

Open Enterprise Server 2015 SP1 Planning and Implementation Guide

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- ◆ Appendix L, “Small Footprint CIM Broker (SFCB),” on page 309
- ◆ Appendix M, “Documentation Updates,” on page 313

Purpose

This guide provides:

- ◆ Planning and implementation instructions
- ◆ Service overviews
- ◆ Links to detailed information in other service-specific guides.

Audience

This guide is designed to help network administrators

- ◆ Understand Open Enterprise Server 2015 SP1 services prior to installing them.
- ◆ Make pre-installation planning decisions.
- ◆ Understand installation options for each platform.
- ◆ Implement the services after they are installed.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with OES 2015 SP1. Please use the User Comments feature at the bottom of each page of the online documentation.

Additional Documentation

Additional documentation is found on the [OES 2015 SP1 Documentation Web site \(../././oes2015\)](#).

Documentation Conventions

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

1 What's New or Changed

This section summarizes the new and changed features in Novell Open Enterprise Server (OES) 2015 SP1.

- ♦ Section 1.1, “AFP,” on page 15
- ♦ Section 1.2, “Archive and Version Services,” on page 16
- ♦ Section 1.3, “CIFS,” on page 16
- ♦ Section 1.4, “Distributed File Services (DFS),” on page 16
- ♦ Section 1.5, “DNS and DHCP,” on page 16
- ♦ Section 1.6, “Domain Services for Windows,” on page 16
- ♦ Section 1.7, “Dynamic Storage Technology,” on page 16
- ♦ Section 1.8, “File Systems and Storage,” on page 16
- ♦ Section 1.9, “Install,” on page 17
- ♦ Section 1.10, “iFolder,” on page 17
- ♦ Section 1.11, “iPrint,” on page 17
- ♦ Section 1.12, “Linux POSIX Volumes,” on page 18
- ♦ Section 1.13, “Linux User Management,” on page 18
- ♦ Section 1.14, “Migration Tool,” on page 18
- ♦ Section 1.15, “NCP Server,” on page 18
- ♦ Section 1.16, “NetStorage,” on page 18
- ♦ Section 1.17, “Novell Cluster Services,” on page 18
- ♦ Section 1.18, “Novell Identity Translator (NIT),” on page 19
- ♦ Section 1.19, “Novell Linux Volume Manager,” on page 19
- ♦ Section 1.20, “Novell Remote Manager,” on page 19
- ♦ Section 1.21, “Novell Samba,” on page 19
- ♦ Section 1.22, “Novell Storage Services,” on page 19
- ♦ Section 1.23, “Novell FTP,” on page 21
- ♦ Section 1.24, “Novell Auditing Client Logger (VLOG) Utility,” on page 21
- ♦ Section 1.25, “QuickFinder,” on page 21
- ♦ Section 1.26, “Storage Management Services (SMS),” on page 21
- ♦ Section 1.27, “Web Services,” on page 21

1.1 AFP

AFP in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.2 Archive and Version Services

Beginning with OES 2015, Archive and Version Services was discontinued.

1.3 CIFS

This section describes enhancements and changes in Novell CIFS, beginning with the initial release Novell Open Enterprise Server (OES) 2015 SP1.

Salvage and Purge Support for Active Directory and eDirectory Users

Beginning with OES 2015 SP1, Active Directory and eDirectory users can perform Salvage or Purge operation through NFARM utility.

For example, Active Directory and eDirectory users can recover or permanently delete the files or folders that are already deleted.

DFS Support

You can enable or disable DFS support for the CIFS server. By default, this option is disabled.

1.4 Distributed File Services (DFS)

DFS in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.5 DNS and DHCP

The DNS/DHCP services in OES 2015 SP1 have been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.6 Domain Services for Windows

Domain Services for Windows (DSfW) in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.7 Dynamic Storage Technology

DST in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.8 File Systems and Storage

Other than bug fixes and the what's new entries mentioned under Novell Storage Services (NSS), there are no changes to File Systems and Storage in the OES 2015 SP1 release.

1.9 Install

This section describes enhancements to the installation program for Open Enterprise Server (OES) 2015 SP1.

