

Novell Open Enterprise Server

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COEXISTENCE AND MIGRATION
GUIDE



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About This Guide

This guide discusses coexistence and migration issues when dealing with Novell® Open Enterprise Server (OES) Support Pack 2 for the NetWare® 6.5 and SUSE® Linux Enterprise Server (SLES) 9 platforms. The guide is divided into the following sections:

- “Coexistence and Migration Overview” on page 9
- “Addressing Coexistence and Migration Issues” on page 11
- “Installation, Upgrade, and Migration Scenarios” on page 45

This guide is designed as a companion to the *Novell OES SP2 Planning and Implementation Guide*, which helps network installers and administrators plan their deployment of OES.

Also included are links to the various OES product administration guides, which provide more detailed coexistence and migration information specific to individual products.

As you scope out your OES transition project, you might find that you require strategic or technical assistance beyond what can be provided in this guide. Novell offers a wide range of services—including enterprise-level consulting, training, education, certification, and technical support—to meet the needs of your organization. Visit the [Novell Web site \(http://www.novell.com\)](http://www.novell.com) for information on how to engage Novell for assistance.

Audience

This guide is intended for network installers and administrators.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with OES. To contact us, use the User Comments feature at the bottom of any page in the online documentation.

Documentation Updates

For the most recent version of the *OES Coexistence and Migration Guide*, see the [Novell Open Enterprise Server online documentation \(http://www.novell.com/documentation/oes\)](http://www.novell.com/documentation/oes).

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

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When a single pathname can be written with a backslash for some platforms or a forward slash for other platforms, the pathname is presented with a backslash. Users of platforms that require a forward slash, such as UNIX* or Linux*, should use forward slashes as required by your software.

Coexistence and Migration Overview

Novell® Open Enterprise Server (OES) is a secure, reliable suite of services that provides proven networking, communication, collaboration and application services in an open, easy-to-deploy environment. OES combines the industry's most comprehensive set of workgroup and enterprise services with NetWare® 6.5, the trusted leader for secure networking services, and SUSE® Linux Enterprise Server (SLES) 9, a leading open platform for delivering business-level applications.

OES provides choice and flexibility by allowing you to deploy the platform mix that best meets your needs. You can choose to use NetWare, Linux, or a combination of both technologies. This powerful, unique networking foundation allows NetWare and Linux servers to coexist and interoperate within your organization. Common management, directory, and monitoring utilities enable you to manage both platforms with a single set of tools, which simplifies daily administration.

This chapter presents an overview of coexistence and migration issues as they relate to the services and technologies included with OES. It contains the following sections:

- “Approaches to System Coexistence and Migration” on page 9
- “Key Concepts and Terms” on page 10
- “What's Next” on page 10

While Novell has invested considerable effort in identifying the most common coexistence and migration issues you might face, it is impossible to anticipate every possible combination of products and services you might have. Therefore, we intend to continue developing coexistence and migration information and plan to update the Web-based documentation regularly with the newly developed information.

1.1 Approaches to System Coexistence and Migration

One of the top priorities in designing Open Enterprise Server was to ensure that new OES components, running on either NetWare or Linux, can be introduced into an existing network environment without disrupting any of the products and services already in place. It was also deemed important that, wherever possible, there be a clear migration path for moving existing products or services and related data onto the OES platform.

The ability that OES provides to run the same network services on either NetWare or Linux offers many exciting new possibilities for IT administrators. Yet this dualistic nature of OES is not without its challenges. While there are some minor differences between OES products and services mounted on NetWare and on Linux, there are important technical differences in supporting these two platforms at the underlying system level.

For the purposes of this guide, the underlying system can be viewed as a collection of *fabrics*, or sets of components that work together to provide necessary capabilities such as directory services, identity management, naming, discovery, time synchronization, and security. These fabrics exist outside of any single server or node on the network.

As an example, when a new OES server is installed on the network and its services are made available to users, certain issues must be addressed regardless of the server's operating system platform:

- How can the new server be properly named and added to the network-wide directory of servers? (directory and naming)
- How can the new server's time be synchronized with that of other servers? (time synchronization)
- How can the new service be discovered by network clients? (discovery)
- How can users be securely identified and authorized to access the new service? (identity management and security)
- How can users on various client platforms access data stored on the new server? (client access)

These are just a few of the functions performed by the respective fabrics within the system.

This guide presents solutions for system migration and coexistence for these different fabrics.

1.2 Key Concepts and Terms

To help provide a common base of understanding, this guide defines relevant terms as follows:

- **Coexistence:** Compatibility between networking technologies when a new product/service is introduced into an existing network environment.
- **Fabric:** A set of technologies that work together to provide necessary network services such as discovery, directory, time synchronization, security, and client access.
- **Migration:** Moving an existing product/service, along with all of its dependent configuration data, from its original platform onto a new server platform.
- **Product/service:** A Novell solution that can be installed as an optional part of an OES server, such as Novell iFolder[®], iPrint, etc.

A migration, as defined above, is different from an update or upgrade of a product/service on the same server platform. However, many of the same coexistence and migration issues exist when upgrading older NetWare servers within an OES environment.

In this guide, unless specified otherwise, the term *migration* refers specifically to moving a product/service from the NetWare platform onto the Linux platform.

1.3 What's Next

To gain an understanding of system preparation tasks and general coexistence and migration issues that you should consider as you plan your transition to OES, see [Chapter 2, “Addressing Coexistence and Migration Issues,”](#) on page 11.

For instructions on how to install, upgrade, or migrate servers into an OES environment, see [Chapter 3, “Installation, Upgrade, and Migration Scenarios,”](#) on page 45.

Addressing Coexistence and Migration Issues

To facilitate your transition to Novell® Open Enterprise Server (OES), you should take the time to properly address any coexistence and migration issues that apply to your situation.

This chapter provides general information to help you prepare your existing network for OES. Where appropriate, it provides links to other manuals for additional information.

- [“System Preparation and Deployment Tools” on page 11](#)
- [“General Coexistence and Migration Issues for OES” on page 19](#)
- [“Coexistence and Migration Issues for Other Novell Products” on page 43](#)
- [“What's Next” on page 43](#)

2.1 System Preparation and Deployment Tools

With OES, Novell provides a number of tools to facilitate system preparation, deployment, and migration.

- [“Novell Deployment Manager” on page 11](#)
- [“PKIDiag Utility” on page 15](#)
- [“SDIDiag Utility” on page 16](#)
- [“Installation and Migration Tools” on page 16](#)

2.1.1 Novell Deployment Manager

Deployment Manager is Novell's server installation, upgrade, and system preparation utility. It provides easy access to a number of tasks you might need to perform as you prepare your network for OES server installations or upgrades. It also presents a consolidated interface to various server install/upgrade options and post-install tasks, along with links to relevant documentation and hints to ensure the success of your OES deployment.

Before you introduce an OES server into an existing network, whether through a new installation or by upgrading an older server, you should run Deployment Manager to ensure that your network—and eDirectory™ in particular—is properly prepared.

While Deployment Manager is primarily a NetWare® server deployment tool, it can also be used to prepare eDirectory when you are installing an OES Linux server into a tree containing no NetWare 6.5 or OES NetWare servers.

If you already have a NetWare 6.5 or OES NetWare server in your eDirectory tree, you do not need to run Deployment Manager.

Table 2-1 summarizes the options available in Deployment Manager and indicates when they should be run. The options are listed in the order they are presented in Deployment Manager.

Table 2-1 *Deployment Manager Options*

Deployment Manager Option	What It Does	When You Should Run It
Network Preparation		
Overview	Provides a summary of each of the options in the Network Preparation category (information only).	To get a quick idea of what each of the Network Preparation options does.
Back Up Data	Provides instructions for backing up data on NetWare 5.1 servers with SBACKUP and NetWare 6 servers with SBCON (information only).	To find out how to run SBACKUP or SBCON to back up data on your NetWare servers before upgrading them.
Search Tree for eDirectory/ NDS Versions	Launches the View and Update NDS utility to check the NetWare and NDS [®] versions of servers in a tree and update NDS on servers that require it.	You have NetWare 4/NDS 6 servers or NetWare 5/NDS 7 or NDS 8 servers in your eDirectory tree. You must complete the Prepare for New eDirectory task after running this utility.
Prepare for New eDirectory	Launches the Extend the Core Schema utility to extend the core schema of the NDS tree in preparation for installing the version of eDirectory that comes with OES NetWare.	You have NetWare 4/NDS 6 servers or NetWare 5/NDS 7 or NDS 8 servers in your tree. You must complete the Search Tree for eDirectory/NDS Versions task before running this utility.
Generate GUIDs on NetWare 4 servers	Launches the View NetWare 4 Servers and Restart NDS utility to check for NetWare 4.11 and 4.2 servers in your tree that have the updated NDS files that support GUID generation and (optionally) restart ds.nlm to trigger the GUID generation.	Your tree contains NetWare 4 servers that you will upgrade to OES NetWare.
Prepare a Server for Upgrade	Launches the Server Health Utility to perform a general health check on a NetWare server and to ensure, among other things, that there is enough memory, a sys: volume is in place, and that the server meets the minimum requirements for an OES NetWare upgrade.	You have a NetWare 5 or 6 server that you plan to upgrade to OES NetWare.
Prepare Cluster for Upgrade	Launches the Prepare a Cluster utility to prepare an existing Novell Cluster Services cluster so that the NetWare 5.1 servers in the cluster can be upgraded to OES NetWare without trustees and rights being lost.	You have a NetWare 5.1 cluster that you plan to upgrade to OES NetWare. After you complete the server upgrades, you must complete the Install/Upgrade Cluster task in the Post-Install Tasks category.

Deployment Manager Option	What It Does	When You Should Run It
Update Certificate Authority Objects	Provides instructions for updating the Certificate Authority (CA) server from a NetWare 5 Public Key Infrastructure (PKI) installation, and for configuring your network for Novell Certificate Server v2.x (information only).	You installed the base-level PKI as part of a NetWare 5 installation and designated a NetWare 5 server as the Organizational Certificate Authority.
Prepare for Universal Password	Provides information about preparing your network for the Universal Password feature in OES NetWare (information only).	You plan to enable the Universal Password feature (it is disabled by default in OES NetWare).
Prepare for CIFS/AFP	Provides information on preparing your OES NetWare server to support Windows* native networking workstations through CIFS and Macintosh native networking workstations through AFP (information only).	You have Windows or Macintosh workstations on your network that you want to be able to access data on your new OES NetWare server without having the Novell Client™ software installed.
Verify NCI Keys	Provides information about running the SDIDiag utility to check your eDirectory tree for SDI (Security Domain Infrastructure) key consistency (information only).	You have invalid SDI keys in eDirectory from a previous installation of NCI.
Schema Update	Launches the Schema Update utility to extend the schema of an existing NDS/eDirectory tree for the products and services that are bundled with OES on both the NetWare and Linux platforms.	To extend the schema for products and services that might be installed as part of future server installations or upgrades. Doing this eliminates the need for future installers to have Admin rights to the root of the tree. You must complete the Search Tree for eDirectory/NDS Versions and Prepare for New eDirectory tasks before running this utility.
Install/Upgrade Options		
Overview	Provides a summary of each of the options in the Install/Upgrade category (information only).	To get a quick idea of what each of the Install/Upgrade options does.
Install NetWare 6.5	Provides information about the OES NetWare installation procedure, with links to the online documentation (information only).	To see what is involved in installing a new OES NetWare server.
Automate an Installation	Provides general information about using a response file to automate a NetWare server installation, and launches the Response File Generator to assist you in creating a customized response file.	To create a response file to do a “silent” or “unattended” server installation.

Deployment Manager Option	What It Does	When You Should Run It
Upgrade to NetWare 6.5	Provides links to the online documentation for in-place server upgrades, and launches the Upgrade a Server Remotely utility to perform a remote upgrade.	To perform a remote server upgrade from your Deployment Manager workstation.
Consolidate or Migrate Servers	Launches Install/Run the Server Consolidation and Migration Toolkit to either install the version of the toolkit on <i>NetWare 6.5 CD 1</i> or run the toolkit if it is already installed on your workstation.	To install or run the Server Consolidation and Migration Toolkit. The toolkit combines NetWare Migration Wizard 8.1 and Server Consolidation Utility 4.11 under a single launch interface. Migration Wizard migrates data from an older NetWare server to a new OES NetWare server. The new server replaces the old server and assumes its server name and IP address. The Server Consolidation Utility copies data from NetWare or Windows NT* servers to OES servers (both NetWare and Linux). Source servers can continue to exist and retain their server names and IP addresses.
Post-Install Tasks		
Creating Additional Volumes	Provides links to the online documentation for creating additional volumes during the NetWare server installation (information only).	To know how to create volumes other than sys: on your server during the NetWare installation procedure.
Install NetWare 6.5 Products	Launches the Remote Product Install utility to do a post-installation of OES NetWare products remotely.	To remotely install additional OES NetWare products on a server from your Deployment Manager workstation.
Use DSREPAIR	Provides instructions for running the DSRepair utility to check the NDS/eDirectory and schema status after installing or upgrading to a new version of NetWare (information only).	To verify that changes made to NDS/eDirectory and the schema have properly synchronized on your new NetWare server and that the new server's time is synchronized with other servers on the network.
Install/Upgrade Cluster	Launches the Install or Upgrade a Cluster utility to complete the upgrade of a NetWare 5.1 cluster server.	To complete the upgrade of a NetWare 5.1 cluster server.
Remove Deployment Manager	Launches the Remove Deployment Manager function to remove the files that Deployment Manager copied to your workstation the first time you ran it.	To remove the approximately 80 MB of Deployment Manager files to save disk space, or to clear the current version so you can run an older version of Deployment Manager from an earlier NetWare 6.5 Support Pack release.

