2 Linux clusters using the internal certificate method, ensure that the DNS service is configured to use the cluster IP/DNS address. During the OES 2 Linux install, select the *Use eDirectory Certificates* option so that Novell Certificate Server automatically creates the *SSL Certificate DNS* certificate with the correct IP/DNS address. By selecting the Use eDirectory Certificates option during the install and using the cluster IP/DNS address, clustered applications should be able to access the certificates without needing further configuration for the Server Certificate object.

9.3   Using External Certificates in a Cluster

External (third-party) certificates create a Server Certificate object that includes the cluster's IP and/or DNS address. Create a backup of this certificate. For each server in the cluster, create a Server Certificate object with the same name by importing the previously created backup certificate and key pair to a location on that server. This allows all of the servers in the cluster to use and share the same certificate and key pair. After all cluster nodes have the certificate, configure the cluster applications to use the server certificate.

IMPORTANT: This cluster task can also be used for sharing internal certificates on the cluster nodes. In early versions of Novell Certificate Server, this was the only option available.

For information about exporting and using eDirectory Server Certificates for External Services, see "Using eDirectory Certificates with External Applications" (http://www.novell.com/documentation/crt33/crtadmin/data/bh9x78f.html) in the *Novell Certificate Server 3.3.2 Administration Guide* (http://www.novell.com/documentation/crt33/crtadmin/data/a2ebomw.html).

For OES 2 Linux clusters using the external certificate method, the solution is more complicated than for internal certificates. You must create the certificate for each server in the cluster just as you did for NetWare. You must also create a configuration on the SAS:Service object for each server so that the common certificate is automatically exported to the file system where the non-eDirectory enabled applications can use it.

10 Novell CIFS

Novell CIFS for Linux is available beginning in OES 2 SP1 Linux.

After you set up Novell CIFS on the Linux node and before you finalize the NetWare-to-Linux conversion, use the CIFS function in the Migration Tool to convert the configuration. For information, see "Migrating CIFS from NetWare to OES 2 SP3 Linux" in the *OES 2 SP3: Migration Tool Administration Guide*.

The commands in the scripts are also different. After the migration, modify the load and unload scripts on the Linux server. For information, see Section 4.6, "Comparing File Access Protocol Resource Script Commands," on page 26.

CIFS on OES 2 SP1 Linux does not support NCP cross-protocol file locking.

Beginning in OES 2 SP2 Linux, CIFS supports NCP cross-protocol file locking, which allows NCP, AFP, and CIFS users to access files on an NSS volume concurrently without data corruption by locking the files across protocols. On Linux, the cross-protocol file locking parameter for NCP Server is enabled by default. It must be enabled on each node in the cluster if you plan to give both NCP users and CIFS users access to an NSS volume in the cluster. See "Configuring Cross-Protocol File Locks for NCP Server" in the *OES 2 SP3: NCP Server for Linux Administration Guide*.

Beginning in OES 2 SP3 Linux, CIFS supports the merged view for Novell Dynamic Storage Technology (DST) shadow volumes built with NSS volumes. Wait until the cluster conversion is complete before attempting to set up DST shadow volumes in the OES 2 SP3 Linux cluster.

11 Novell Distributed File Services VLDB

The Novell Distributed File Services volume location database (VLDB) `.dat` file format is the same on both NetWare and Linux. The shared NSS volume that contains the `.dat` file can be cluster migrated to the Linux server.

Use one of these two methods for migrating the VLDB from NetWare to Linux:

- Section 11.1, "Cluster Migrating the Shared NSS Volume for the VLDB," on page 61
- Section 11.2, "Adding a Linux Server as a Replica Site," on page 62

11.1 Cluster Migrating the Shared NSS Volume for the VLDB

Use this method if you want to use the same shared disk where the VLDB is currently stored.

1 For each Linux node where you expect to run the VLDB service, install Novell Storage Services and any of its dependent services on the Linux node, then add it to the mixed cluster that you are converting.

2 For each of the Linux nodes, assign the node's nssadmin user as a trustee of the container that is configured as the Management Context for the VLDB, and give the user at least the `Read` and `Compare` rights to the [All Attribute Rights] property.

IMPORTANT: If the Management Context is configured to use the container that contains a node's Server object, the nssadmin User object for that server is a already a trustee of the container and has the `Supervisor` right. Do not modify the existing rights settings for this nssadmin User object when you add rights for the [All Attribute Rights] property.

    2a In iManager, select *Rights > Modify Trustees*.

    2b Select the container that is configured as the Management Context, then click *OK*.

    2c Click *Add Trustee*, select the nssadmin User object, then click *OK*.

    The nssadmin User object is in the same container as its server. The user name format is *servname*admin.*context*. For example, if the server name is server1.ou1.mycompany, then *server1*admin.*ou1.mycompany* is the nssadmin user name.

    2d Click *Assigned Rights* for the selected nssadmin User object.

    2e Assign the *Read* and *Compare* rights to the *[All Attribute Rights]* property, then click *Done*.

    2f Click *Apply* to save and apply the changes.

    2g Repeat Step 2c through Step 2f for each of the Linux nodes where you expect to run the VLDB service.

3 Cluster migrate the DFS cluster resource from NetWare to Linux.

4 On the Linux node where the VLDB is active, offline the DFS cluster resource.

5 Remove the NetWare clusters from the cluster by using the `cluster leave` command, then finish the cluster conversion.

This automatically updates the basic cluster commands in the cluster resource scripts.

6 Using the *Clusters* plug-in in iManager, modify the load script of the DFS cluster resource to change the `vldb` command to the Linux format. For example, change it from

```
vldb /dir=vldbpath
```

to

```
vldb -dir /vldbpath
```

7 Online the cluster resource.

8 Run a VLDB repair to ensure that the database is correct.

11.2 Adding a Linux Server as a Replica Site

Use this method if you want to use a different shared disk for the VLDB on Linux. You can do this by adding a DFS replica site on Linux.