- ♦ [“Upgrading to OES 2015 SP1” on page 17](#)
- ♦ [“Multi-Forest Support for AD Users” on page 17](#)

Upgrading to OES 2015 SP1

- ♦ **Upgrade from OES 11 SP2 to OES 2015 SP1:** Channel upgrade allows you to upgrade from OES 11 SP2 to OES 2015 SP1 using `zypper` command. For more information, see [Channel Upgrade from OES 11 SP2 to OES 2015 SP1](#) in the [OES 2015 SP1: Installation Guide](#).
- ♦ **Upgrade from OES 11 SP3 to OES 2015 SP1:** Using `zypper` command, you can now manually upgrade from OES 11 SP3 to OES 2015 SP1. For more information, see [Channel Upgrade from OES 11 SP3 to OES 2015 SP1 Using Zypper](#) in the [OES 2015 SP1: Installation Guide](#).

Multi-Forest Support for AD Users

Multi-forest support allows you to access NSS resources from Active Directory users belonging to AD forests having bi-directional trust with OES joined forest or AD domains having bi-directional external trust with OES joined forest.

Forest trust (bi-directional) must be in place and active between the trusting forest and trusted forest(s). For more information about NIT, see [NIT \(Novell Identity Translator\)](#) in the [OES 2015 SP1: NSS AD Administration Guide](#).

The following OES components supports the multi-forest changes for AD users:

- ♦ Novell Storage Services (NSS)
- ♦ Common Internet File System (CIFS)
- ♦ Distributed File Services (DFS)
- ♦ Dynamic Storage Technology (DST)
- ♦ Migration Tool
- ♦ Novell Identity Translator (NIT)
- ♦ Storage Management Services (SMS)
- ♦ OES File Access Rights Management (NFARM)
- ♦ OES User Rights Management (NURM)
- ♦ NSS Auditing Client Logger (VLOG)
- ♦ NSS Utilities (rights, nssquota, nsschown, and metamig)

1.10 iFolder

See [“What's New in iFolder”](#) in the [Novell iFolder 3.9.2 Administration Guide](#).

1.11 iPrint

In addition to bug fixes, OES 2015 SP1 provides the following enhancements to Novell iPrint:

iPrint Client 6.05 for Windows

The iPrint Client is upgraded to version 6.05. This client is available on Windows 10, Windows 8.x, Windows 7, Windows Vista, Windows Server 2008 R2, and Windows Server 2012 R2. For more information, see [Installing the iPrint Client](#).

iPrint Client 6.03 for Mac

The iPrint Client is upgraded to version 6.03. This client is available on Mac 10.11 (El Capitan), OS X 10.10, OS X 10.9, and OS X 10.8. For more information, see [Installing the iPrint Client](#).

Novell iPrint Rebranded as Micro Focus iPrint

Novell is now part of Micro Focus, so the iPrint clients (Windows and Mac) are rebranded as Micro Focus iPrint, there is no functionality impact.

1.12 Linux POSIX Volumes

Linux POSIX volumes in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.13 Linux User Management

LUM in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.14 Migration Tool

Migration Tool in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.15 NCP Server

NCP in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.16 NetStorage

NetStorage in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.17 Novell Cluster Services

Cluster Services in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.18 Novell Identity Translator (NIT)

Multi-Forest Support for AD Users

Multi-forest support allows you to access NSS resources from Active Directory users belonging to AD forests having bi-directional trust with OES joined forest or AD domains having bi-directional external trust with OES joined forest.

Forest trust (bi-directional) must be in place and active between the trusting forest and trusted forest(s). For more information about NIT, see [NIT \(Novell Identity Translator\)](#) in the [OES 2015 SP1: NSS AD Administration Guide](#).

The following OES components supports the multi-forest changes for AD users:

- ♦ Novell Storage Services (NSS)
- ♦ Common Internet File System (CIFS)
- ♦ Distributed File Services (DFS)
- ♦ Dynamic Storage Technology (DST)
- ♦ Migration Tool
- ♦ Novell Identity Translator (NIT)
- ♦ Storage Management Services (SMS)
- ♦ OES File Access Rights Management (NFARM)
- ♦ OES User Rights Management (NURM)
- ♦ NSS Auditing Client Logger (VLOG)
- ♦ NSS Utilities (rights, nssquota, nsschown, and metamig)

1.19 Novell Linux Volume Manager

NLVM in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.20 Novell Remote Manager

NRM in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.21 Novell Samba

Samba in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.22 Novell Storage Services

NSS provides the following enhancements and changes in OES 2015 SP1:

- ♦ [Delayed Block Allocation](#)
- ♦ [Trustee Index Media](#)

- ◆ [nsscon \(Enhanced\)](#)
- ◆ [sputil](#)
- ◆ [OES User Rights Management \(NURM\)](#)
- ◆ [OES File Access Rights Management \(NFARM\)](#)

Delayed Block Allocation

Improvements in block allocation algorithm leading to reduced disk fragmentation. For more information, see [Delayed Block Allocation](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux](#).