For more information and instructions on how to use Deployment Manager, see “[Prepare the Network with Deployment Manager](#)” in the *OES NetWare Installation Guide*.

Deployment Manager Tasks Available in Novell iManager

You can complete the following Deployment Manager tasks from the Install and Upgrade option in Novell iManager 2.5:

- Search Tree for eDirectory/NDS Versions
- Prepare for New eDirectory
- Generate GUIDs on NetWare 4 Servers
- Prepare a Server for Upgrade
- Prepare Cluster for Upgrade
- Schema Update
- Automate an Installation
- Upgrade to NetWare 6.5
- Consolidate or Migrate Servers
- Install NetWare 6.5 Products
- Install/Upgrade Cluster

2.1.2 PKIDiag Utility

Novell eDirectory relies on a sophisticated Public Key Infrastructure (PKI) to provide the strong encryption and certificate issuing mechanisms that are necessary for maintaining secure connections. If the security infrastructure is not functioning correctly, the installation and configuration of some OES components will fail.

PKIDiag is a diagnostic tool for analyzing the security infrastructure and resolving errors and configuration problems. It runs as a NetWare Loadable Module™ (NLM™) at the NetWare server console.

The Novell Deployment Manager runs PKIDiag as part of its Server Health Utility. However, it runs PKIDiag in diagnostic mode, which identifies errors but does not fix them. If the Server Health Utility detects PKI problems, you must run PKIDiag and resolve any problems before you can successfully upgrade an existing NetWare server in the tree to OES NetWare.

For more information about eDirectory and PKI issues in OES, see [Section 2.2.5, “Security and Certificate Management,”](#) on page 26.

To download the PKIDiag utility, see [TID 2967938 - “PKI Diag Utility 2”](#) (<http://support.novell.com/cgi-bin/search/searchtid.cgi?/2967938.htm>).

For more information on the PKIDiag utility, see the following:

- [TID 10089099 - “How to Use PKIDIAG to avoid issues while Installing NetWare 6.5”](#) (<http://support.novell.com/cgi-bin/search/searchtid.cgi?/10089099.htm>)
- [TID 10095905 - “How to use PKIDIAG?”](#) (<http://support.novell.com/cgi-bin/search/searchtid.cgi?/10095905.htm>)

2.1.3 SDIDiag Utility

If you have an NDS/eDirectory tree that was created during the installation of a previous version of NetWare, it is possible that a different version of Novell International Cryptography Infrastructure (NICI) was used to create the SDI (Security Domain Infrastructure) keys.

NOTE: SDI keys are referred to as NICI keys in the Novell Deployment Manager utility.

Each server within an eDirectory tree should hold matching copies of the SDI keys in order for products such as Novell Certificate Server and Novell Modular Authentication Services (NMASTM) to function correctly. If you have servers running versions of NICI earlier than 2.4.2, or if your tree is running a version of NDS or eDirectory earlier than 8.7.1, you should run the SDIDiag utility to ensure that your Security Domain Infrastructure is properly configured.

The SDIDiag utility is an SDI diagnostic and repair utility that lets you view the various keys within a tree and ensure that all servers are synchronized with consistent keys. It can be run either as an NLM program at the NetWare server console or as a Windows .exe program on a network workstation.

For more information about eDirectory certificate management issues in OES, see [Section 2.2.5, “Security and Certificate Management,”](#) on page 26.

To download the SDIDiag utility, see [TID 2966746 - “SDIDiag 2.1 \(<http://support.novell.com/cgi-bin/search/searchtid.cgi?/2966746.htm>\)”](#).

For more information on the SDIDiag utility, see the following:

- [TID 10081773 - “SDIDiag Switches, Options and Information” \(<http://support.novell.com/cgi-bin/search/searchtid.cgi?/10081773.htm>\)](#)
- [TID 10083939 - “How do I check if my Security Domain Infrastructure is synchronized?” \(<http://support.novell.com/cgi-bin/search/searchtid.cgi?/10083939.htm>\)](#)

2.1.4 Installation and Migration Tools

OES comes with a number of tools to help you install, upgrade, and migrate your network servers.

YaST Installation Program for OES Linux Servers

Novell has integrated the OES for Linux installation with the SUSE® YaST program. YaST is a graphical Linux-based utility that greatly simplifies the installation and configuration of components on SUSE Linux Enterprise Server 9 (SLES 9) servers. When you install and configure OES Linux, you also install and configure SLES 9.

For more information and instructions on installing OES for Linux, see the [OES Linux Installation Guide](#).

In OES SP2, YaST installs SLES 9 SP3 and OES components at the same time. The default selection for Novell Open Enterprise Server is to install all OES components *except* the following:

- Novell Cluster Services
- Novell iFolder® 2.x
- Novell iFolder® 3.x

- Novell iFolder[®] 3.x Web Access
- Novell Storage Services[™] (NSS)
- Novell IP Address Management

If you require these services, Novell recommends that you install them after the initial OES installation is complete.

If you want to install a specialized OES Linux server, you can select from the following predefined server types in YaST:

- Novell iFolder 2 Server
- Novell iPrint Server
- Novell Management Server
- Novell QuickFinder[™] Server
- Novell Virtual Office Server (not included in OES SP2)

OES SP2 provides the ability to install and configure multiple servers at the same time using a control file in AutoYaST. This is similar in concept to using a response file in OES NetWare installations. The servers should share similar hardware and perform similar tasks. For more information, see “[Installing and Configuring Multiple Servers Using AutoYaST](#)” in the *OES Linux Installation Guide*.

You can also use YaST to upgrade an existing SLES 9, SLES 9 SP1, or SLES 9 SP2 server to OES Linux. (These are the only supported upgrades for this release. Upgrading to OES from SUSE Linux Enterprise Server 8 is not supported.) For more information, see “[Upgrading to OES Linux](#)” in the *OES Linux Installation Guide*.

To apply the latest support pack to an existing OES Linux server, see “[Patching an OES Linux Server](#)” in the *OES Linux Installation Guide*.

NetWare 6.5 Installation Program for OES NetWare Servers

OES SP2 for NetWare and NetWare 6.5 Support Pack 5 are the same product and they use the same CD set and installation program. The option to choose between Open Enterprise Server and a NetWare 6.5 Support Pack installation was removed from the Install program in OES SP1.

When you install OES SP2 for NetWare, you can optionally install the following updated products:

- iManager 2.5

This is the cross-platform version of iManager which lets you manage both OES NetWare and OES Linux servers. This version also includes enhanced performance and a new administration interface.

- Virtual Office 1.5

In OES FCS and SP1, the administration interface for Virtual Office was removed from iManager and incorporated into Virtual Office 1.5.

Virtual Office is not included in OES SP2. Existing Virtual Office installations will continue to run on servers updated to OES SP2. If you are creating a new server and want to install Virtual Office, install it using the OES SP1 CDs, then update or patch the server to SP2. The OES SP1 CD images are available on the [Novell Support Web site \(http://support.novell.com/tools/csp/csp_oes.html\)](http://support.novell.com/tools/csp/csp_oes.html).

- QuickFinder Server 4

OES includes QuickFinder Server 4, a powerful search engine that indexes a wide variety of Web and file system data and makes it easy for users to find the information they are looking for. QuickFinder Server is an updated version of the NetWare Web Search Server that has been enhanced to run on both NetWare and Linux.

NOTE: In OES SP2, the NetWare Install program refers to the latest version of QuickFinder as version 4.2.0. In YaST, the software is simply referred to as Novell QuickFinder. Make sure you are using the OES SP2 CDs to install or upgrade to the latest version of QuickFinder.

To avoid the possibility of installing incompatible products on the same server, the NetWare Install program does not allow iManager 2.5 and Virtual Office 1.0 to be installed on the same server.

Likewise, NetWare Web Search Server and QuickFinder Server cannot coexist on the same NetWare server. Because QuickFinder runs on both NetWare and Linux, it is the logical choice for the OES environment.

You can also use the NetWare 6.5 installation program to perform in-place upgrades to OES NetWare. Remote or across-the-wire upgrades can be launched from either Deployment Manager or iManager.

For more information and instructions on installing OES NetWare, see the *OES NetWare Installation Guide*.

Novell Server Consolidation and Migration Toolkit

In OES SP1 and later releases, the NetWare Migration Wizard and the Novell Server Consolidation Utility are combined under a single launch interface called the Novell Server Consolidation and Migration Toolkit. The launch interface asks you what type of consolidation or migration project you want to perform and then launches the appropriate utility automatically.

- Server Consolidation Utility 4.11 is a file-and-print consolidation tool that helps you reorganize your network by copying data from existing source servers to newer destination servers. It automates key tasks, such as copying data from NetWare or Windows NT file systems to OES NetWare or Linux servers and migrating the corresponding users and their file permissions. This automation eliminates the need for you to choose from various standalone utilities that would help you perform these tasks individually.

In version 4.11 of the Server Consolidation Utility, you can copy data from NetWare or Windows source servers to OES Linux and OES NetWare servers. When copying data from NetWare to OES Linux, the destination volume must be an NSS volume. For data coming from NetWare servers, the Server Consolidation Utility preserves as much of the existing metadata as possible, including NetWare trustee rights, file/directory attributes, and ownership information. For data coming from Windows servers, the NTFS file permissions are mapped to Novell rights to give you similar security functionality.

Due to inherent differences in the way the Linux operating system handles file systems, there are a number of migration issues you need to be aware of when copying data to OES Linux servers. For more information, see “[Consolidating Data to OES Linux](#)” in the *Novell Server Consolidation and Migration Toolkit 1.1 Administration Guide*.

Another new feature is the ability to migrate iPrint printers and Print Managers from NetWare 6.5 to an OES Linux environment. For more information, see “[Migrating iPrint Printers and](#)

[Print Managers from NetWare to Linux](#)” in the *Novell Server Consolidation and Migration Toolkit 1.1 Administration Guide*.

- NetWare Migration Wizard 8.1 is a server hardware upgrade tool that lets you transfer file system data and eDirectory information from an existing NetWare 4, 5, or 6 source server to a new OES NetWare destination server. After the migration, the new server replaces the old server and assumes its server name and IP address.

Use NetWare Migration Wizard to migrate to OES NetWare. Migrations from Windows source servers or from NetWare sources to OES Linux destinations are not supported in the Migration Wizard.

For more information on using the utilities included in the Server Consolidation and Migration Toolkit, see the *Novell Server Consolidation and Migration Toolkit Administration Guide*.

2.2 General Coexistence and Migration Issues for OES

This section covers the general coexistence and migration issues that you should consider as you plan your transition to OES. Where appropriate, it provides links to service-specific information found in the individual OES product administration guides.

The discussion of coexistence and migration issues is organized around the various system fabrics:

- [Directory Services \(page 20\)](#)
- [Naming \(page 24\)](#)
- [Discovery \(page 25\)](#)
- [Security and Certificate Management \(page 26\)](#)
- [Time Synchronization \(page 28\)](#)
- [Network Protocols \(page 29\)](#)
- [Data Storage \(page 30\)](#)
- [Clustering \(page 32\)](#)
- [Backup \(page 33\)](#)
- [Client Access to File Services \(page 33\)](#)
- [Printing \(page 36\)](#)
- [System/Network Management \(page 37\)](#)
- [Web and Application Services \(page 39\)](#)
- [Open Source Software \(page 41\)](#)
- [Software Distribution and Patch Management \(page 41\)](#)
- [Licensing \(page 42\)](#)

Together, these fabrics make up the underlying foundation and infrastructure of the network. While it is unlikely for any two networks to have the same configuration within each fabric area, the sections that follow cover common issues that can help ease your transition to OES.

2.2.1 Directory Services

Directory services is a central, underlying component in distributed systems. The directory stores information about all services and resources available on the network. It also contains information about the users who are authorized to access these services and resources. The integration of the directory with user authentication allows for identity-based access to resources. A user logs in once to the directory tree and is granted access to servers and resources across the entire network.