1 Install OES 2 Linux on the server that you want to add to the cluster. Ensure that Novell Storage Services and any of its dependent services are installed.

2 Assign the node's nssadmin user as a trustee of the container that is configured as the Management Context for the VLDB, and give the user at least the `Read` and `Compare` rights to the `[All Attribute Rights]` property.

IMPORTANT: If the Management Context is configured to use the container that contains a node's Server object, the nssadmin User object for that server is a already a trustee of the container and has the `Supervisor` right. Do not modify the existing rights settings for this nssadmin User object when you add rights for the `[All Attribute Rights]` property.

2a In iManager, select *Rights > Modify Trustees*.

2b Select the container that is configured as the Management Context, then click *OK*.

2c Click *Add Trustee*, select the nssadmin User object, then click *OK*.

The nssadmin User object is in the same container as its server. The user name format is *servname*admin.*context*. For example, if the server name is `server1.ou1.mycompany`, then *server1*admin.*ou1.mycompany* is the nssadmin user name.

2d Click *Assigned Rights* for the selected nssadmin User object.

2e Assign the *Read* and *Compare* rights to the *[All Attribute Rights]* property, then click *Done*.

2f Click *Apply* to save and apply the changes.

3 Create a shared NSS pool and volume on the OES 2 Linux server, or create a shared Linux POSIX volume.

4 In iManager, add the Linux server as the second VLDB replica site for the DFS management context, and point to the shared NSS volume as the VLDB location.

5 Allow the VLDB data to synchronize between the NetWare replica and the Linux replica.

6 In iManager, remove the NetWare instance of the replica site.

7 Add the Linux server to the mixed-node NetWare cluster.

8 Continue with the cluster conversion as described in Section 5.1, "Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)," on page 29.

12 DHCP Server

The Novell DHCP Server for Linux is based on a standards-compliant implementation from ISC that is distributed with SUSE Linux Enterprise Server. DHCP uses a different schema on Linux to store the configuration in eDirectory.

After you set up Novell DHCP Server on the OES 2 Linux server and before you complete the cluster conversion, you can use the DHCP option for the Migration Tool to convert the configuration from NetWare to OES 2 Linux. You cannot directly reuse the data. Migrate your DHCP server data, then perform the post-migration tasks to set up the configuration in the OES 2 Linux nodes of the cluster.

12.1 Setting Up Novell DHCP on OES 2 Linux

Novell DHCP Server for OES 2 Linux supports using a shared Linux POSIX file system or a shared NSS file system for the cluster resource. Set up DHCP on the OES 2 Linux servers by using one of the following methods in the *OES 2 SP3: Novell DNS/DHCP Administration Guide*:

- "Configuring DHCP with Novell Cluster Services for the NSS File System"
- "Configuring DHCP with Novell Cluster Services for the Linux File System"

12.2 Prerequisites for Migration

For more information about prerequisites, see "Migration Requirements" for DHCP in the *OES 2 SP3: Migration Tool Administration Guide*.

12.3 Migrating the DHCP Configuration from NetWare to Linux Clusters in the Same Tree

In this scenario, both the NetWare server and the OES 2 Linux server are in the same eDirectory tree. The NetWare source server must be running NetWare 5.1 SP8 or later versions. The Linux target server must be running OES 2 SP1 (or later) Linux on either 32-bit or 64-bit hardware.

Run the DHCP function in the Migration Tool from one of the OES 2 Linux nodes. Perform the Tree Level Migration with the same Source server (tree to which NetWare clustered nodes are attached) and Target server (tree to which the Linux clustered nodes are attached). This ensures that the entire NetWare DHCP configuration data is available for OES 2 Linux DHCP.

For information, see "Migrating DHCP " in the *OES 2 SP3: Migration Tool Administration Guide*, and follow the instructions for NetWare and Linux in the same eDirectory tree.

IMPORTANT: Before starting the DHCP server on the Linux cluster, stop the DHCP server on the NetWare cluster.

12.4 Post-Migration Tasks

1 Log in as the `root` user to the OES 2 Linux node where you ran the migration, then open a terminal console

2 Online the DHCP service cluster resource by entering

```
cluster online resource_name
```

3 On the Linux node where you ran the migration:

   3a Open the `/mount_path/etc/dhcpd.conf` file in a text editor.

      Replace *mount_path* with the Linux path to the folder in the shared volume where DHCP-specific directories are created.

   3b In the `/mount_path/etc/dhcpd.conf` file, change the value for the `ldap-dhcp-server-cn` parameter to the `cn` of the migrated DHCP server, then save your changes.

   3c Copy the `migrated_server.leases` file from `/var/opt/novell/dhcp/leases/` folder or to the lease path specified in the Migration Tool to the `/mount_path/var/lib/dhcp/db/` folder, then rename it to `dhcpd.leases`.

4 Stop the DHCP server on the NetWare cluster by taking the NetWare DHCP cluster resource offline.

5 Start the DHCP server on the Linux cluster.

```
rcnovell-dhcpd start
```

13 DNS Server

You can migrate the data from the Novell DNS Server on NetWare to a Novell DNS Server on Linux after you have installed and set up DNS services on an OES 2 SP1 Linux node in the cluster. You cannot directly reuse the data.

13.1 Prerequisites for Migration

For information about prerequisites, see "Migrating DNS from NetWare to OES 2 SP3 Linux" in the *OES 2 SP3: Migration Tool Administration Guide*.

13.2 Migrating the DNS Configuration from NetWare to Linux Clusters in the Same Tree

In this scenario, both the NetWare server and the OES 2 SP1 Linux server are in the same eDirectory tree. The NetWare source server must be running NetWare 5.1 SP8 or later versions. The Linux target server must be running OES 2 SP1 Linux on either 32-bit or 64-bit hardware.

Use iManager to move the DNS server from a NetWare NCP server to an OES 2 SP1 Linux NCP server. For information see "Using iManager to Migrate Servers within the Same eDirectory Tree" in the *OES 2 SP3: Migration Tool Administration Guide*.