Trustee Index Media

A new media format has been introduced beginning with OES 2015 SP1 to improve the scan time of trustee information for NURM, NFARM, and TrusteeInfo.xml. For more information, see [Trustee Index Media](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux](#).

nsscon (Enhanced)

Commands are added for the following:

- ◆ Update the NSS media for Trustee Index support. For more information on Trustee Index commands, see [Trustee Index Media](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux](#).
- ◆ Force the Trustee Index support upgrade in a mixed-node cluster using `/ForceMedia` switch. For more information on the `/ForceMedia` switch, see [Trustee Index Media](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux](#).
- ◆ Automatically upgrades the NSS32 and NSS64 pools to latest pool media. For more information, see [Automatic Pool Media Upgrade Commands](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux](#).
- ◆ Enable or disable the delayed block allocation at the server level. For more information, see [Delayed Block Allocation Commands](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux](#).

sputil

A new administrative tool has been introduced beginning with OES 2015 SP1 for performing purge operation on files deleted by eDirectory and AD users.

For more information, see [sputil](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux](#).

OES User Rights Management (NURM)

NURM provides the following enhancements and changes in OES 2015 SP1:

- ◆ **Contextless login:** A new feature has been added to disable the contextless login for eDirectory users.
- ◆ **Refreshing user maps:** If the mappings have changed since the time a user map was created, they could be refreshed using the same conditions that were used while creating them.
- ◆ **Two way synchronization of rights:** Using the user-rights-map utility, rights could be synched between Active Directory and eDirectory.

- ♦ **Secure LDAP port to connect to the AD server:** You can now use SSL to connect securely to an AD server. Some of the standard LDAP ports for Active Directory are 389, 636, 3268, and 3269.
- ♦ **Map rights using multiple user maps:** You can now select multiple user maps and apply rights on the selected volume.
- ♦ **Pagination and filtering:** When the number of records to be displayed are huge, they are paginated, and each page holds up to 1000 records. The filter option works based on records in all the pages.

For more information, see [NURM \(OES User Rights Management\)](#) in the [OES 2015 SP1: NSS AD Administration Guide](#).

OES File Access Rights Management (NFARM)

Salvage and Purge Support for Active Directory and eDirectory Users: Beginning with OES 2015 SP1, Active Directory and eDirectory users can perform salvage and purge operation. eDirectory users can perform salvage and purge operations through CIFS using NFARM utility without AD integration. For more information, see [Salvage and Purge](#) in the [OES 2015 SP1: NSS AD Administration Guide](#).

1.23 Novell FTP

FTP Support for AD Users: Beginning with OES 2015 SP1, AD users can leverage the OES FTP services and access the NSS resources. For more information, see [FTP \(Pure-FTPd\) and OES 2015 SP1 for AD Users](#) in the [OES 2015 SP1: NSS AD Administration Guide](#).

1.24 Novell Auditing Client Logger (VLOG) Utility

In addition to bug fixes, the VLOG utility in OES 2015 SP1 have been enhanced to filter based on user names and application names. For more information, see [User Element Options](#) and [Application Element Options](#) in the [OES 2015 SP1: NSS Auditing Client Logger \(VLOG\) Utility Reference](#).

1.25 QuickFinder

Beginning with OES 2015, QuickFinder is discontinued.