Novell eDirectory

Each iteration of NetWare from 4.0 on has been accompanied by its own version of Novell Directory Services[®] (NDS) and later by versions of Novell eDirectory. More recently, eDirectory has been ported to other platforms and made available as a separate product that can run on Microsoft* Windows, Red Hat*, and SUSE versions of Linux, as well as on various flavors of UNIX (Solaris*, AIX*, and HP-UX*).

While each new version of NDS/eDirectory brought numerous technical improvements, some backward compatibility issues arose as changes were made to the underlying protocols, database, and security infrastructure. Customers moving from NetWare 4.x to 5.x faced significant challenges not only in upgrading NDS but in moving from IPX™-based NetWare 4 to TCP/IP-based NetWare 5. Those transitioning from NetWare 5.x to 6.x faced major hurdles in the switch from NDS to eDirectory, as changes were made to the core schema and security-related components.

To minimize coexistence issues with older versions of NDS and eDirectory, OES SP2 ships with Novell eDirectory 8.7.3 IR 7. This version of eDirectory is compatible with the following versions of NetWare and NDS/eDirectory.

NetWare Version	NDS/eDirectory Version
NetWare 6.5 SP5 (OES SP2)	eDirectory 8.7.3 IR 7 (eDirectory 8.7.3.7)
NetWare 6.5 SP4 (OES SP1)	eDirectory 8.7.3 IR 6 (eDirectory 8.7.3.6)
NetWare 6.5 SP3 (OES FCS)	eDirectory 8.7.3 IR 5 (eDirectory 8.7.3.5)
NetWare 6.5 SP2	eDirectory 8.7.3 IR 2 (eDirectory 8.7.3.2)
NetWare 6.5 FCS or SP1	eDirectory 8.7.0 or 8.7.1
Netware 6.0 SP4 or SP5	eDirectory 8.6.2
NetWare 5.1 SP7 or SP8	NDS 7.62c or 8.85c
NetWare 4.2 SP9	NDS 6.21 or later

Since the release of NetWare 6.5, Novell has strongly encouraged customers to upgrade to eDirectory 8.7 wherever possible. The compatible NDS/eDirectory versions listed in the table above are to help servers coexist temporarily during a phased upgrade project and should not be viewed as a long-term coexistence solution.

The recommendation to move to eDirectory 8.7 has been generally accepted throughout the NetWare customer base. Novell has helped motivate customers by making minimal schema changes between eDirectory 8.7.0 and 8.7.3, and by resolving most of the security infrastructure issues of the past.

Most NetWare installations today have at least one NetWare 6.x server running on the network. Thus, for the majority of Novell customers looking to deploy OES servers on their networks, the necessary eDirectory implementation issues have already been dealt with.

If you have successfully installed at least one NetWare 6.5 server in your tree, you can skip the rest of this section and continue with [Section 2.2.2, “Identity Management,” on page 23](#).

eDirectory Coexistence Issues

If you have an NDS/eDirectory tree that was created with any version of NetWare prior to NetWare 6.5 and you plan to introduce a new OES server (running on either NetWare or Linux) into that tree, you should be aware of and take appropriate steps to address the following coexistence issues.

- Core Schema Compatibility

Trees running eDirectory 8.6 and NDS 8.85c, 7.62c, or 6.21 must have the core schema extended to support eDirectory 8.7 before you can install the first NetWare 6.5/OES NetWare or OES Linux server.

Use the Novell Deployment Manager and complete the tasks to Search for eDirectory/NDS Versions and Prepare for New eDirectory. For more information, see [“Prepare the Network with Deployment Manager”](#) in the *OES for NetWare Installation Guide*.

- Certificate Authority and Security Domain Key

In a NetWare 5.1 environment, the Certificate Authority (CA) and security domain key (W0 object) must be located on a server running eDirectory 8.7.

For more information, see [Section 2.2.5, “Security and Certificate Management,” on page 26](#).

- SLP and LDAP Authentication Issues

There are several issues with NetWare 5.1 SP7 and NDS 8 regarding Service Location Protocol (SLP) and LDAP authentication. Novell recommends that you apply at least the sas.nlm and SLP modules from NetWare 5.1 SP8 before attempting to install an OES server.

Without the updated sas.nlm module, an OES Linux server installed into an NDS 8 tree hangs during the LDAP authentication portion of the install.

If the SLP modules are not applied, the NetWare 5.1 SP7 server might not be able to work correctly with the Linux version of OpenSLP.

For more information, see [Section 2.2.4, “Discovery,” on page 25](#).

- Partitions and OES Servers

In a NetWare 5 tree running NDS 7.62c or a NetWare 4 tree running NDS 6.21, either the OES servers must be installed into their own eDirectory 8.7 partition, or the master replica of the partition must be located on a server running eDirectory 8.7.

For more information, see the *Novell eDirectory 8.7.3 Administration Guide*.

- Connecting through IPX in NetWare 4

In a NetWare 4 tree running NDS 6.21, you must enable IPX on all NetWare 5 or later servers that need to communicate with the NetWare 4 servers. Coexistence of an IPX-based network and a TCP/IP-based network is achieved through the technologies introduced with NetWare 5 (SCMD compatibility mode, dual transport stacks, etc.).

OES Linux servers do not support IPX and are unable to communicate with NetWare 4 servers.

For more information, see [Section 2.2.7, “Network Protocols,” on page 29](#).

- Management Tool Compatibility

Many of the current eDirectory management tools do not perform well with older versions of the directory. For example, NDS iMonitor can not get health check information from an NDS 6 server, and iManager cannot perform partition operations on an NDS 6 server. In large networks, scalability issues can arise as well.

eDirectory Migration Issues

The recommended strategy to avoid migration issues on an existing NetWare network is to upgrade to eDirectory 8.7.3 before you start installing OES servers.

For information on upgrading to eDirectory 8.7.3 on NetWare, see “[Installing or Upgrading Novell eDirectory on NetWare](#)” in the *Novell eDirectory 8.7.3 Installation Guide*.

For more information on preparing an existing NetWare eDirectory tree for OES, see [Section 3.2, “Installing OES Servers into an Existing Tree,”](#) on page 45.

OES for Linux servers can be installed into an existing eDirectory 8.7.3 tree consisting of SLES 9 servers. However, you should install OES for Linux only on a clean computer. Do not attempt to install OES for Linux on a server that already has eDirectory 8.7.3 installed.

You can upgrade existing SLES 9 and SLES 9 SP1 servers to OES. The upgrade process updates Novell eDirectory on the servers at the same time. For more information, see “[Upgrading to OES Linux](#)” in the *OES for Linux Installation Guide*.

The following eDirectory platforms do not support OES for Linux, even if you upgrade them to version 8.7.3:

- Novell Nterprise™ Linux Services (NNLS)
- SLES 8
- Red Hat Linux (any version)
- UNIX (any flavor)
- Windows NT/2000/2003

For additional information, see “[eDirectory Coexistence and Migration](#)” in the *Novell OES Planning and Implementation Guide*.

LDAP

Novell eDirectory includes Lightweight Directory Access Protocol (LDAP) Services, a server application that provides LDAP authentication for objects stored in eDirectory. It also lets LDAP clients access information stored in eDirectory.

SLES 9 uses OpenLDAP, an open source software component, as its LDAP authentication mechanism.

LDAP Coexistence Issues

LDAP Services for eDirectory 8.7.3 and OpenLDAP servers can coexist in the same tree. Most OES services leverage LDAP Services for eDirectory for authentication.

When you install OES for NetWare or OES for Linux, default port numbers are assigned to eDirectory LDAP. You can change the default ports if necessary to avoid port conflicts.

If you are adding an OES Linux server to a NetWare 5.1/NDS 8 tree, ensure that all OES services which use LDAP are configured to go to the OES Linux server and not to a NetWare 5.1 server.

LDAP is not available in a NetWare 4 environment. NetWare 4 supports only Novell Directory Access Protocol (NDAP), which is not compatible with LDAP.

LDAP Migration Issues

If you have users in an OpenLDAP database and you want to migrate them to eDirectory, you can use the Novell Import Conversion Export (ICE) Utility for this purpose. For more information, see “[Novell Import Conversion Export Utility](#)” in the *Novell eDirectory 8.7.3 Administration Guide*.

For additional information, see “[Coexistence and Migration of eDirectory LDAP Services](#)” in the *Novell OES Planning and Implementation Guide*.

2.2.2 Identity Management

Maintaining user identities on a network might seem like a basic task, but it can become complex when users have multiple identities to access services on NetWare, Windows, and Linux servers.

Nsure Identity Manager Bundle Edition

To simplify identity management in mixed networks, OES includes the Nsure[®] Identity Manager Bundle Edition. Formerly known as DirXML, Nsure Identity Manager provides licensed synchronization of user-related information (including passwords) held in NT domains, Active Directory* domains, and eDirectory trees. When data from one system changes, Identity Manager detects and propagates these changes to other connected systems based on the business policies you define.

Identity Manager Coexistence and Migration Issues

In networks where eDirectory must coexist with other directories, Identity Manager is a good solution for synchronizing user identities across disparate systems.

For additional information, see “[Identity Management Services](#)” in the *Novell OES Planning and Implementation Guide*.

Linux User Management (LUM)

Linux User Management (LUM) is a service provided in OES to let eDirectory users function as local users on Linux servers.

Users in a Linux environment are defined and managed according to the POSIX (Portable Operating System Interface) standard. POSIX dictates that all users of a particular Linux server have standard attributes, such as user name, user ID (UID), primary group ID (GID), and password.

When eDirectory users are Linux enabled through LUM, the standard Linux (POSIX) attributes and values are added to their User objects, including membership in a special group that serves as the primary group.

When users are Linux enabled, access to OES Linux servers is enabled by leveraging the Linux Pluggable Authentication Module (PAM) architecture. PAM makes it possible for eDirectory users to authenticate with the OES Linux server through LDAP.

Some services on an OES Linux server require that eDirectory users be Linux enabled in order to access the services. These include core Linux utilities enabled for LUM (such as ftp, login, and rsh), OES Samba shares on the server, and Novell Remote Manager (NRM) on Linux.

There are other OES services that do not require Linux-enabled access, but have some LUM requirements. These include NCP™ Server, NSS, QuickFinder, Novell iFolder 2.x, and other Web services.

For more information about planning for LUM access to OES services, see “[Linux Access for eDirectory Users \(LUM\)](#)” in the *Novell OES Planning and Implementation Guide*.

LUM Coexistence and Migration Issues

Novell Linux User Management was first introduced for Novell Nterprise Linux Services (NNLS). LUM has been enhanced for use with the expanded suite of OES services.

There is no direct migration path from NNLS to OES, so there are no coexistence and migration issues to deal with for LUM.

For more information about LUM and how to Linux enable eDirectory users, see the *Novell Linux User Management Technology Guide*.

2.2.3 Naming

In TCP/IP-based networks, a naming service is required to resolve IP addresses into server names. This allows users and applications to identify network servers either by name (such as server1) or by IP address (such as 123.45.67.89).

DNS/DHCP

Domain Name Services (DNS) is the standard naming service in TCP/IP-based networks. DNS is based on the Bind architecture developed for UNIX systems. It is often paired with Dynamic Host Configuration Protocol (DHCP) to provide host server configuration information to clients.

For NetWare, Novell has developed a directory-enabled DNS/DHCP service that complies with the Bind 9.2 standard. Novell DNS/DHCP Services leverage eDirectory to provide centralized configuration and management of the services. Administrators can manage Novell DNS/DHCP Services using the Web-based iManager utility or the standalone DNS/DHCP Management Console.

SLES 9 also comes with a Bind-compliant DNS Server.

DNS/DHCP Coexistence and Migration Issues

Because the NetWare and Linux DNS/DHCP services both adhere to the Bind standard, they can coexist on the same network. Clients can receive naming and configuration information from any DNS/DHCP server that is available.

Some DNS security mechanisms, such as DNS Security Transaction Signatures and DNS Security Extensions, are not supported in the NetWare DNS server.

The SLES 9 DNS server does not support the dynamic reconfiguration and SNMP Traps that are available with the NetWare DNS server. It is not integrated with eDirectory and cannot be managed with iManager or the Novell DNS/DHCP Management Console.

You can migrate zone data of a master zone from a NetWare DNS server to a SLES 9 DNS server.

For more information, see “[OES Coexistence and Migration Issues](#)” in the *Novell OES DNS/DHCP Services Administration Guide*.

2.2.4 Discovery

Another essential function within a network is the ability for clients and applications to discover the existence and location of services. The discovery fabric of a system can range from a fully manual process such as DNS to a fully automatic process such as Service Location Protocol (SLP).

Various discovery mechanisms are available to network service components:

- DNS/DHCP
- Directory services
- Local host configuration files
- Service Location Protocol
- WinSock (NetWare only)
- Universal Description, Discovery, and Integration (UDDI) server

Any given system can adopt the exclusive use of a particular discovery technology, or it can use the different technologies in combination. When multiple discovery providers are available, clients and applications can be written to select from the alternative elements in a policy ladder.