13.3 Post-Migration Tasks

See "Post-Migration Procedure" in the *OES 2 SP3: Migration Tool Administration Guide*.

1 Use iManager or the Java Management Console to check for the existence of the following objects:

- DNS-DHCP
- DNSDHCP-GROUP
- RootServerInfo
- DNS Server object

2 Use the Clusters plug-in for iManager to verify the Cluster load script and unload script of the DNS cluster resources.

For information, see "DNS Load and Unload Scripts" in the *OES 2 SP3: Novell DNS/DHCP Administration Guide*.

3 Start the DNS server on the OES 2 Linux cluster.

14 Novell iPrint

This section describes how to convert the iPrint cluster resource from NetWare 6.5 SP8 to OES 2 Linux.

14.1 Installing iPrint on the OES 2 Linux Nodes

Prepare the first OES 2 Linux server for use with iPrint in a cluster:

1 Install the following services on an OES 2 Linux server:

- Novell iPrint
- Novell Storage Services
- Novell Cluster Services (but do not configure at install time)

Select at least these services and any dependent services that each one requires.

2 After the install, add the server to the NetWare cluster:

For instructions, see Section 5.2, "Adding New OES 2 Linux Nodes to Your NetWare Cluster," on page 32.

14.2 Setting Up iPrint on the OES 2 Linux Nodes

Perform the steps in this section to set up iPrint and an iPrint cluster resource on the OES 2 Linux nodes in the mixed-node cluster.

14.2.1 Preparing the OES 2 Linux Nodes for iPrint

Because iPrint on NetWare and iPrint on Linux are different, cluster migrating the iPrint cluster resource from NetWare to Linux is not an option. You create a new pool cluster resource on an OES 2 Linux node that will be the iPrint cluster resource on Linux. To set up iPrint on each server, you move the iPrint configuration information from the default Linux installation path on each node to the newly created shared NSS pool resource. Later, you will move the iPrint Driver Store and Print Manager information from the NetWare resource to the OES 2 Linux resource.

1 In a Web browser, open iManager, then use the Storage role to create a new shared pool and volume on one of the OES 2 Linux servers where iPrint is installed.

This is the iPrint cluster resource that will contain the iPrint data.

For information about creating a clustered NSS pool and volume, see "Creating Cluster-Enabled Pools and Volumes" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

2 On the first OES 2 Linux node, set up clustering for iPrint on the shared NSS volume that you created in Step 1.

  2a Log in as the `root` user to the OES 2 Linux node where the shared pool resource is active, then open a terminal console.

  2b Go to the `/opt/novell/iprint/bin` folder, then run the `iprint_nss_relocate` script by entering

```
./iprint_nss_relocate -a admin_fdn -p admin_password -n nss_volume_path -l
cluster [-c <Specify Container FDN where iPrint LUM object already
exists or should be created>] [-w <Specify Container FDN where Apache LUM
objects exist>]
```

Replace *admin_fdn* with the comma-delimited fully distinguished name of the iPrint administrator user (such as `cn=admin,o=mycompany`). Replace *admin_password* with the actual password of the specified iPrint administrator user. Replace *nss_volume_path* with the Linux path (such as `/media/nss/NSSVOL1`) to the shared NSS volume where you want to relocate the iPrint configuration data.

For information about the script options, see "Setting up iPrint on an NSS File System" in the *OES 2 SP3: iPrint for Linux Administration Guide*.

For example, enter

```
./iprint_nss_relocate -a cn=admin,o=mycompany -p password -n /media/nss/
NSSVOL1 -l cluster -c o=mycompany,t=iPrint_Tree -w
o=mycompany,t=iPrint_Tree
```

  2c Review the messages displayed on the screen to confirm the data migration from the local Linux path to the shared NSS path is completed.

3 For each remaining Linux node in the cluster where iPrint is installed, set up clustering for iPrint by doing the following:

  3a Log in as the `root` user to the OES 2 Linux node where the shared pool resource is active, then open a terminal console.

  3b Cluster migrate the shared NSS pool resource from the active OES 2 Linux node to this OES 2 Linux node by entering

```
cluster migrate resource_name node_name
```

  3c Log in to the newly active OES 2 Linux node as the `root` user, then open a terminal console.

  3d Run the `iprint_nss_relocate` script as described in Step 2b, using the same values.

  3e Repeat Step 3a through Step 3d until all of the OES 2 Linux nodes are configured for iPrint.

14.2.2 Setting Up iPrint on the OES 2 Linux iPrint Cluster Resource

1 In iManager, select *iPrint > Create Driver Store*, then create a Driver Store on the OES 2 Linux node where the iPrint cluster resource is active.

For information, see "Creating a Driver Store" in the *OES 2 SP3: iPrint for Linux Administration Guide*.

Use the IP or DNS name of the shared NSS pool resource that you created in Section 14.2.1, "Preparing the OES 2 Linux Nodes for iPrint," on page 68 as the *Target Server*. For the *eDirectory Server Name*, choose an eDirectory server that holds a copy of the replica where the Printer Agents will be created.

2 In iManager, select *iPrint > Create Print Manager*, then create a Print Manager on the OES 2 Linux node where the iPrint cluster resource is active.

For information, see "Creating a Print Manager" in the *OES 2 SP3: iPrint for Linux Administration Guide*.

Use the IP or DNS name of the shared NSS pool resource that you created in Section 14.2.1, "Preparing the OES 2 Linux Nodes for iPrint," on page 68 as the *iPrint Service*. For the *eDirectory Server Name*, choose same server that you specified for the Driver Store. Deselect the *Start print manager after creation* option.

14.2.3 Setting Up Preferred Nodes for the OES 2 Linux iPrint Cluster Resource

Configure the Preferred Nodes list for the Linux shared NSS pool cluster resource to prevent an inadvertent failback of the resource to a NetWare server.

1 In iManager, click *Clusters > Cluster Manager*, then select the cluster where the Linux shared NSS pool resource is currently active.