1.26 Storage Management Services (SMS)

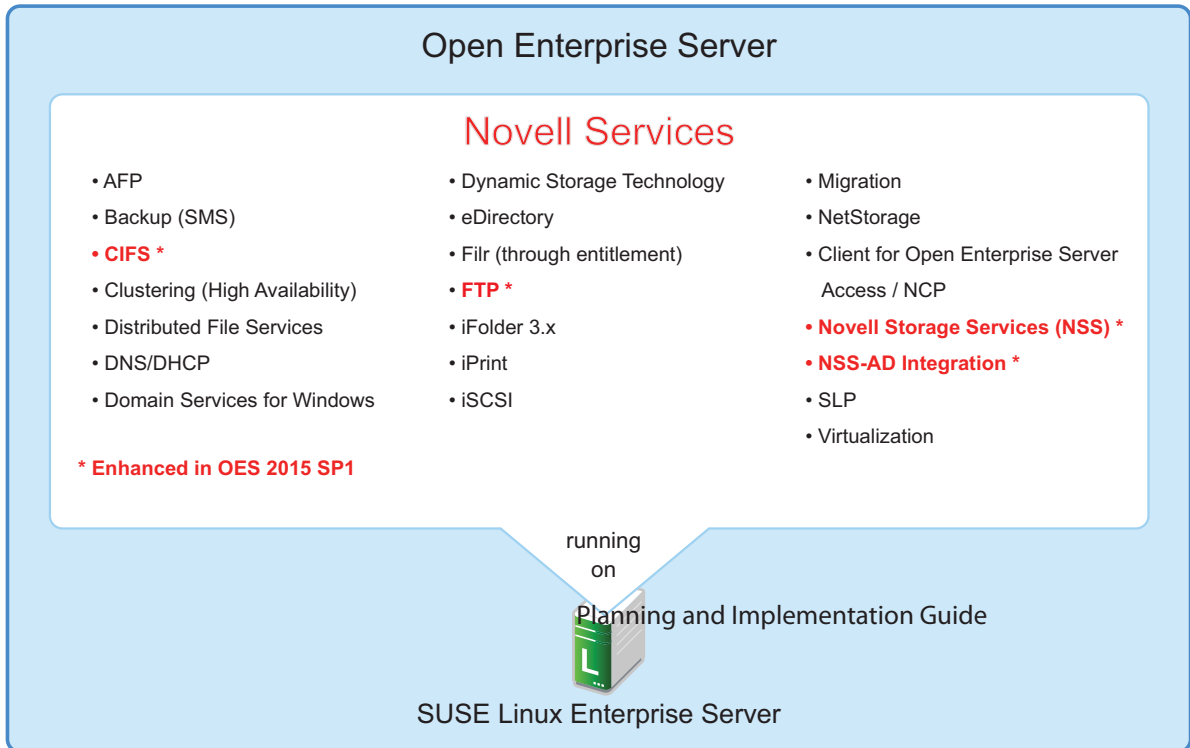
SMS in OES 2015 SP1 has been modified for bug fixes. There are no new features or enhancements in OES 2015 SP1.

1.27 Web Services

The web services and applications in Novell Open Enterprise Server (OES) 2015 SP1 comprise Novell software and open source software that support SUSE Linux Enterprise Server (SLES) 11 Service Pack 4 (SP4). There are no new features or enhancements in OES 2015 SP1.

2 Welcome to Open Enterprise Server 2015 SP1

Updated Network Services



To learn more, click a link in the following table.

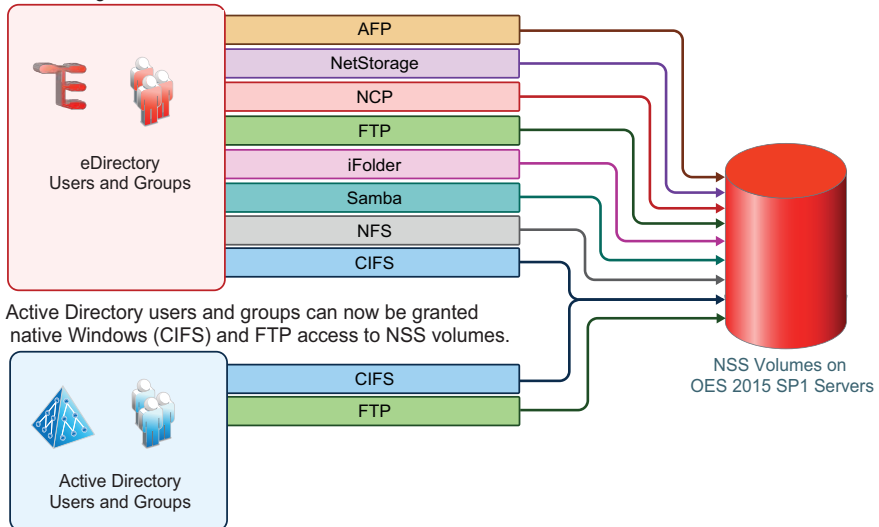
Service	More Information about What's Changed
CIFS	CIFS
FTP	Novell FTP
Novell Storage Services (NSS)	Novell Storage Services
NSS-AD Integration (NIT, NFARM, NURM)	Novell Identity Translator (NIT) , OES User Rights Management (NURM) , OES File Access Rights Management (NFARM)