Novell SLP and OpenSLP

NetWare 3 and 4 used the IPX-based Service Advertising Protocol (SAP) as the discovery mechanism. With SAP, NetWare servers began advertising their services automatically upon installation. If a server became unavailable, the SAP information on the network was dynamically refreshed.

When support for the TCP/IP protocol was added starting with NetWare 5, the Service Location Protocol was adopted as the default, though optional, discovery mechanism. SLP was chosen because it was the TCP/IP-based protocol most like SAP in its automatic nature and dynamic refresh capabilities.

The Novell version of SLP adapted portions of the SLP standard in order to provide a more robust service advertising environment.

Novell SLP remains the default discovery mechanism in OES for NetWare. However, all NetWare service components that engage in discovery, including Novell Client software, can use alternative mechanisms such as DNS, eDirectory, or local host configuration files.

In SLES 9, SLP is available through the inclusion of OpenSLP, an open source implementation of the IETF Service Location Protocol Version 2.0 standard.

In OES for Linux, OpenSLP is available for those applications that require it. However, the default discovery mechanism is DNS.

SLP Coexistence and Migration Issues

Novell SLP directory agents share information with other directory agents in the same context through eDirectory. With OpenSLP, each directory agent is completely separate. An OpenSLP directory agent knows only about the services it is told about, and directory agents are not synchronized.

You can run both OpenSLP and Novell SLP directory agents in the same network, but OpenSLP directory agents won't synchronize with Novell SLP directory agents, and Novell SLP directory agents won't synchronize with OpenSLP directory agents.

OpenSLP-based user agents or service agents can access Novell SLP-based directory agents.

For more information on SLP configuration issues in eDirectory, see “[Configuring OpenSLP for eDirectory](#)” in the *Novell eDirectory 8.7.3 Administration Guide*.

WinSock and Discovery

NetWare Loadable Module (NLM) programs that use the WinSock interface can have access to all of the discovery vehicles automatically. When an application sends an inquiry to WinSock, whether the inquiry is for a specific service name or specified with wildcard characters, WinSock searches all of the discovery vehicles for information to return to the application. If you removed SLP as a source of information and placed the information into DNS or a local host file, the application would not know the difference.

NOTE: There is no WinSock equivalent in the Linux environment. BSDSock provides only the transport interface, not the name resolution interface.

UDDI and Discovery

UDDI is an open-source, platform-independent registry that enables you to describe, discover, integrate, and publish Web services. The purpose of UDDI-compliant registries is to provide a discovery platform on the World Wide Web so you can easily locate, integrate, and manage businesses and services.

For NetWare 6.5, Novell developed a directory-enabled UDDI server for use with the exteNd™ J2EE Application Server. In OES for NetWare, the UDDI server component has been removed from the list of products that can be installed through the NetWare installation program.

However, the Novell UDDI server has been released as open source software and is available for download on the [Novell Forge Web site \(http://forge.novell.com/modules/xfmod/project/showfiles.php?group_id=1025\)](http://forge.novell.com/modules/xfmod/project/showfiles.php?group_id=1025).

CIMOM and Discovery

The current OpenWBEM implementation of the Common Information Model Object Manager (CIMOM) lists SLP as an optional discovery provider. If SLP is to be used with CIMOM, it must be in compliance with the SLP API specification (RFC 2614). The default discovery vehicle for CIMOM is the statically configured URI. For more information, see the CIMOM specification at the [Desktop Management Task Force \(DMTF\) Web site \(http://www.dmtf.org\)](http://www.dmtf.org).

2.2.5 Security and Certificate Management

Security is a top concern in network environments, especially when internal networks are connected to the outside world via the Internet. Among the many aspects of security are user identification and authentication (making sure a user is who he or she claims to be) and authorization (giving an authenticated user permission to access resources on the network).

The simplest form of user security is assigning a username and password. If a person supplies the correct password for a given username, that person is assumed to be an authentic network user and is granted access to all resources authorized for the user account.

A more stringent authentication process involves the use of digital certificates issued and verified by a Certificate Authority (CA) as part of a Public Key Infrastructure. In this system, public and private keys are used to encrypt user passwords to prevent their detection as they are transmitted across the network.

For a more detailed overview of network security concepts, see “[Authentication](#)” and “[Security](#)” in the *Novell OES Planning and Implementation Guide*.

Novell International Cryptography Infrastructure (NICI)

Novell International Cryptography Infrastructure (NICI) is the basis for the security services offered in NetWare/eDirectory-based networks. NICI is a cross-platform, extensible cryptography module that provides keys, algorithms, various key storage and usage mechanisms, and a large-scale key management system. Downloadable modules enable eDirectory users throughout the world to implement 128-bit (and stronger) network encryption.

For more information about NICI, see the *[NICI 2.6x Administration Guide](#)*.

In addition to eDirectory, other security services built on NICI include Novell Certificate Server™ and Novell Modular Authentication Service (NMAAS).

Novell Certificate Server

Novell Certificate Server provides public key cryptography services that are natively integrated into eDirectory and that allow you to mint, issue, and manage both user and server certificates. These services allow you to protect confidential data transmissions over public communications channels such as the Internet.

For more information about Novell Certificate Server, see the *[Novell Certificate Server 2.7.x Administration Guide](#)*.

Novell Modular Authentication Service (NMAAS)

NMAAS provides unified support for additional ways of authenticating users to eDirectory on NetWare 5.1 or later, Windows NT/2000, and Linux/UNIX networks to help ensure that the people accessing your network resources are who they say they are. NMAAS allows the use of authentication devices such as smart cards and tokens, as well as biometric methods such as fingerprint reading and retinal scanning.

For more information about NMAAS, see the *[Novell Modular Authentication Services \(NMAAS\) 2.3 Administration Guide](#)*.

Password Support in OES

In OES, you have the choice of retaining your current password maintenance methods (simple password, NDS passwords, etc.), or you can deploy Universal Password to simplify password management.

For more information, see “[Password Support in OES](#)” in the *Novell OES Planning and Implementation Guide*.

Security Coexistence and Migration Issues

Coexistence and migration issues can arise when OES servers are installed into networks that use older versions of NCI. NCI was first introduced with NetWare 5.0. It has undergone several updates in conjunction with subsequent releases of NetWare. The version included with OES is NCI 2.6.6.

The first server you install in an eDirectory tree becomes the Certificate Authority for that tree. If you have a tree that was created with a NetWare 5.x server as the first server, you should check the tree for SDI (Security Domain Infrastructure) key consistency before installing any OES servers.

NOTE: A Security Domain is a collection of one or more servers that share a common cryptographic key. In Novell network environments, a Security Domain is a single NDS/eDirectory tree. The Security Domain Infrastructure is a cryptographic system that comprises the components and services used to manage these common keys.

You might see SDI keys referred to as NCI keys because they are created within the NCI framework.

You might have invalid SDI keys if the following products or features do not work after installing an OES server into the tree:

- CIFS/AFP Native File Access Protocols
- Identity Manager 2 (formerly DirXML)
- Universal Password

You might also see errors such as the following:

- Error: NCI 1418 when communicating
- Error -1423
- Error -1411

To verify that SDI keys are properly synchronized in your tree, use the SDIDiag utility as described in [Section 2.1.3, “SDIDiag Utility,” on page 16](#).

To identify and resolve problems with the PKI service in your tree, use the PKIDiag utility as described in [Section 2.1.2, “PKIDiag Utility,” on page 15](#).

2.2.6 Time Synchronization

Keeping accurate time is a critical function for servers in an eDirectory tree. The reported time must be synchronized across the network in order to provide expiration dates and time stamps to establish the order of events taking place in eDirectory.

NetWare Timesync

By default, NetWare servers use an NLM mechanism called Timesync to provide for synchronized time. Timesync supports the NetWare time server hierarchy of Single Reference Time Server, Reference Time Server, Primary Time Server, and Secondary Time Server.

Timesync is a derivative of the Network Time Protocol (NTP) version 3 and can both consume and provide NTP time packets in addition to Timesync packets.

During installation of OES for NetWare, you can choose between Timesync and NTPv3 as the time synchronization mechanism for new servers. Choosing NTPv3 allows OES NetWare servers to participate in an existing NTP-based network.

Network Time Protocol

NTP addresses fault tolerance in the form of a time provider group, where all the servers in one geographical location network obtain time from other servers in the same network. Only one server communicates with an external time provider and obtains time from it.

On OES for Linux servers, NTP is the only supported time synchronization method. OES Linux uses the NTP daemon (xntpd) to communicate with other servers in the time provider group and get time information.

Time Synchronization Coexistence and Migration Issues

The time synchronization modules in OES have been designed to ensure that new OES servers, running on either NetWare or Linux, can be introduced into an existing network environment without disrupting any of the products and services that are in place.

For a thorough explanation of time synchronization planning and implementation, as well as coexistence and migration issues, see “[Time Synchronization](#)” in the *Novell OES Planning and Implementation Guide*.

2.2.7 Network Protocols

Network nodes must support a common protocol in order to exchange packets. For example, a transport protocol defines how to establish a point-to-point connection so that one node can send a message to another and have the packets arrive intact and in the correct order. It also determines how nodes are identified with unique addresses and how packets are routed, if necessary, to reach the intended receiver.

IPX

In the 1980s, Novell adopted Internetwork Packet Exchange™ (IPX) as the networking protocol for NetWare-based networks. IPX and its companion transport protocol Sequenced Packet Exchange™ (SPX™) form a very efficient mechanism for exchanging packets within local and wide area networks.

IPX remained the foundational protocol for NetWare until the release of NetWare 5.0, which introduced support for the Internet-standard TCP/IP protocol suite.

TCP/IP

The Novell TCP/IP stack that runs on NetWare servers is compliant with the latest RFCs. It is multiprocessor enabled and provides advanced features such as multihoming, load balancing, and fault tolerance.

Like all UNIX and Linux operating systems, SLES 9 is designed to work with the TCP/IP protocols. Novell does not support IPX on Linux.

In OES, communication between existing NetWare servers and new OES Linux servers is provided through TCP/IP.

IP Address Management Framework

IP Address Management is a centralized framework that stores and displays the IP address:port configuration of applications present on a server. The framework helps you in managing the IP address-application association when changing the server's IP address. It also helps in resolving IP address and port conflicts. This framework is available in OES NetWare and is fully functional with most NetWare 6.5 services.

In OES SP2, Novell IP Address Management is available as an optional network service that you can install on your OES Linux server. However, in this release, no services are currently using this framework to manage IP address configurations.

Network Protocol Coexistence and Migration Issues

Coexistence between old IPX-based networks and new OES TCP/IP-based networks can be achieved through the technologies introduced with NetWare 5.0, such as the SCMD compatibility mode and dual transport stacks. When you install OES for NetWare, you can add IPX support as required.

The release of OES provides NetWare 4 customers with IPX-based networks an excellent opportunity to migrate to TCP/IP. Although there is no direct upgrade path from NetWare 4 to OES for NetWare, tools such as the NetWare Migration Wizard and Server Consolidation Utility are available to help in migrating user and directory data to new OES servers.

The migration of the transport fabric from IPX to TCP/IP is a different, larger issue. During the data migration process, IPX compatibility must be maintained on both source and destination servers. Applications and services that run only on IPX must be either rewritten or replaced. After all IPX dependencies are resolved, you can safely remove IPX support from your NetWare servers.

For more information on deploying TCP/IP in a NetWare environment, see the *Novell TCP/IP Administration Guide for OES*.

2.2.8 Data Storage

Hosting shared data storage is one of the primary functions of network servers. Whether data volumes are directly attached to the server in RAID configurations or externally accessible in Storage Area Network (SAN) or Network Attached Storage (NAS) configurations, users need to be able to access their data on a continual basis.

For a comparison of the various file systems available on NetWare and Linux, see “[File Systems Overview](#)” in the *File Systems Management Guide for OES*.

NetWare Traditional File System

The NetWare traditional file system is used in NetWare 5.0 and earlier versions. It is a 32-bit file system that supports ASCII double-byte characters and a maximum file size of 4 GB.

Novell Storage Services (NSS)

Novell Storage Services (NSS) was introduced in NetWare 5.1 and became the primary storage system in NetWare 6. NSS is a 64-bit file system that supports faster volume mounting and a maximum file size of 8 TB. NSS offers many advanced features and capabilities, including multiple simultaneous namespace support, native Unicode*, user and directory quotas, multiple data stream support, and event file lists.

In OES, both NetWare and Linux servers can host NSS volumes. NSS offers Linux advanced file system features that aren't available in other Linux file systems, including directory structure visibility, a trustee access control model, rich file attributes, and a file salvage subsystem.

OES SP1 added support for many new features to bring NSS on Linux more into parity with NSS on NetWare. For a list of new features in NSS for OES SP2, see “[What's New](#)” in the *Novell Storage Services File System Administration Guide for OES*.

Linux Traditional File Systems

OES for Linux supports Linux traditional file systems such as Reiser, ext2, and ext3. SLES 9 requires one of these file systems for its system (root) partition.