2 Select the link for the OES 2 Linux shared NSS pool cluster resource to open its Properties page.

3 Go to the *Preferred Nodes* tab.

4 Move all of the NetWare nodes from the *Assigned Nodes* list to *Unassigned Nodes* list.

5 Click *OK* to save your changes.

14.2.4 Editing the Load and Unload Scripts for the OES 2 Linux iPrint Cluster Resource

Edit the load and unload scripts for the OES 2 Linux iPrint cluster resource.

1 Edit the load script. Add the following lines to the existing load script before the `exit 0` statement

```
ignore_error mv /media/nss/NSSVOL1/var/opt/novell/iprint/iprintgw.lpr /media/
nss/NSSVOL1/var/opt/novell/iprint/iprintgw.lpr.bak
```

NOTE: Replace `/media/nss/NSSVOL1` in the above command with your actual cluster volume mount point.

```
exit_on_error rcnovell-idsd start
exit_on_error rcnovell-ipsmd start
```

The daemons can also be started by using the file path `/etc/init.d/novell-idsd start` and `/etc/init.d/novell-ipsmd start`

2 Edit the unload script. Add the following lines to the existing unload script after the `/opt/novell/ncs/lib/ncsfuncs` statement:

```
ignore_error rcnovell-ipsmd stop
ignore_error rcnovell-idsd stop
```

The daemons can also be stopped by using the file path `/etc/init.d/novell-ipsmd stop` and `/etc/init.d/novell-idsd stop`.

3 Activate the load and unload scripts by taking the resource offline, then bringing the resource online.

14.2.5 Verifying the Status of the iPrint Setup

Verify that the iPrint cluster resource is working by cluster migrating the OES 2 Linux iPrint cluster resource to each OES 2 Linux node in turn and performing the following checks:

1 Log in as the `root` user on the OES 2 Linux node where the iPrint cluster resource is active, then open a terminal console.

2 Check the status of the Print Manager and Driver Store.

```
rcnovell-ipsmd status
```

```
rcnovell-idsd status
```

3 Test the ability of `iprntman` to authenticate the admin user (or other user given with `miggui`).

```
iprntman psm -l -u admin
```

4 Cluster migrate the iPrint cluster resource to another OES 2 Linux node by entering

```
cluster migrate resource_name node_name
```

5 Repeat this check for each OES 2 Linux node in the mixed-node cluster.

14.3 Migrating the iPrint Cluster Resource from NetWare to OES 2 Linux

After iPrint is configured for the OES 2 Linux nodes, you are ready to migrate the iPrint Driver Store and Print Manager information from the NetWare iPrint cluster resource to the OES 2 Linux iPrint cluster resource.

Perform the following steps in "Migrating an iPrint Cluster Resource" in the *OES 2 SP3: Migration Tool Administration Guide*.

1 Perform the pre-migration checks as described in "Pre-Migration iPrint Configuration" in the *OES 2 SP3: Migration Tool Administration Guide*.

2 Perform a consolidated migration of the iPrint service as described in "iPrint Consolidate Migration" in the *OES 2 SP3: Migration Tool Administration Guide*.

Start the Migration Tool from the target server (the OES 2 Linux node where the iPrint cluster resource is active).

For the source server, authenticate by using the IP address or DNS name of the NetWare iPrint cluster resource.

For the target server, authenticate by using the IP address or DNS name of the Linux iPrint cluster resource.

3 Verify that the migration was successful as described in "Verifying the Result of the iPrint Migration" in the *OES 2 SP3: Migration Tool Administration Guide*.

4 Transition the Transition end-user printing from NetWare to Linux.

- Offline the NetWare iPrint cluster resource.

- View the NetWare iPrint cluster load script's /DNSNAME value.

- Configure DNS to resolve the /DNSNAME value to the IP address of the target Linux cluster resource hosting the Print Manager.

   NOTE: The propagation of the DNS change might take time, depending on your network.

   DNSNAME is the address that the clients use to find the NetWare Print Manager. The same DNSNAME is used to find the Linux Print Manager.

- Update each of the Linux node `/etc/hosts` files to resolve to the Linux iPrint cluster IP address.

- Update the `/etc/opt/novell/iprint/conf/ipsmd.conf` PSMHostAddress value to the /DNSNAME.

- Restart the Print Manager.

5 (Optional) Perform the post-migration steps as described in "Transfer ID" and "Post Transfer ID Migration Steps " in the *OES 2 SP3: Migration Tool Administration Guide*.

For detailed information about iPrint migration requirements, pre-migration configuration, migration procedures, post-migration tasks, and troubleshooting, see "Migrating iPrint from NetWare or OES 2 Linux to OES 2 SP3 Linux" in the *OES 2 SP3: Migration Tool Administration Guide*.

14.4 Finalizing the Cluster Conversion

After your OES 2 Linux iPrint setup is working as expected, finalize the cluster conversion, as described in Section 5.4, "Finalizing the Cluster Conversion," on page 35.

14.5 Additional Information

See the following Novell Support Technical Information Documents (TIDs) for more information about migrating iPrint from NetWare to OES 2 Linux:

- *TID 7005448: Migrating an iPrint Cluster from NetWare to OES 2* (http://www.novell.com/support/viewContent.do?externalId=7005448)

- *TID 7004455:* iPrint Migration Best Practices (http://www.novell.com/support/viewContent.do?externalId=7004455)

15 **MySQL**

On Linux, you can use the MySQL 5.0.*x* software on Novell Open Enterprise Server (OES) 2 Linux that is offered under the GNU General Public License (GPL).

Configure the OES service to use MySQL 5.0.*x* on OES 2 Linux before setting up clustering for the related MySQL database.

For the Linux version of MySQL, use a procedure similar to the one on NetWare to set up a new cluster resource. Use the Linux commands for MySQL in the load and unload scripts. Use a Linux path on a shared Linux POSIX file system for the MySQL database. As a general reference, see "Configuring MySQL on Novell Clustering Services" in the *NW 6.5 SP8: Novell MySQL Administration Guide*

16 QuickFinder Server

In a Novell Cluster Services cluster, you must install QuickFinder on each node in the cluster. This registers QuickFinder Server with each of the Web servers and application servers running on each server. On OES 2 Linux, QuickFinder is installed by default in the `/var/lib/qfsearch` folder. We recommend that you use the default path. After the installation, you must set up one or more virtual search servers to enable QuickFinder Server to work in a cluster.