NSS Active Directory Support Service

IMPORTANT: To plan, deploy, and administer the NSS AD Support service on your network, refer to the instructions and information in the [OES 2015 SP1: NSS AD Administration Guide](#).

Integration of NSS and Active Directory

1. eDirectory user and group access to OES file services on NSS volumes is unchanged.



2. Active Directory users and groups can now be granted native Windows (CIFS) and FTP access to NSS volumes.

3 Planning Your OES 2015 SP1 Implementation

As you plan which OES services to install, you probably have a number of questions. The following sections are designed to help answer your questions and alert you to the steps you should follow for a successful OES implementation.

- ◆ [Section 3.1, “What Services Are Included in OES 2015 SP1?,” on page 25](#)
- ◆ [Section 3.2, “Which Services Do I Need?,” on page 36](#)
- ◆ [Section 3.3, “Plan for eDirectory,” on page 36](#)
- ◆ [Section 3.4, “Prepare Your Existing eDirectory Tree for OES,” on page 37](#)
- ◆ [Section 3.5, “Identify a Purpose for Each Server,” on page 38](#)
- ◆ [Section 3.6, “Understand Server Requirements,” on page 38](#)
- ◆ [Section 3.7, “Understand User Restrictions and Linux User Management,” on page 38](#)
- ◆ [Section 3.8, “Caveats to Consider Before You Install,” on page 38](#)
- ◆ [Section 3.9, “Consider Coexistence and Migration Issues,” on page 51](#)
- ◆ [Section 3.10, “Understand Your Installation Options,” on page 52](#)

3.1 What Services Are Included in OES 2015 SP1?

This section contains three comparison and information tables to help you understand what OES 2015 SP1 includes:

- ◆ [Table 3-1, “Service Comparison—NetWare 6.5 SP8 and OES 2015 SP1,” on page 25](#)
- ◆ [Table 3-2, “OES 2015 SP1 Service Changes,” on page 32](#)
- ◆ [Table 3-3, “OES 2015 SP1 Utility Changes,” on page 35](#)

Table 3-1 Service Comparison—NetWare 6.5 SP8 and OES 2015 SP1

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
Access Control Lists	Yes	Yes	In combination with NCP Server, Linux supports the Novell trustee model for file access on NSS volumes and NCP (POSIX) volumes on Linux.
AFP (Apple File Protocol)	Yes - NFAP	Yes - Novell AFP	AFP services on NetWare and OES are proprietary and tightly integrated with eDirectory and Novell Storage Services (NSS).