Data Storage Coexistence and Migration Issues

OES NetWare supports both the NetWare traditional file system and NSS.

NetWare Traditional File System

After upgrading an older NetWare server to OES for NetWare, it is possible for a NetWare Traditional file system volume to still reside on that server. You can continue to use Traditional volumes with OES NetWare or you can upgrade them to NSS.

For information on converting Traditional volumes to NSS, see “[Coexistence and Migration Issues](#)” in the *Novell Storage Services File System Administration Guide for OES*.

If you want to migrate data from a Traditional volume to an NSS volume on OES for Linux, use the Novell Server Consolidation Utility 4.0 or later. You must first install NFS name space support on the Traditional volume.

For more information on migrating data from NetWare to Linux, see “[Understand NetWare-to-Linux Data Migration Issues](#)” in the *Novell Server Consolidation and Migration Toolkit 1.1 Administration Guide*.

NSS Volumes

NSS volumes are cross-compatible between NetWare and Linux servers. You can mount a nonencrypted NSS data volume on either kernel—Linux or NetWare—and move it between them. In a clustered SAN, volumes can fail over between kernels, allowing for full data and file system feature preservation when migrating data to Linux.

To use NSS on OES Linux, you must have a disk available to be managed by Enterprise Volume Management System (EVMS). The boot partition (such as /boot for Grub) and system partition (such as /root for the swap and system volumes) are managed by Logical Volume Manager (LVM). Any disk managed by LVM cannot be managed by EVMS, which makes the disks where the boot partition and system partition reside unavailable to NSS.

If you have a single-disk server that you want to install OES for Linux on and create an NSS volume, see “[Installing Linux with EVMS as the Volume Manager of the System Device](#)” in the *OES Linux Installation Guide*.

On OES Linux, you can use NSS volumes only as data volumes. Configure NSS pools and volumes in iManager or NSSMU after the server installation completes successfully.

For OES SP1, a new metadata structure (Beast Version 3) on NetWare was implemented to provide improved support for hard links. After you upgrade your NetWare operating system, you must upgrade the media format to use the new metadata structure; some restrictions apply. For more information, see “[Upgrading the Media Format \(NetWare\)](#)” in the *Novell Storage Services File System Administration Guide for OES*.

For additional information about coexistence and migration of NSS volumes, as well as access control issues for NSS on Linux, see “[Coexistence and Migration Issues](#)” in the *Novell Storage Services File System Administration Guide for OES*.

Linux Traditional File Systems

You can install NCP Server for Linux to provide NetWare Core Protocol™-based access to Linux traditional file systems. This allows users running the Novell Client software to map drives to the Linux file system data, with access controls being enforced by NCP.

For more information on using NCP Server for Linux in OES, see the *NCP Server for Linux Administration Guide*.

Other Data Storage Issues

For information about clustering servers to provide high availability data storage, see [Section 2.2.9, “Clustering,” on page 32](#).

Users can access data storage on OES NetWare and OES Linux servers through a number of methods. For more information, see [Section 2.2.11, “Client Access to File Services,” on page 33](#).

2.2.9 Clustering

In mission-critical networks where 24x7 availability is of paramount concern, clustering is a popular solution for business continuance. By installing multiple servers together in a cluster, resources can be dynamically switched or moved in the event of a server failure. Clustering also allows dynamic assignment and reassignment of server storage.

Novell Cluster Services

Novell Cluster Services is a multinode clustering product available for both NetWare and Linux. It is eDirectory enabled and supports failover, failback, and migration (load balancing) of individually managed cluster resources.

With Novell Cluster Services, you can configure up to 32 servers into a high-availability cluster that can be managed from a single point of control. The product supports shared SCSI, iSCSI, and fibre channel storage area networks.

Cluster Coexistence and Migration Issues

OES provides the ability to convert an existing NetWare based cluster to Linux and to manage mixed Netware and Linux clusters.

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

In a rolling cluster conversion, one server is converted to Linux while the other servers in the cluster continue running NetWare 6.5 or OES NetWare. Then, if desired, another server can be converted to 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.

For additional information, see “[Converting a NetWare Cluster to Linux](#)” in the *OES Cluster Services 1.8 Administration Guide for Linux*.

2.2.10 Backup

The ability to back up and restore network information is essential for protecting business-critical data.

Storage Management Services (SMS)

Novell Storage Management Services™ (SMS) is not a backup application. Rather, it provides a standard framework and the necessary interfaces that can be used in developing a complete backup/restore solution. SMS helps back up file systems (such as NSS) on OES NetWare and OES Linux servers to removable tape media or other media for offsite storage.

SMS is implemented as two independent components that provide functional abstractions:

- Storage Management Data Requestor (SMDR) defines the API framework, provides remote connectivity, and abstracts the details of communication between servers.
- Target Service Agent (TSA) provides an implementation of SMS APIs for a particular target. The TSA provides transparency by abstracting details of the specific service being backed up. For example, various applications use the file system TSA to back up and restore NSS file system data and metadata (trustee assignments, file attributes, and name spaces).

SMS Coexistence and Migration Issues

In OES, the SMS API framework is available on SLES 9 so that there is a single consistent interface to back up file systems on NetWare, file systems on Linux, and Novell applications such as GroupWise® and Novell iFolder. The API set has been enhanced to include new functionality for OES.

Most of the SMS coexistence and migration issues are of concern only to backup application developers. However, administrators should be aware that SMS-based applications must be used to back up and restore NSS file system data on OES for Linux servers. Although NSS is exposed as a Virtual File System-compliant file system, the Linux interfaces are inadequate to be able to back up NSS file system attributes, rich ACLs, trustees, and multiple data streams.

For additional information, see “[Coexistence and Migration Issues](#)” in the *Storage Management Services Administration Guide*.

2.2.11 Client Access to File Services

Storing shared data on network servers is only half of the picture. The other half is making it possible for users of Windows, Macintosh, and UNIX/Linux workstations to access the data. In some networks, the installation of special software is permitted on the workstations to provide client access. Others require users to be able to access shared data without having to install extra software on the workstation.

Novell Client (NCP)

Novell Client for Windows is the long-standing software solution for providing NCP-based access to NetWare data from Windows workstations. The Novell Client extends the capabilities of Windows desktops to access the full range of Novell services, such as authentication to eDirectory, network browsing and service resolution, and secure file system access. It supports traditional Novell protocols such as NCP, RSA, and NDAP, and it interoperates with open protocols such as LDAP. For more information on the Novell Client for Windows, see the *Novell Client for Windows Installation and Administration Guide*.

The Novell Client for Linux provides these same services for Linux workstations. For more information on the Novell Client for Linux, see the *Novell Client 1.0 for Linux Installation and Administration Guide*.

Because NCP is now available on Linux, Novell Client users can attach to OES Linux servers as easily as they have been able to attach to NetWare servers. The NCP Server for Linux enables support for login script, mapping drives to OES Linux servers, and other services commonly associated with Novell Client access.

For more information on NCP Server for Linux, see the *NCP Server for Linux Administration Guide*.

Native File Access Protocols

On NetWare servers, the Native File Access Protocols (NFAP) allow users of Windows, Macintosh, and UNIX/Linux workstations to access NetWare server data through their native interfaces. No Novell Client software is required.

With NFAP, Windows workstations can access data through the Common Internet File System (CIFS) protocol. Macintosh workstations can access data through AppleTalk* Filing Protocol (AFP). UNIX/Linux workstations can access data through the Network File System (NFS) protocol.

iFolder 2.1.x

Novell iFolder 2.1.x provides a Web- and network-based repository (iFolder server) that stores master copies of locally accessible files. Novell offers iFolder client software for Windows and Linux workstations.

The cross-platform capabilities of iFolder make it an ideal file synchronization solution for OES networks. The iFolder server integrates with the Apache Web Server on NetWare and Linux, and it uses LDAP authentication through eDirectory.

For more information about iFolder 2.1.x, see the *Novell iFolder 2.1 Installation and Administration Guide*.

iFolder 3.x

Novell iFolder3.x is the next generation of iFolder, supporting multiple iFolders per user, user-controlled sharing, and a centralized network server for file storage and secure distribution. Users can share files in multiple iFolder folders, and share each iFolder folder with a different group of users. Users control who can participate in an iFolder folder and their access rights to the files in it. Users can also participate in iFolder folders that others share with them.

Novell iFolder 3.x is available only on OES Linux. For more information, see the *Novell iFolder 3.x Administration Guide*.

NetStorage

NetStorage provides Web access from browsers and Web-enabled devices such as PDAs to files on NetWare and Linux servers. It is also the browser-based access solution for iFolder.

In OES, NetStorage is available for both NetWare and Linux.

For more information about NetStorage, see the *OES NetStorage Administration Guide for NetWare* or the *OES NetStorage Administration Guide for Linux*.

Samba

OES includes a Novell implementation of the open source Samba software. Samba implements key services found in Microsoft CIFS environments, such as file and print services, authentication and authorization, name resolution, and service announcement (browsing). Through Samba, Windows workstations can access files stored on OES Linux servers using CIFS or HTTP-WebDAV instead of NCP.

For more information about Samba in OES, see “**Samba Support in OES**” in the *Novell OES Planning and Implementation Guide*.

Client Access Coexistence and Migration Issues

This section summarizes the coexistence and migration issues for the various client access features.

Native File Access Protocols

Native File Access Protocols are available only on OES NetWare servers.

For more information, see the *OES Native File Access Protocols Guide*.

iFolder 2.1.x

In OES for Linux, iFolder 2.1.x can be installed in one of two modes:

- *Standalone* mode: No other Apache instances run other than the one used by iFolder. iFolder runs on the wildcard address: 80/443.
- *Co-existent* mode: iFolder worker thread instance and other Apache instances can coexist. iFolder needs to run as a separate instance on a specific IP address (different from the primary address of the local machine). This new address should have a DNS name, and this should be reachable from the iFolder clients.

For more information, see “**Installing iFolder 2.1.5 on OES for Linux**” in the *Novell iFolder 2.1 Installation and Administration Guide*.

For additional information on iFolder coexistence and migration, see “**Coexistence and Migration Issues**” in the *Novell iFolder 2.1 Installation and Administration Guide*.

iFolder 3.x

Novell recommends that you install iFolder 3.x servers and iFolder 2.1.x servers separately, each on its own dedicated computer. However, because these are two different software packages that share no files in common, they can coexist on an OES Linux server under certain conditions.

There is no migration path between Novell iFolder 2.1.x and iFolder 3.x.

The iFolder client software for these two servers are also separate applications that can coexist on the same workstation; however, you should not attempt to convert the iFolder folder from a previous version of iFolder to an iFolder folder to be managed by iFolder 3.x.

For additional information on iFolder 3.x coexistence and migration, see “[Coexistence and Migration Issues](#)” in the *Novell iFolder 3.x Administration Guide*.

NetStorage

NetStorage on Linux offers connectivity to storage locations using the CIFS/SMB, NCP, and SSH protocols. NetWare uses only NCP.

Because NetStorage is a service that facilitates access to file services in various locations but doesn't actually store files, there are no coexistence or migration issues to consider.

For more information, see “[Access](#)” and “[File Services](#)” in the *Novell OES Planning and Implementation Guide*.

Samba

Samba is a Linux-only solution. NetWare has NFAP to provide similar functionality.

For more information, see “[Access](#)” and “[File Services](#)” in the *Novell OES Planning and Implementation Guide*.

2.2.12 Printing

Print services constitute another fundamental network component. Users need to be able to print to shared printers attached to the network. Administrators can facilitate printing for users by making it easy to locate nearby printers, install the proper print drivers, and connect to the printer.

Novell iPrint

OES includes Novell iPrint, a powerful and easy-to-implement printing solution that provides print-anywhere functionality to network users. iPrint lets Windows, Linux, and Macintosh users quickly locate network printers using their Web browser, easily install and configure a located printer using their native printer installation method, and print to installed printers from any location using an IP connection.

For more information about iPrint in general, see the *OES iPrint Administration Guide for NetWare* or the *OES iPrint Administration Guide for Linux*.

For more information about planning for iPrint, see “[Print Services](#)” in the *Novell OES Planning and Implementation Guide*.

iPrint Coexistence and Migration Issues

For information on upgrading from NetWare queue-based printing, Novell Distributed Print Services™ (NDPS®), or previous versions of iPrint, see “[Installing iPrint Software](#)” in the *OES iPrint Administration Guide for NetWare*.

If you select iPrint during the OES for Linux server installation, the iPrint software components are automatically installed on the server. While the Common UNIX Printing System (CUPS) software is also installed with SLES 9, CUPS is disabled to avoid port 631 conflicts.

For more information on configuring iPrint on OES for Linux, see “[Setting Up iPrint on Your Server](#)” in the *OES iPrint Administration Guide for Linux*.

In OES SP2, migrating iPrint services from a NetWare server to an OES Linux server is supported in Server Consolidation Utility 4.11, which is included in the Novell Server Consolidation and Migration Toolkit. For more information, see “[Migrating iPrint Printers and Print Managers from NetWare to Linux](#)” in the *Novell Server Consolidation and Migration Toolkit 1.1 Administration Guide*.