When the Linux setup is completed, you are ready to manually migrate settings from the NetWare cluster to the Linux cluster. Set up QuickFinder on the OES 2 Linux cluster nodes, then manually migrate QuickFinder data from a NetWare node to an OES 2 Linux node.

For information about using the QuickFinder Server Manager and other procedures for QuickFinder, see the *OES 2 SP3: Novell QuickFinder Server 5.0 Administration Guide*.

- Section 16.1, "Prerequisites," on page 75
- Section 16.2, "Setting Up QuickFinder Server on Linux Cluster Nodes," on page 75
- Section 16.3, "Migrating QuickFinder Data from NetWare to Linux," on page 76
- Section 16.4, "Post-Migration Considerations," on page 77
- Section 16.5, "Searching the Cluster Volume," on page 77

16.1 Prerequisites

Before you begin:

1 On one Linux node, create a Linux POSIX cluster resource where all of the indexes and virtual search server settings are to be stored.

For information, see "Configuring and Managing Cluster Resources for Shared Linux POSIX Volumes" in the *OES 2 SP3: Novell Cluster Services 1.8.8 Administration Guide for Linux*.

16.2 Setting Up QuickFinder Server on Linux Cluster Nodes

On each OES 2 Linux node, do the following to set up QuickFinder for Linux:

1 Cluster migrate the Linux POSIX cluster resource to the OES 2 Linux node where you want to install QuickFinder

2 Install QuickFinder on the active cluster node.

3 Create a virtual search server to enable QuickFinder Server to work in a cluster.

Give each virtual search server the same name and location. After the first server is set up, any settings that you create on the shared volume are automatically displayed.

3a On the active cluster node, open the QuickFinder Server Manager.

3b Click *Global Settings*, then click *Add New Virtual Server*.

3c In *Name*, specify the DNS name of the cluster.

3d In *Location*, specify the Linux path on the Linux POSIX cluster resource where all of the indexes and virtual search server settings will be located.

3e Click *Add*.

4 Repeat Step 1 to Step 3 for each of the nodes in the cluster.

16.3 Migrating QuickFinder Data from NetWare to Linux

Use the following steps to migrate QuickFinder Server data from a NetWare server to a corresponding Linux server. You must repeat the tasks for each NetWare server in the cluster. It assumes a one-to-one server replacement in the cluster.

WARNING: Migrating indexes and virtual search server settings from a QuickFinder Server running on NetWare to QuickFinder Server running on OES 2 Linux replaces the existing settings on the Linux server. If you want to merge your NetWare settings with the existing Linux settings, you must manually re-create the NetWare settings by using the QuickFinder Server Manager.

---

1 Open a Web browser, the access the QuickFinder Server Manager on the NetWare server.

```
http://servername/qfsearch/admin
```

2 Click *Global Settings* in the top toolbar.

3 Write down the paths for each virtual search server displayed in the *Location* column.

4 On the OES 2 Linux server where the shared volume is active, mount the NetWare server by using the `ncpmount` command.

5 Make a backup of the `/var/lib/qfsearch/SiteList.properties` file.

Ensure that you don't have a file with this name as a backup on the NetWare server.

6 Copy all `.properties` and `Cron.jobs` files from the root folder `sys:/qfsearch` on the NetWare server to `/var/lib/qfsearch` on the Linux server.

7 Copy `sys:/qfsearch/Sites` and all of its subdirectories to `/var/lib/qfsearch/Sites`.

8 Copy `sys:/qfsearch/Templates` and all of its subdirectories to `/var/lib/qfsearch/Templates`.

9 If any of the paths listed in Step 3 are not under `sys:/qfsearch` (for example, if you installed a virtual search server somewhere other than the default location), you must also copy those paths to Linux.

For example, if you have the path `sys:/SearchSites/PartnerSite`, you must copy it to the Linux server. You could copy it to `/var/opt/SearchSites/PartnerSite` or `/var/lib/qfsearch/Sites/PartnerSite`.

10 Edit all NetWare paths in `/var/lib/qfsearch/SiteList.properties` to reflect the new Linux paths.

For example, change `sys:/qfsearch` to `/var/lib/qfsearch`.

Or, as in the example in Step 9, change `sys:/SearchSites/PartnerSite` to `/var/opt/SearchSites/PartnerSite`.

Some paths might have one or two backslashes (\) that must be replaced with one forward slash (/). For example, `sys:\\qfsearch\\docs` needs to be changed to `/var/lib/qfsearch/docs`.

11 Update all NetWare paths in the properties and configuration files copied in the steps above to the Linux paths, and update any DNS names.

The following files must be updated:

```
AdminServlet.properties
Cron.jobs
Sites/Highlighter.properties
Sites/Print.properties
Sites/Search.properties
```

For each of the virtual search servers, modify the following:

- ◆ `qfind.cfg`
- ◆ Any of the above `.properties` files, if they exist.

IMPORTANT: Linux filenames are case sensitive.

The names of most properties files are mixed case, so ensure that the files copied from NetWare are the correct case. You can compare them to the `.properties.sample` files on Linux.

You might also need to update paths in templates. If you have problems such as a template not being found or some properties not being set properly, check the case of the filename.

If you modified any "file" index paths to index directories on the Linux server, that index must be regenerated.

12 After all the files have been modified, run the following commands to set the access rights and the owner and groups so that the QuickFinder engine has rights to access the files.

As the `root` user, enter

```
chown -R root:www /var/lib/qfsearch
```

```
chmod -R 770 /var/lib/qfsearch
```

13 Repeat Step 1 to Step 12 for each NetWare and Linux pair of nodes.

16.4 Post-Migration Considerations

QuickFinder Server 5.0 indexes are not compatible with previous versions of QuickFinder Server. The indexes must be regenerated, and you cannot synchronize QuickFinder Server 5.0 indexes with indexes from a previous version of QuickFinder Server (and vice-versa).

16.5 Searching the Cluster Volume

To perform a search on the shared volume after the NetWare migration is complete:

1 Open a Web browser, then enter

```
http://DNS_CLUSTER/qfsearch/search
```

QuickFinder Server sees the DNS and sends the request to the appropriate virtual search server.

17 Novell Storage Services Pools

Consider the guidelines in this section when converting Novell Storage Services (NSS) pool cluster resources from NetWare to Novell Open Enterprise Server (OES) 2 Linux.

17.1 NSS Pool Cluster Migration

In the mixed-node cluster, NSS pool cluster resources created on NetWare can be failed over or cluster migrated to nodes that are running OES 2 Linux where NSS is installed and running. Some NSS features are not available or work differently on Linux. For information, see "Cross-Platform Issues for NSS" in the *OES 2 SP3: NSS File System Administration Guide for Linux*.

Pool snapshots use different technologies on NetWare and Linux. Ensure that you delete pool snapshots for all clustered pools before you begin the cluster conversion.

17.2 NSS File System Migration to NCP Volumes or Linux POSIX File Systems

To move data from NSS file systems on NetWare to NCP volumes or to Linux POSIX file systems on Linux, you must use the OES 2 SP1 Migration tool. For information, see "Migrating File System from NetWare, OES 1 or OES 2 to OES 2 SP3 Linux" in the *OES 2 SP3: Migration Tool Administration Guide*.

17.3 Estimated Time Taken to Build the Trustee File on Linux

On Linux, NCP Server stores file system trustees and rights information in the `._NetWare/.trustee_database.xml` file at the root of each NSS volume or NCP volume. The NSS file system also stores this information in its file system metadata as it does on NetWare. This database file is updated when you:

- Add file system trustees and rights
- Delete file system trustees and rights
- Modify file system trustees and rights

When you migrate an NSS volume from NetWare to Linux, the trustee database file does not exist. NCP Server reads the trustee and rights information from the NSS file system metadata, validates the User object, and stores the settings in a `._NetWare/.trustee_database.xml` file at the root of the volume. The information collection process begins automatically when the NSS volume is mounted on the OES 2 Linux server.

Testing found that building the initial database on Linux for an existing volume takes about one minute per 50,000 storage objects. Testing was done on the following configuration for the target server:

HP DL380 G5
2 Quadcore Intel Xeon CPU E5345 @ 2.33 GHz
12 GB RAM
1 Gigabit NIC
2 HBAs with 4 paths to the EMC DMX Symmetrix Storage with 4 gigabits per second (Gbps) bandwidth

To follow the synchronization between the file system and the trustee file, look for output in the `/var/opt/novell/log/ncp2nss.log` file.

A Documentation Updates

This section contains information about documentation content changes made to information in the *Novell Cluster Services for Linux Conversion Guide* since the initial Novell Cluster Services 1.8.5 release for Novell Open Enterprise Server 2.

This document was updated on the following dates:

A.1 May 2013 Scheduled Maintenance

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

A.1.1 What's New or Changed for Novell Cluster Services

Location	Change
Section 1.1, "What's New (May 2013)," on page 9	This section is new.

A.2 April 2013 Scheduled Maintenance

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

A.2.1 What's New or Changed for Novell Cluster Services

Location	Change
Section 1.2, "What's New (April 2013)," on page 9	This section is new.

A.3 April 12, 2013

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

- Section A.3.1, "Apache HTTP Server," on page 82

A.3.1 Apache HTTP Server

Chapter 7, "Apache HTTP Server," on page 39 was updated to describe key considerations for using Apache 2 on Novell Open Enterprise Server 2 SP3 servers.

When you install OES services on the server, Novell-ready versions of Apache 2 HTTP Server and Tomcat 5 are automatically installed. Apache and the OES Welcome Web site are automatically configured for non-secure port 80 and secure port 443. The Apache HTTP Server daemon (`httpd2`) starts automatically on server restart.

To set up personalized Web sites, you must manually create a virtual host configuration file for each Web site. Templates for secure SSL virtual host and non-secure virtual host configuration files are available in the `/etc/apache2/vhosts.d/` directory. Use a text editor to create or modify the configuration files, then gracefully restart the Apache daemon (`rcapache2 graceful`) to apply the changes.

WARNING: Do not install the SUSE *Linux Web and Lamp Server* pattern. Do not use the *HTTP Server* option in YaST to manage Apache or virtual host settings on an OES server. It overwrites essential OES settings for Apache and breaks the existing setup. For recovery information, see Section 7.4.1, "Apache Server Errors after Using the HTTP Server Option in YaST," on page 53.

A.4 January 2013 Scheduled Maintenance

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

- Section A.4.1, "What's New or Changed for Novell Cluster Services," on page 83

A.4.1 What's New or Changed for Novell Cluster Services

Location	Change
Section 1.3, "What's New (January 2013)," on page 10	Added information about Novell iManager 2.7.6 and Novell Client 2 SP3 for Windows.

A.5 November 30, 2012

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

- Section A.5.1, "Novell iPrint," on page 83

A.5.1 Novell iPrint

Location	Change
Section 14.2.4, "Editing the Load and Unload Scripts for the OES 2 Linux iPrint Cluster Resource," on page 69	The daemons can also be started by using the file path `/etc/init.d/novell-idsd start` and `/etc/init.d/novell-ipsmd start`.
	The daemons can also be stopped by using the file path `/etc/init.d/novell-ipsmd stop` and `/etc/init.d/novell-idsd stop`.

A.6 April 19, 2012

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

- Section A.6.1, "Novell Storage Services Pools," on page 83
- Section A.6.2, "Planning the Conversion of Load and Unload Scripts," on page 84

A.6.1 Novell Storage Services Pools

Location	Change
Section 17.3, "Estimated Time Taken to Build the Trustee File on Linux," on page 79	To follow the synchronization between the file system and the trustee file, look for output in the `/var/opt/novell/log/ncp2nss.log` file.