2.2.13 System/Network Management

The ability to effectively manage servers and network resources is another key service. All network operating systems come with a suite of utilities to help administrators maintain the system in peak working condition.

Network management can be divided into two categories: presentation and instrumentation. Presentation includes the utilities and interfaces that are provided to manage the system. Instrumentation defines the types of information and alerts that can be passed on to a standards-based management tool.

At the presentation level, OES includes Novell iManager 2.5 as a cross-platform utility for general system management and Novell Remote Manager (NRM) for low-level, node-specific management.

At the instrumentation level, Novell provides Simple Network Management Protocol (SNMP)-based instrumentation and proprietary instrumentation for NetWare. SNMP support is installed with eDirectory.

With OES, Novell is embracing a new strategy to reduce the level of complexity associated with consolidating network management tasks across disparate systems. The strategy is based on OES and adds Common Information Model (CIM)-based instrumentation for NetWare and Linux in an effort to move away from the proprietary instrumentation. iManager 2.5 supports CIM-based plug-ins to present the management information.

Novell iManager 2.5

Novell iManager 2.5 is an extensible Web-based network management console that supports both OES NetWare and OES Linux servers. Through various plug-ins, iManager can configure and manage OES network services. It also manages eDirectory schema, partitions, and replicas, as well as users, groups, and other objects. Through Role-Based Services (RBS), you can delegate iManager administration tasks to other users.

Novell Remote Manager (NRM)

Novell Remote Manager (NRM) is a Web-based tool for low-level, node-specific management. With NRM, you can manage OES servers from a remote location, monitor a server's health, change the server configuration, and perform diagnostic and debugging tasks.

RconsoleJ

RconsoleJ is a Java*-based tool that lets you access NetWare servers remotely and run server utilities from a workstation.

For additional information, see “[Coexistence and Migration](#)” in the *Remote Server Management for NetWare Administration Guide for OES*.

Health Monitoring Services

Health Monitoring Services let you monitor the health of NetWare or Linux servers. Among the various aspects of server health you can monitor are memory, operating system, processes/threads, network, and CPU. Color-coded icons (in green, yellow, and red) indicate whether your servers meet performance standards.

Health Monitoring Services use a CIM Object Manager provided by the Open Web-Based Enterprise Management (OpenWBEM) initiative. For more information about OpenWBEM, visit the [DMTF Web site \(http://www.dmtf.org/standards/wbem\)](http://www.dmtf.org/standards/wbem).

System/Network Management Coexistence and Migration Issues

The preceding list of OES management tools is by no means comprehensive. Novell includes many other tools to help you manage everything in your network.

Wherever possible, Novell provides cross-platform tools that can be used to manage both OES NetWare and Linux services. However, some of the tools are service specific or platform specific and are for managing only NetWare or only Linux servers.

For a complete listing and description of the management tools and interfaces available in OES, see “[Overview of Management Tools and Interfaces](#)” in the *Novell OES Planning and Implementation Guide*.

Novell iManager

Although iManager is written to function on either NetWare or Linux, not all of the plug-in modules are present in the OES Linux environment. Some plug-in modules present information unique to the NetWare environment and have no equivalent in the Linux environment.

For information about migrating from iManager 1.5.x and upgrading from iManager 2.0.x, see “[Upgrading to iManager 2.5](#)” in the *Novell iManager 2.5 Administration Guide*.

Novell Remote Manager

NRM is available on both OES NetWare and Linux platforms. However, due to the inherent differences between the two operating systems, NRM on Linux doesn't include all the functionality of NRM on NetWare.

For additional information on NRM for NetWare, see “[Coexistence and Migration](#)” in the *Novell Remote Manager for NetWare Administration Guide for OES*.

For additional information on NRM for Linux, see “[Coexistence and Migration](#)” in the *Novell Remote Manager Administration Guide for Linux*.

Health Monitoring Services

Health Monitoring Services is a new service in OES. For robust monitoring, OES NetWare and OES Linux servers must be running the OpenWBEM CIMOM (owcimomd) module. Otherwise, the servers can report only a Simple Server Status (up or down).

For additional information, see “[Coexistence and Migration](#)” in the *Health Monitoring Services Administration Guide for OES*.

OpenWBEM

The implementation of OpenWBEM and CIMOM in OES represents the first release of these services by Novell. In this release, you can only collect data and do some analysis. When these services are fully implemented, you will be able to gather data, analyze it, configure thresholds, set up system alerts, and perform any corrective actions needed.

For additional information, see “[Coexistence and Migration](#)” in the *OpenWBEM Services Administration Guide for OES*.

2.2.14 Web and Application Services

Web and application services support the creation and deployment of Web sites and Web applications. More and more applications are being developed to the Web services model to leverage the widespread availability of Internet-based protocols and tools.

With the proper Web components in place, a server can host dynamic Web sites where the content changes according to selections made by the user. You can also run any of the hundreds of free Web applications that can be downloaded from the Internet. Web and application services make it easy to build your own dynamic Web content and create customized Web database applications.

Apache and Tomcat

Apache is the most popular Web server in use on the World Wide Web today. OES includes the Apache Web Server 2.0 for both NetWare and Linux. This serves as the foundation Web server upon which you can build Web sites and host Web applications for use in your business.

OES also includes a Jakarta-Tomcat servlet container for both NetWare and Linux. Tomcat is used to run basic Java servlet and Java Server Pages (JSP) applications on either operating system platform. Tomcat 4 is the default version for the administrative instance on both platforms. For Web application development, OES also includes Tomcat 5 for both NetWare and Linux, which implements the Java Servlet 2.4 and JSP 2.0 specifications.

MySQL

OES includes the open source MySQL* database server on both the NetWare and Linux platforms. When combined with a Web application and a Web server, MySQL is a very reliable and scalable database for use in hosting eCommerce and business-to-business Web applications.

NOTE: The more powerful PostgreSQL database server comes with SLES 9. It has been ported to the NetWare platform as well and is available separately as open source software.

Perl and PHP

The scripting technologies integrated with OES for both NetWare and Linux include industry standard Perl (Practical Extraction and Report Language) and PHP (PHP: Hypertext Preprocessor). These are powerful server-side scripting languages commonly used by Web programmers to create scripts for Web servers and to access Web databases.

OES NetWare includes additional scripting technologies that simplify the task of developing NetWare-based applications. They include Novell Script for NetWare (NSN), Universal Component System (UCS), and Novell ScriptPages (NSP).

Java and J2EE

The Java 2 Platform, Enterprise Edition (J2EE*) is a widely used environment for developing large-scale Web applications. OES offers a choice of J2EE-certified application servers: JBoss* and the Novell exteNd™ Application Server. JBoss is bundled with SLES 9, while the Novell exteNd Application Server is available with OES NetWare.

QuickFinder Server

OES includes the Novell QuickFinder Server on both the NetWare and Linux platforms. QuickFinder lets you add search and print functionality to any Web site or internal intranet. It can index and find matches within a wide variety of data types.

QuickFinder replaces the NetWare Web Search Server that is available in NetWare 6.5 SP3 and earlier versions of NetWare 6.

Web Services Coexistence and Migration Issues

The Web and application services available in OES can be deployed in a variety of combinations. Their availability on both NetWare and Linux platforms makes it easy to mix and match according to your network's needs. In most cases, you can also migrate existing installations on NetWare to OES Linux.

Apache

For the most part, Apache is functionally the same on both NetWare and Linux. Novell made some enhancements in Apache for NetWare to allow for directory-enabled administration.

OES for NetWare installs an administration instance of Apache that is used by Web-based management tools such as Novell Remote Manager.

For additional coexistence and migration information on the Apache Web server, see “[Apache Coexistence and Migration Issues](#)” in the *Apache Web Server for NetWare Administration Guide for OES*.

Tomcat

OES for NetWare installs an administration instance of Tomcat that is used by Web-based management tools such as Novell Remote Manager.

For additional coexistence and migration information on the Tomcat servlet container, see “[Tomcat Coexistence and Migration Issues](#)” in the *Tomcat for NetWare Administration Guide for OES*.

QuickFinder

QuickFinder and NetWare Web Search Server cannot coexist on the same NetWare server. However, you can have as many instances of QuickFinder and NetWare Web Search Server as you need on separate servers.

When indexing a file system, the QuickFinder engine indexes only what it has rights to see. On NetWare, it has full access to all mounted volumes. On Linux, it has rights to only the files that the novellwww users in the wwwgroup have rights to see.

When you upgrade a NetWare server running NetWare Web Search Server to OES SP2 for NetWare (NetWare 6.5 SP5), Web Search Server is automatically upgraded to QuickFinder. The upgrade

identifies all the configuration settings and indexes from Web Search and enables them to be used by QuickFinder.

For additional coexistence and migration information on QuickFinder, see “**Coexistence and Migration Issues**” in the *QuickFinder Server 4.0 Administration Guide*.

2.2.15 Open Source Software

OES provides support for running a variety of open source software programs.

AMP Server

Both OES for Linux and OES for NetWare provide a platform for running the thousands of AMP (Apache/Tomcat, MySQL, Perl/PHP) programs that are available in the open source community.

For more information, see the *Web and Application Services Overview for OES*.

OpenSSH

OpenSSH is an open source technology that has been integrated with OES for NetWare. It provides a secure shell that lets users who are Admin equivalent gain remote access to servers on the network and copy files and directories between those servers using SSH utilities.

Novell's implementation is based on [OpenSSH version 3.6p1 \(http://www.openssh.com\)](http://www.openssh.com). It uses encryption provided by NCI technology rather than SSL to implement 128-bit (and stronger) encryption. Because OpenSSH encrypts all traffic (including passwords), it effectively eliminates eavesdropping, connection hijacking, and other network-level attacks that have plagued users of Telnet, Rlogin, Ftp, and similar utilities.

2.2.16 Software Distribution and Patch Management

One of a network administrator's biggest challenges is keeping installed software up to date on all servers and workstations.

For OES, Novell has laid the foundation for a common software distribution and patch management facility for both NetWare and Linux servers.

BASH on NetWare

BASH (Bourne Again Shell) is a versatile Linux utility that has been ported to NetWare. It lets you perform a subset of the BASH commands available on Linux.

For more information, see “**BASH**” in the *Utilities Reference for OES*.

RPM (RPM Package Manager)

SLES 9 uses RPM (RPM Package Manager) to manage software packages. Its main programs are rpm and rpmbuild. The powerful RPM database can be queried by users, system administrators, and package builders for detailed information about the installed software.

For OES, RPM has been ported to NetWare and runs as a NetWare Loadable Module on the server. RPM for NetWare works the same as RPM on Linux, with a few minor differences due to limitations in the BASH command on NetWare.

In OES SP2, not all of the products that can be installed on OES NetWare servers support RPM. Those that are not installable through RPM store information in the products.dat file. For interim compatibility, the information in products.dat is synchronized with the RPM database.

ZENworks[®] Linux Management 6.6.x supports software distribution via RPM on the NetWare platform. For more information, see the *ZENworks Linux Management Administration Guide* (<http://www.novell.com/documentation/zlm>).

RCD (Red Carpet Daemon)

Red Carpet[®] Daemon (RCD) is a software distribution mechanism developed for Linux. RCD performs software management functions on behalf of the rc software management tool, which allows remote software management. RCD can update, install, and remove software from local files or from specified download servers, and can handle interactions with the system's package database (such as verification and searching).

For OES, RCD has been ported to NetWare and runs as a NetWare Loadable Module on the server. RCD works the same on both Linux and NetWare.

RCD for NetWare is not loaded by default in OES. You must either load rcd.nlm manually at the server console or add the command to the server's autoexec.ncf file.

You can set up users with the redpass command and control the software distribution process using the rug command line utility.

Rug

Rug is a patch management utility developed for Linux. It is the command line complement to RCD and works with the rcd daemon to install, update, and remove software according to the commands you give it.

For OES, rug has been ported to NetWare and runs as a NetWare Loadable Module on the server. Rug works the same on both Linux and NetWare.

You can run rug from the BASH shell or from the NetWare server console. Screen output for rug is displayed in a new proprietary screen.

For registered OES customers, Novell has set up an upgrade server at <http://update.novell.com> to deliver patches to subscriber channels. You can access this server to install OES patches that apply to NetWare, but not SLES 9 patches.

2.2.17 Licensing

Licensing provides a way for software manufacturers to enforce compliance with end user license agreements (EULAs). Licensing services monitor license usage and prevent customers from exceeding the number of licenses they purchased.

When you install or upgrade NetWare servers, the installation software automatically installs Novell Licensing Services (NLS). Either during the installation or afterwards using iManager, you can install and manage license certificates in your eDirectory tree. You must have a valid license/key file pair (*.nlf and *.nfk).

For more information, see “[How Novell Licensing Services Works](#)” in the *OES Licensing Services Administration Guide for NetWare*.