A.6.2 Planning the Conversion of Load and Unload Scripts

Location	Change
Section 4.4, "Comparing Master IP Address Scripts," on page 23	You can modify the Master IP Address only after the cluster conversion is finalized.
	To follow the synchronization between the file system and the trustee file, look for output in the `/var/opt/novell/log/ncp2nss.log` file.

A.7 January 2012 Scheduled Maintenance

This guide has been updated to conform to the Novell 2012 style guidelines. Updates were made to the following sections. The changes are explained below.

- Section A.7.1, "Planning the Cluster Conversion," on page 84
- Section A.7.2, "What's New," on page 84

A.7.1 Planning the Cluster Conversion

Location	Change
Section 2.1, "Supported Conversion Paths," on page 12	The NetWare to Linux conversion is supported from NetWare 6.5 SP8 (with the latest patches applied) to OES 2 SP3 on the SUSE Linux Enterprise 10 SP4 operating system.
Section 2.2, "Supported Mixed-Node Clusters," on page 12	A mixed cluster made up of NetWare 6.5 SP7 or earlier nodes and OES 2 SP3 Linux nodes is not supported.

A.7.2 What's New

Location	Change
Chapter 1, "What's New for Novell Cluster Services Cluster Conversion from NetWare to Linux," on page 9	This section is new.

A.8 August 2011 Scheduled Maintenance

The OES 2 SP3 August 2011 Maintenance Patch provides support for OES 2 SP3 on the SUSE Linux Enterprise 10 SP4 operating system. Links were updated to point to the latest SLES 10 documentation.

A.9 June 3, 2011

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

- Section A.9.1, "Converting NetWare 6.5 Clusters to OES 2 Linux," on page 85

A.9.1 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
"Removing NetWare Nodes from the Cluster" on page 34	This section was added for completeness.

A.10 December 2010 (OES 2 SP3)

This content in this guide previously appeared as the "Converting NetWare 6.5 Clusters to OES 2 Linux" chapter in the *OES 2 SP2: Novell Cluster Services for Linux Administration Guide*.

In addition, updates were made to the following sections. The changes are explained below.

- Section A.10.1, "Apache Web Server," on page 85
- Section A.10.2, "Converting NetWare 6.5 Clusters to OES 2 Linux," on page 85
- Section A.10.3, "Novell Distributed File Services VLDB," on page 86
- Section A.10.4, "Planning the Cluster Conversion," on page 86
- Section A.10.5, "Planning the Conversion of Load and Unload Scripts," on page 86

A.10.1 Apache Web Server

This section was expanded to include installation and setup information that is specific to Linux.

A.10.2 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
Step 1 in "Finalizing the Cluster Conversion" on page 35	Beginning in OES 2 SP3, you can use the `cluster convert preview all` command to preview all resources.

A.10.3 Novell Distributed File Services VLDB

Location	Change
Step 2 in "Cluster Migrating the Shared NSS Volume for the VLDB" on page 61 Step 2 in "Adding a Linux Server as a Replica Site" on page 62	For each of the Linux nodes, assign the node's nssadmin user as a trustee of the container that is configured as the Management Context for the VLDB, and give the user at least the `Read` and `Compare` rights to the `[All Attribute Rights]` property.

A.10.4 Planning the Cluster Conversion

Location	Change
Section 2.11, "Managing File Systems in Mixed-Node Clusters," on page 14	If you need to configure (or reconfigure) existing shared NSS pools and volumes in a mixed-node cluster, you must temporarily bring down all Linux cluster nodes prior to making changes, then make the configuration changes on a NetWare node. Ensure that the resources are working properly on NetWare before having the Linux cluster nodes rejoin the cluster.

A.10.5 Planning the Conversion of Load and Unload Scripts

Location	Change
Section 4.2, "Comparing Script Length Limits for NetWare and Linux," on page 22	This section is new.

A.11 May 2010 Scheduled Maintenance

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

- Section A.11.1, "Novell AFP," on page 86
- Section A.11.2, "Novell CIFS," on page 87

A.11.1 Novell AFP

Location	Change
Chapter 6, "Novell AFP," on page 37	Beginning in OES 2 SP2 Linux, the cross-protocol file locking parameter for NCP Server is enabled by default.

A.11.2   Novell CIFS

Location	Change
Chapter 10, "Novell CIFS," on page 59	Beginning in OES 2 SP2 Linux, the cross-protocol file locking parameter for NCP Server is enabled by default.

A.12   January 2010 Scheduled Maintenance

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

- ◆ Section A.12.1, "Planning the Cluster Conversion," on page 87
- ◆ Section A.12.2, "Converting NetWare 6.5 Clusters to OES 2 Linux," on page 87

A.12.1   Planning the Cluster Conversion

Location	Change
"SBD Devices Must Be Marked as Shareable for Clustering" on page 12	This section is new.

A.12.2   Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
"Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)" on page 29	Step 1 on page 29 is new. Before you add the first Linux node to the NetWare cluster, mark the NetWare cluster SBD devices as Shareable for Clustering.
"Adding New OES 2 Linux Nodes to Your NetWare Cluster" on page 32	Step 1 on page 32 is new. Before you add the first Linux node to the NetWare cluster, mark the NetWare cluster SBD devices as Shareable for Clustering

A.13   January 20, 2010

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

- ◆ Section A.13.1, "Converting NetWare 6.5 Clusters to OES 2 Linux," on page 87

A.13.1   Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
"Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)" on page 29	.Step 11 was removed. A cluster restart is no longer required.

Location	Change
"Finalizing the Cluster Conversion" on page 35	.Step 3 was revised. A cluster restart is no longer required.

A.14 January 4, 2010

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

A.14.1 eDirectory Server Certificates

Location	Change
"Using Internal Certificates in a Cluster" on page 58	.This section was modified for clarity..