Installing OES for Linux doesn't require license files. Nevertheless, you are required to accept a EULA, which defines your rights to use OES on the Linux platform. For more information, see “**Licensing**” in the *Novell OES Planning and Implementation Guide*.

2.3 Coexistence and Migration Issues for Other Novell Products

The coexistence and migration issues surrounding the deployment of other Novell products that are not bundled with OES are beyond the scope of this document.

Check the [Novell OES Web page \(http://www.novell.com/oes\)](http://www.novell.com/oes) for information about deploying other Novell products in the OES environment.

2.4 What's Next

For instructions on how to install, upgrade, or migrate servers into an OES environment, see **Chapter 3, “Installation, Upgrade, and Migration Scenarios,”** on page 45.

Installation, Upgrade, and Migration Scenarios

After you have addressed the coexistence and migration issues for the various system fabrics as necessary, you are ready to install, upgrade, or migrate servers to Novell® Open Enterprise Server (OES).

This chapter presents some common deployment and migration scenarios for OES for NetWare® and OES for Linux.

- [Section 3.1, “Installing OES Servers into a New Tree,” on page 45](#)
- [Section 3.2, “Installing OES Servers into an Existing Tree,” on page 45](#)
- [Section 3.3, “Upgrading or Migrating Existing Servers to OES,” on page 49](#)
- [Section 3.4, “Configuring Client Workstations for OES,” on page 53](#)

3.1 Installing OES Servers into a New Tree

Installing OES servers into a new tree is the most straightforward of all installation scenarios. Simply follow the instructions in the appropriate OES server installation guide:

- [“Installing OES NetWare”](#) in the *OES for NetWare Installation Guide*.
- [“Installing Open Enterprise Server \(OES\) Linux”](#) in the *OES for Linux Installation Guide*.

3.1.1 Install an OES NetWare Server First

In this release of OES, if you want to create a new eDirectory™ tree that will contain both OES NetWare and OES Linux servers, you must start by installing an OES NetWare server first.

If you install an OES Linux server first, create a new tree during the install, and then add an OES NetWare server to this newly created tree, you will not be able to install any Client or Server Licenses. Any features that require either a NetWare Server license or NetWare Client Access license will be inaccessible.

3.1.2 Installing Older NetWare Versions with OES Linux

Installation of NetWare versions earlier than OES NetWare (NetWare 6.5 SP4) into an OES Linux tree is problematic and should not be attempted. In particular, Novell does not support installing a new NetWare 5.1 server into an OES Linux tree.

3.2 Installing OES Servers into an Existing Tree

In these scenarios, a NetWare-based tree exists and the task at hand is to introduce a new OES server into that tree. No existing servers are to be replaced.

- [“Installing an OES NetWare Server into an eDirectory Tree” on page 46](#)
- [“Installing an OES Linux Server into an eDirectory Tree” on page 46](#)

- [“Installing an OES Server into a NetWare 5/NDS 7 or 8 Tree” on page 46](#)
- [“Installing an OES Server into a NetWare 4/NDS 6 Tree” on page 47](#)

3.2.1 Installing an OES NetWare Server into an eDirectory Tree

If you have an eDirectory tree that already contains at least one NetWare 6.5 server, most of the preparatory tasks necessary for OES NetWare have already been completed.

Depending on the eDirectory version in the existing tree, you might need to apply some updates and schema extensions to prepare the tree for the version of eDirectory 8.7.3 that comes with OES. See [Section 2.2.1, “Directory Services,” on page 20](#) for more information.

Installing a new OES SP2 NetWare server into the tree is the same as installing a new NetWare 6.5 SP5 server. See [“NetWare 6.5 Installation Program for OES NetWare Servers” on page 17](#) for more information.

For detailed installation instructions, see [“Installing OES NetWare”](#) in the *OES NetWare Installation Guide*.

3.2.2 Installing an OES Linux Server into an eDirectory Tree

If you have an eDirectory tree that already contains at least one NetWare 6.5 server, most of the preparatory tasks necessary for OES Linux have already been completed.

Depending on the eDirectory version in the existing tree, you might need to apply some updates and schema extensions to prepare the tree for the version of eDirectory 8.7.3 that comes with OES. See [Section 2.2.1, “Directory Services,” on page 20](#) for more information.

TIP: To help ensure a successful OES Linux installation into an existing NetWare tree, Novell recommends that you apply the eDirectory core schema and OES product extensions, and then allow the schema to synchronize throughout the tree before installing the first OES Linux server. In OES SP2, you can do this by running the Prepare for New eDirectory and Schema Update tasks in the Novell Deployment Manager utility. For more information, see [“Prepare the Network with Deployment Manager”](#) in the *OES for NetWare Installation Guide*.

The OES for Linux installation procedure installs both SUSE® LINUX Enterprise Server 9 (SLES 9) with Support Pack 2 and OES components at the same time. See [“YaST Installation Program for OES Linux Servers” on page 16](#) for more information.

For detailed installation instructions, see [“Installing Open Enterprise Server \(OES\) Linux”](#) in the *OES for Linux Installation Guide*.

3.2.3 Installing an OES Server into a NetWare 5/NDS 7 or 8 Tree

If you have a NetWare 5.1 tree with NDS® 7 or 8, follow these steps to install the first OES NetWare or OES Linux server into the tree.

Keep in mind that Novell recommends upgrading to eDirectory 8.7.3 as a long-term OES deployment strategy. Compatibility of OES with earlier versions of eDirectory and NDS is provided as an interim solution only.

- 1 Ensure that all NetWare 5.1 servers have Support Pack 8 applied.

You can download NetWare Support Packs from the [Novell Downloads page \(http://www.novell.com/download\)](http://www.novell.com/download).

- 2 Using Novell Deployment Manager, complete the Search Tree for eDirectory/NDS Versions task which updates NDS on the NetWare 5.1 servers to version 7.62c or 8.85c.
- 3 In Deployment Manager, complete the Prepare for New eDirectory task to extend the core schema for compatibility with eDirectory 8.7.3.
- 4 Install OES NetWare servers as outlined in “[Installing OES NetWare](#)” in the *OES for NetWare Installation Guide*.
- 5 Install OES Linux servers as outlined in “[Installing Open Enterprise Server \(OES\) Linux](#)” in the *OES for Linux Installation Guide*, paying particular attention to the following:

- The Open Enterprise Server installation option is selected by default. This option installs all OES components except Novell Cluster Services™, Novell iFolder® 2.1.x, Novell iFolder 3.x, Novell Storage Services™ (NSS), and Novell IP Address Management. If you require these services, Novell recommends that you install them after the initial OES installation is complete.
- Be sure to not skip the Certificate Authority (CA) creation screen, and do not enable OpenLDAP (it is disabled by default).
- When typing the eDirectory login information, use fully distinguished dot notation (for example, cn=admin.o=novell). Specify the IP address of the NetWare server holding the Master replica of the [Root] partition.
- On the SLP configuration screen, select the SLPDA configuration option and specify the scope and IP address of the NetWare 5.1 server acting as the SLP Directory Agent.

See “[SLP Coexistence and Migration Issues](#)” on [page 25](#) for more information about SLP DA synchronization in OES.

- On the Network Time Protocol (NTP) configuration screen, specify the IP address of the NetWare 5.1 server acting as the time provider (Single Reference or Reference Time Server).

Although the NetWare 5.1 Timesync NLM™ program is not fully NTPv3 compatible, it can provide NTP time to OES Linux NTP-based servers. The only difference noticed in Novell's testing is that it takes longer for time to synchronize when using timesync.nlm.

After the OES Linux server installation is complete, you can reconfigure all servers to obtain time from the Linux NTPv3 time source. See [Section 2.2.6, “Time Synchronization,”](#) on [page 28](#) for more information.

- As you proceed through the OES component configuration screens, make sure you leave the IP address for LDAP authentication set to the default (local LDAP server).

Do not change the LDAP address to the IP address of a NetWare 5.1 server. The version of NDS in NetWare 5.1 contains a pre-eDirectory LDAP implementation that does not understand all of the LDAP calls the OES components make.

To upgrade your NetWare 5.1 servers to OES NetWare, see [Section 3.3, “Upgrading or Migrating Existing Servers to OES,”](#) on [page 49](#).

3.2.4 Installing an OES Server into a NetWare 4/NDS 6 Tree

If you have a NetWare 4.11 or 4.2 tree with NDS 6, follow these steps to install the first OES NetWare server into the tree.

An OES NetWare server must be installed first to prepare the tree and provide IPX™ communication with the NetWare 4 servers. After the network is sufficiently updated to support OES NetWare and TCP/IP communication, you can install OES Linux servers.

WARNING: NetWare 4.10 is not supported in a mixed environment with OES NetWare. Any NetWare 4.10 servers should be either upgraded or removed from the tree before you start installing OES servers.

Keep in mind that Novell recommends upgrading to eDirectory 8.7.3 as a long-term OES deployment strategy. Compatibility of OES with earlier versions of eDirectory and NDS is provided as an interim solution only.

- 1 Ensure that all NetWare 4.11 servers have Support Pack 9 applied.
You can download NetWare Support Packs from the [Novell Downloads page \(http://www.novell.com/download\)](http://www.novell.com/download).
- 2 Make sure the Novell Client™ software on the Windows workstation you use to run Novell Deployment Manager is configured to support IPX.
IPX support is not installed by default in the Novell Client.
- 3 Using the Novell Deployment Manager, complete the Search for NDS/eDirectory Versions task and update NDS on the NetWare 4 servers to version 6.21.
To verify the NDS version, enter `modules ds.nlm` at the server console.
- 4 In Deployment Manager, complete the Prepare for New eDirectory task to extend the core schema for compatibility with eDirectory 8.7.3.
- 5 In Deployment Manager, complete the Generate GUIDs on NetWare 4 Servers task.
- 6 On the NetWare 4 server holding the Master replica of the [Root] partition, run DSRepair > Advanced Options > Global Schema Operations > Post NetWare 5 Schema Update, and then run Local DSRepair > Rebuild Operational Schema.
- 7 Install the first OES NetWare server as outlined in “[Installing OES NetWare](#)” in the *OES for NetWare Installation Guide*.
Be sure to enable IPX during the server installation.
- 8 Install OES Linux servers as outlined in “[Installing Open Enterprise Server \(OES\) Linux](#)” in the *OES for Linux Installation Guide*.
Because there is no support for IPX or IPX compatibility mode (SCMD) on Linux, the OES Linux servers cannot communicate with any of the NetWare 4 servers.

After this OES coexistence configuration is in place, you should plan to migrate your NetWare 4 servers to OES NetWare as quickly as possible. You have the following options for NetWare 4 servers:

- Use NetWare Migration Wizard 8.1 from the Server Consolidation and Migration Toolkit to migrate a NetWare 4 server onto new hardware running OES NetWare. As part of the migration, the old server is shut down and the new server assumes the server name and IP address of the old server.

For instructions on running Migration Wizard 8.1, see the [NetWare Migration Wizard 8.1 Administration Guide](#).

- Use Novell Server Consolidation Utility 4.1 from the Server Consolidation and Migration Toolkit to copy data from NetWare 4 servers onto new OES NetWare or Linux servers. The old servers remain active and retain their server names and IP addresses.

Verify that users can access the migrated data on your new OES NetWare servers, then remove the NetWare 4 source servers from the tree.

For instructions on running the Server Consolidation Utility 4.1, see the *Novell Server Consolidation Utility 4.1 Administration Guide*.

- Perform a down-server upgrade of NetWare 4.2 servers to OES NetWare.

Down-server upgrades are no longer officially supported by Novell. However, in certain situations, customers can work with Novell Technical ServicesSM staff to complete a down-server upgrade. Contact [Novell Technical Services \(http://support.novell.com\)](http://support.novell.com) for assistance.

After all of your NetWare 4 servers have been removed from the tree, support for IPX is no longer needed on the OES NetWare servers. Remove the IPX modules and bindings from the autoexec.ncf files or disable the IPX bindings using the inetcfg utility.

If your OES network uses NTPv3 for time synchronization, convert the time synchronization method on your upgraded NetWare servers from timesync.nlm to NTPv3. See [Section 2.2.6, “Time Synchronization,” on page 28](#) for more information.

3.3 Upgrading or Migrating Existing Servers to OES

These scenarios assume that an OES-compatible tree exists and the task at hand is to upgrade existing servers to OES or to migrate data from the existing servers to new OES servers.

IMPORTANT: Before upgrading any servers to OES, you should complete the network preparation tasks outlined in [Section 3.2, “Installing OES Servers into an Existing Tree,” on page 45](#) for your version of NDS/eDirectory.

- [“From NetWare to OES NetWare” on page 49](#)
- [“From NetWare to OES Linux” on page 50](#)
- [“From Linux to OES NetWare” on page 50](#)
- [“From Linux to OES Linux” on page 50](#)
- [“From Windows to OES NetWare” on page 51](#)
- [“From Windows to OES Linux” on page 51](#)
- [“Summary of OES Upgrade and Migration Paths” on page 51](#)

3.3.1 From NetWare to OES NetWare

You can upgrade any version of NetWare from 5.1 SP8 through 6.5 SP5 (OES SP2 for NetWare). Choose the upgrade option that works best for your situation:

- Local upgrade: In-place upgrade performed on a running server using the NetWare 6.5 SP5/OES install program. Using the SP5 overlay method lets you upgrade the operating system and any installed products as well as apply the SP5 fixes all at the same time.

For instructions, see [“Upgrading to OES NetWare”](#) in the *OES NetWare Installation Guide*.

- Remote upgrade: Across-the-wire upgrade performed on a running server using either Novell Deployment Manager or Novell iManager. Using the SP5 overlay method lets you upgrade the operating system and any installed products as well as apply the SP5 fixes all at the same time. For instructions, see “[Remote Upgrades](#)” in the *OES NetWare Installation Guide*.

You can also use one of the following migration methods to transfer data from older NetWare servers to new OES NetWare servers:

- Server migration (hardware upgrade): File system data and eDirectory transfer from an existing NetWare server to a new OES NetWare server using NetWare Migration Wizard. The new server replaces the old one.
- Consolidation: Data copy from source servers to destination servers using the Server Consolidation Utility. Source servers can continue to exist.

For instructions, see the *Novell Server Consolidation and Migration Toolkit Administration Guide*.

3.3.2 From NetWare to OES Linux

Direct upgrades are not supported from any version of NetWare to any version of OES Linux.

You can transfer data from a NetWare 5.1 or later server to an NSS volume on an OES Linux server as a consolidation project using the Server Consolidation Utility 4.11, which is part of the Server Consolidation and Migration Toolkit.

For NetWare 4.11, 4.2, and 5.0 servers, you can use a two-step consolidation process to move the data from NetWare to Linux. First, run the Server Consolidation Utility to copy the data to a NetWare 6.5 or OES NetWare server, and then run the utility again to copy the data to an NSS volume on an OES Linux server.

For more information, see the *Novell Server Consolidation and Migration Toolkit Administration Guide*. Pay particular attention to the information found in “[Consolidating Data to OES Linux](#)”.

If you have an externally attached NSS data volume on a NetWare 6.5 or OES NetWare server, another option is to unmount the volume from the NetWare server and mount it on an existing OES Linux server.

For more information, see “[Coexistence and Migration Issues](#)” in the *Novell Storage Services File System Administration Guide*.

3.3.3 From Linux to OES NetWare

There is no supported upgrade/migration path from any version of Linux to any version of NetWare.

3.3.4 From Linux to OES Linux

You can use the YaST installation program that comes with OES to upgrade an existing SLES 9 server to SLES 9 SP3 with OES. For instructions, see “[Upgrading to OES Linux](#)” in the *OES Linux Installation Guide*.

Upgrades to OES Linux from any other version of Linux are not supported.

3.3.5 From Windows to OES NetWare

Migrations from Windows NT or Windows 2000/2003 Server to OES NetWare are supported as server consolidation projects. With Server Consolidation Utility 4.11, you can select a Windows domain as the source and copy Windows file system data along with users/groups, permissions, and ownership information from Windows servers to OES NetWare servers in a destination eDirectory tree.

At this time, the Server Consolidation Utility supports copying data from Windows 2000/2003 servers in Active Directory from only one domain at a time. The domain functional level must be Windows 2000 Mixed Mode. The utility uses the Mixed Mode domain levels to access an Active Directory domain as if it were a flat NT domain. You will not be able to access certain aspects of Active Directory, such as trust relationships.

For instructions, see “[Consolidating Data from Windows Servers](#)” in the *Novell Server Consolidation and Migration Toolkit 1.1 Administration Guide*.

3.3.6 From Windows to OES Linux

Migrations from Windows NT or Windows 2000/2003 Server to OES Linux are supported as server consolidation projects. With Server Consolidation Utility 4.11, you can select a Windows domain as the source and copy Windows file system data along with users/groups, permissions, and ownership information from Windows NT servers to OES Linux servers in a destination eDirectory tree.

At this time, the Server Consolidation Utility supports copying data from Windows 2000/2003 servers in Active Directory from only one domain at a time. The domain functional level must be Windows 2000 Mixed Mode. The utility uses the Mixed Mode domain levels to access an Active Directory domain as if it were a flat NT domain. You will not be able to access certain aspects of Active Directory, such as trust relationships.

For instructions, see “[Consolidating Data from Windows Servers](#)” in the *Novell Server Consolidation and Migration Toolkit 1.1 Administration Guide*.

3.3.7 Summary of OES Upgrade and Migration Paths

Table 3-1 summarizes the upgrade/migration paths to OES. The terms used in the table are defined as follows:

- Local Upgrade: In-place upgrade performed at the server itself
- Remote Upgrade: Across-the-wire upgrade performed from a workstation
- Server Migration: File system data and eDirectory transfer via NetWare Migration Wizard
- Consolidation: File system data copy via Server Consolidation Utility
- Data Volume Transfer: Move of an existing NSS volume from one server to another

Table 3-1 OES Upgrade and Migration Path Summary

Source Operating System	Destination OES NetWare/NetWare 6.5 SP4	Destination OES Linux
NetWare 6.5 + SP2, SP3, SP4, or SP5	Local Upgrade: In-place upgrade using NetWare 6.5 SP5 Install overlay method	Local/Remote Upgrade: Not supported Server Migration: Not supported
Minimum DS: eDirectory 8.7.x	Remote Upgrade: Across-the-wire upgrade using Deployment Manager or iManager Server Migration: Migration Wizard 8.1 Consolidation: Server Consolidation Utility 4.11	Consolidation: Server Consolidation Utility 4.11 Data Volume Transfer: Install OES Linux server, then mount an existing NSS volume on it
NetWare 6.0 + SP5	Local Upgrade: In-place upgrade using NetWare 6.5 SP5 Install overlay method	Local/Remote Upgrade: Not supported Server Migration: Not supported
Minimum DS: eDirectory 8.6.2	Remote Upgrade: Across-the-wire upgrade using Deployment Manager or iManager Server Migration: Migration Wizard 8.1 Consolidation: Server Consolidation Utility 4.11	Consolidation: Server Consolidation Utility 4.11 (to NSS volumes only)
NetWare 5.1 + SP8	Local Upgrade: In-place upgrade using NetWare 6.5 SP5 Install overlay method	Local/Remote Upgrade: Not supported Server Migration: Not supported
Minimum DS: NDS 7.62c or 8.85c	Remote Upgrade: Across-the-wire upgrade using Deployment Manager or iManager Server Migration: Migration Wizard 8.1 Consolidation: Server Consolidation Utility 4.11	Consolidation: Server Consolidation Utility 4.11 (to NSS volumes only)
NetWare 5.0 + SP6a + NSS patch	Local/Remote Upgrade: Not supported Server Migration: Migration Wizard 8.1	Local/Remote Upgrade: Not supported Server Migration: Not supported
Minimum DS: NDS 7.62c or 8.85c	Consolidation: Server Consolidation Utility 4.11 (requires TCP/IP on source NetWare server)	Consolidation: Not supported (can use SCU to copy data to NetWare 6.5, then from NetWare 6.5 to OES Linux)
NetWare 4.11 +SP9	Local/Remote Upgrade: Not supported Server Migration: Migration Wizard 8.1	Local/Remote Upgrade: Not supported Server Migration: Not supported
NetWare 4.2 Minimum DS: NDS 6.21	Consolidation: Server Consolidation Utility 4.11 (requires IPX on destination NetWare server)	Consolidation: Not supported (can use SCU to copy data to NetWare 6.5, then from NetWare 6.5 to OES Linux; requires IPX on NetWare server)

Source Operating System	Destination OES NetWare/NetWare 6.5 SP4	Destination OES Linux
SUSE LINUX Enterprise Server 9	No supported upgrade/migration path from any version of Linux to any version of NetWare	Local Upgrade: YaST with Open Enterprise Server selected Upgrade from any other version of Linux: Not supported
Windows NT 4.0 Server SP6a	Local/Remote Upgrade: Not supported Server Migration: Not supported	Local/Remote Upgrade: Not supported Server Migration: Not supported
Windows 2000 Server SP2 and Windows 2003 Server SP1 (domain functional level must be Mixed Mode)	Consolidation: Server Consolidation Utility 4.11 (copies NTFS data, users/groups, permissions, ownerships from one domain at a time)	Consolidation: Server Consolidation Utility 4.11 (copies NTFS data, users/groups, permissions, ownerships from one domain at a time)

NOTE: NetWare 4.11, 5.0, and 5.1 have reached end-of-life status and are no longer supported by Novell. They are listed here solely as legacy platforms that can be migrated to OES.

3.4 Configuring Client Workstations for OES

When you install new OES NetWare servers, client workstations can access the servers through the standard NetWare connectivity methods:

- Windows workstations can access OES NetWare servers by using the Novell Client for Windows via NCP™, or by using the NetWare Native File Access Protocols via CIFS.
- Macintosh workstations can access OES NetWare servers by using the NetWare Native File Access Protocols via AFP.

Another method for Macintosh workstations running OSX is to specify a NetWare volume in the Finder via SMB. For example, in the Finder click *Go > Connect to Server* (or use the Command-K keyboard shortcut) and enter

```
smb://ip_address_or_DNS_name/volume
```

You are prompted to log in to eDirectory to establish the server connection.

- UNIX/Linux workstations, including those running Novell Linux Desktop, can access OES NetWare servers by using the NetWare Native File Access Protocols via NFS.

When you install new OES Linux servers, client workstations can access the servers through the standard Linux connectivity methods:

- Windows workstations can access OES Linux servers by using the Novell Client for Windows via NCP Server for Linux, or by using Samba via CIFS.
- Macintosh workstations can access OES Linux servers by using third-party AFP support for Linux.
- UNIX/Linux workstations, including those running Novell Linux Desktop, can access OES Linux servers by using NFS, FTP, and other Linux protocols.

With the Novell Client for Linux, Linux workstations can access OES Linux servers via NCP, which allows the use of NetWare-style login scripts and drive mappings.

When you upgrade or migrate existing servers to OES, you might need to modify login scripts and reconfigure client configurations to point to the new OES servers. See the documentation for your client software for more information.

Documentation Updates

This section contains information on documentation content changes that have been made in the *OES Coexistence and Migration Guide* since the initial release of Open Enterprise Server. This information can help you to keep current on updates to the documentation.

All changes that are noted in this section were also made in the documentation. The documentation is provided on the Web in two formats: HTML and PDF. The HTML and PDF documentation are both kept up-to-date with the documentation changes listed in this section.

The documentation update information is grouped according to the date the changes were published. Within a dated section, the changes are listed by the names of the main table of contents sections.

If you need to know whether a copy of the PDF documentation you are using is the most recent, the PDF document contains the date it was published on the front title page and in the Legal Notices section immediately following the title page.

This documentation was updated on the following dates:

- “December 23, 2005 (Open Enterprise Server SP2)” on page 55
- “September 29, 2005 (Open Enterprise Server SP1)” on page 55
- “June 1, 2005” on page 56

A.1 December 23, 2005 (Open Enterprise Server SP2)

Updated version references, corrected minor errors, and reformatted the page design to comply with revised Novell® documentation standards.

A.2 September 29, 2005 (Open Enterprise Server SP1)

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

- [Addressing Coexistence and Migration Issues](#)
- [Installation, Upgrade, and Migration Scenarios](#)

A.2.1 Addressing Coexistence and Migration Issues

The following updates were made in this section:

Location	Change
Section 2.1, “System Preparation and Deployment Tools,” on page 11	Updated version references, merged references to NetWare 6.5 and OES NetWare, and revised references to Server Consolidation Utility and Migration Wizard, which are now combined into the Server Consolidation and Migration Toolkit.

Location	Change
Section 2.2, "General Coexistence and Migration Issues for OES," on page 19	Updated version references, updated documentation cross references, added sections for iFolder 3.x, revised references to Novell Client for Linux, and added information about migration iPrint services from NetWare to Linux, which is a new feature of the Server Consolidation Utility 4.1.

A.2.2 Installation, Upgrade, and Migration Scenarios

The following updates were made in this section:

Location	Change
Section 3.1, "Installing OES Servers into a New Tree," on page 45	Updated version numbers, revised tip for installing OES Linux server into an existing eDirectory tree, removed steps that applied only to NetWare 5.1 SP7, and revised references to the utilities included in the Server Consolidation and Migration Toolkit.
Section 3.3, "Upgrading or Migrating Existing Servers to OES," on page 49	Updated version numbers for the utilities included in the Server Consolidation and Migration Toolkit, clarified requirements for migrating from Windows 2000/2003 Active Directory environment, and revised references to the Novell Client for Linux.

A.3 June 1, 2005

Minor updates and corrections were made throughout the guide.