A.15 December 10, 2009

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

A.15.1 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
Section 5.1, "Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)," on page 29	Added the following instruction in Step 3 on page 30:
	You can do this by running NWConfig, then selecting *Product Options > Directory Options <install NDS> > Remove Directory Services from this server*.

A.16 November 2009 (OES 2 SP2)

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

A.16.1 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
Section 5.4, "Finalizing the Cluster Conversion," on page 35	Modified Step 3 to state that you must run `/opt/novell/ncs/bin/ncs-configd.py -init` on each of the nodes in the cluster, or restart Cluster Services on each of the nodes in the cluster.

A.16.2 Planning the Conversion of Load and Unload Scripts

Location	Change
Section 4.7, "Customizing the Translation Syntax for Converting Load and Unload Scripts," on page 27	This section is new.

A.17 July 30, 2009

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

A.17.1 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
Section 5.4, "Finalizing the Cluster Conversion," on page 35	**WARNING:** After you finalize the cluster conversion, rollback to NetWare is not supported.

A.17.2 Planning the Cluster Conversion

Location	Change
Section 2.12, "Using Novell iManager in Mixed-Node Clusters," on page 15	This section is new. Use Novell iManager 2.7.2 or later for all cluster administration in the mixed-node cluster.
Section 2.13, "Using Novell Remote Manager Is Not Supported in Mixed-Node Clusters," on page 15	Do not use Novell Remote Manager when managing mixed-node clusters. Novell Remote Manager is not supported for cluster management on OES 2 Linux.
Section 2.14, "Using ConsoleOne Is Not Supported for Mixed-Node Clusters," on page 15	This section is new. Do not use ConsoleOne when managing mixed-node clusters. ConsoleOne is not supported for cluster management on OES 2 Linux.

A.18 June 22, 2009

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

◆ Section A.18.1, "Planning the Cluster Conversion," on page 90

A.18.1 Planning the Cluster Conversion

Location	Change
Section 2.13, "Using Novell Remote Manager Is Not Supported in Mixed-Node Clusters," on page 15	This section is new.

A.19 June 5, 2009

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

◆ Section A.19.1, "Converting NetWare 6.5 Clusters to OES 2 Linux," on page 90
◆ Section A.19.2, "Novell Storage Services Pools," on page 90

A.19.1 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
Section 5.1, "Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)," on page 29	In Step 10 on page 31, added clarification that checking for an SBD is necessary only if the cluster has a shared disk system.
Section 5.2, "Adding New OES 2 Linux Nodes to Your NetWare Cluster," on page 32	In Step 6 on page 34, added clarification that checking for an SBD is necessary only if the cluster has a shared disk system.

A.19.2 Novell Storage Services Pools

Location	Change
Chapter 17, "Novell Storage Services Pools," on page 79	Added information about how long it might take to build the trustee.xml file during a migration from NetWare to Linux.

A.20 May 6, 2009

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

- Section A.20.1, "Planning the Cluster Conversion," on page 91

A.20.1 Planning the Cluster Conversion

Location	Change
Section 2.11, "Managing File Systems in Mixed-Node Clusters," on page 14	If you need to configure (or reconfigure) existing shared NSS pools and volumes or trustee assignments in a mixed-node cluster, you must temporarily remove all Linux cluster nodes by issuing the `cluster leave` command prior to making any NSS changes.

A.21 March 3, 2009

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

- Section A.21.1, "Converting NetWare 6.5 Clusters to OES 2 Linux," on page 91

A.21.1 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
Step 3 in Section 5.4, "Finalizing the Cluster Conversion," on page 35	You must restart the cluster so that clstrlib.ko is reloaded: `rcnovell-ncs restart`

A.22 February 13, 2009

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

- Section A.22.1, "Converting NetWare 6.5 Clusters to OES 2 Linux," on page 91
- Section A.22.2, "Novell Storage Services Pools," on page 92
- Section A.22.3, "Planning the Conversion of Load and Unload Scripts," on page 92

A.22.1 Converting NetWare 6.5 Clusters to OES 2 Linux

Location	Change
Chapter 3, "Planning the Conversion of Cluster Resources," on page 17	Added a link to the eDirectory caveat.

A.22.2   Novell Storage Services Pools

Location	Change
Section 17.2, "NSS File System Migration to NCP Volumes or Linux POSIX File Systems," on page 79	This section is new.

A.22.3   Planning the Conversion of Load and Unload Scripts

Location	Change
Section 4.1, "Translation of Cluster Resource Scripts for Mixed NetWare and Linux Clusters," on page 21	The path to the files is /var/opt/novell/ncs/.

A.23   February 3, 2009

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

- Section A.23.1, "Novell AFP," on page 92

A.23.1   Novell AFP

Location	Change
Chapter 6, "Novell AFP," on page 37	Added information about using the NCP cross-protocol file locking feature on OES 2 SP1 Linux.

A.24   December 2008 (OES 2 SP1)

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

- Section A.24.1, "Converting NetWare 6.5 Cluster to OES 2 Linux," on page 92
- Section A.24.2, "Planning the Cluster Conversion," on page 93
- Section A.24.3, "Planning the Conversion of Cluster Resources," on page 93
- Section A.24.4, "Planning the Conversion of Load and Unload Scripts," on page 93

A.24.1   Converting NetWare 6.5 Cluster to OES 2 Linux

Location	Change
Section 5.1, "Converting NetWare Cluster Nodes to OES 2 Linux (Rolling Cluster Conversion)," on page 29	This procedure has been updated.

A.24.2 Planning the Cluster Conversion

Location	Change
Section 2.15, "Using the Monitoring Function in Mixed-Node Clusters Is Not Supported," on page 15	This section is new.

A.24.3 Planning the Conversion of Cluster Resources

Location	Change
Chapter 3, "Planning the Conversion of Cluster Resources," on page 17	This section is new.

A.24.4 Planning the Conversion of Load and Unload Scripts

Location	Change
Section 4.6, "Comparing File Access Protocol Resource Script Commands," on page 26	This section is new.