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
Apache Web Server	Yes - NetWare port of open source product	Yes - Standard Linux	<p>“Using Apache HTTP Server on OES Servers (Single Server or Cluster Nodes)” in the <i>OES 2015 SP1: Web Services and Applications Guide</i>.</p> <p>Administration Instance vs. Public Instance on NetWare.</p> <p>What's Different about Apache on NetWare.</p>
Archive and Version Services (AVS) (Novell)	Yes	No	Discontinued from OES 2015.
Backup (SMS) <ul style="list-style-type: none"> ◆ SMS ◆ NSS-Xattr 	Yes	Yes	<p>SMS provides backup applications with a framework to develop complete backup and restore solutions. For information, see the <i>OES 2015 SP1: Storage Management Services Administration Guide for Linux</i>.</p> <p>NSS provides extended attribute handling options for NSS on Linux. For information, see “Using Extended Attributes (xAttr) Commands” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>.</p>
CIFS (Windows File Services)	Yes - NFAP	Yes - Novell CIFS	Both NFAP and Novell CIFS are Novell proprietary and tightly integrated with eDirectory and Novell Storage Services (NSS).
Clustering	Yes	Yes	“Comparing Novell Cluster Services for Linux and NetWare” in the <i>OES 2015 SP1: Novell Cluster Services NetWare to Linux Conversion Guide</i> .
DFS (Novell Distributed File Services)	Yes	Yes	<p>In combination with NCP Server, DFS supports junctions and junction targets for NSS volumes on Linux and NetWare.</p> <p>DFS also supports junction targets for NCP volumes on non-NSS file systems, such as Btrfs, Ext3, and XFS. The VLDB command offers additional options to manage entries in the VLDB for NCP volumes.</p>
DHCP	Yes	Yes	<p>For a comparison between what is available on OES and NetWare, see “DHCP Differences Between NetWare and OES 2015 SP1” in the <i>OES 2015 SP1: Planning and Implementation Guide</i>.</p> <p>To plan your DHCP implementations, see “Planning a DHCP Strategy” in the <i>OES 2015 SP1: DNS/DHCP Services for Linux Administration Guide</i> and “Planning a DHCP Strategy” in the <i>NW 6.5 SP8: Novell DNS/DHCP Services Administration Guide</i>.</p>

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
DNS	Yes	Yes	<p>For a comparison between what is available on OES and NetWare, see “DNS Differences Between NetWare and OES 2015 SP1” in the <i>OES 2015 SP1: Planning and Implementation Guide</i>.</p> <p>See “Planning a DNS Strategy” in the <i>OES 2015 SP1: DNS/DHCP Services for Linux Administration Guide</i> and “Planning a DNS Strategy” in the <i>NW 6.5 SP8: Novell DNS/DHCP Services Administration Guide</i>.</p>
Dynamic Storage Technology (DST)	No	Yes	For more information, see the OES 2015 SP1: Dynamic Storage Technology Administration Guide .
eDirectory 8.8	Yes	Yes	No functional differences.
eDirectory Certificate Server	Yes	Yes	No functional differences.
eGuide (White Pages)	Yes	No	This functionality is now part of the Identity Manager User Application. For more information, see the User Application: Administration Guide .
Filr	No	Entitlement	See “Novell Filr” on page 30 .
FTP Server	Yes	Yes	<p>FTP file services on OES servers are provided by Pure-FTPd, a free (BSD), secure, production-quality and standard-conformant FTP server. The OES implementation includes support for FTP gateway functionality as on NetWare and offers a level of integration between eDirectory and Pure-FTP that allows users to authenticate to eDirectory for FTP access to the server.</p> <p>For more information, see “Novell FTP (Pure-FTPd) and OES 2015 SP1” in the <i>OES 2015 SP1: Planning and Implementation Guide</i>.</p>
Health Monitoring Services	Yes	Yes	<p>In OES, NRM provides health monitoring via the open source monitoring tools Ganglia and Nagios. These tools do not use SFCB.</p> <p>For help with diagnosing problems using Ganglia and Nagios in OES, see “Diagnosing Problems Using Ganglia and Nagios (OES 2015 SP1)” in the <i>OES 2015 SP1: Novell Remote Manager Administration Guide</i>.</p> <p>The NRM Health Monitor tool is no longer available in OES 11 SP2 and later.</p>
Identity Manager 4.0.2 Bundled Edition	No	Yes	See “Using the Identity Manager 4.0.2 Bundle Edition.” (http://www.novell.com/documentation/oes2015/oes_implement_lx/data/b143d3j6.html).
iPrint	Yes	Yes	See “Overview” in the <i>OES 2015 SP1: iPrint Linux Administration Guide</i> , and “Overview” in the <i>NW 6.5 SP8: iPrint Administration Guide</i> .

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
IPX (Internetwork Packet Exchange) from Novell	Yes	No	No plans to port IPX to OES.
iSCSI	Yes	Yes	<p>The iSCSI target for Linux does not support eDirectory access controls like the NetWare target does. Nor is the iSCSI initiator or target in OES integrated with NetWare Remote Manager management. You use YaST management tools instead.</p> <p>On the other hand, the iSCSI implementation for Linux is newer and performs better.</p> <p>See Linux-iSCSI Project on the Web (http://linux-iscsi.sourceforge.net).</p> <p>See “Overview” in the <i>NW 6.5 SP8: iSCSI 1.1.3 Administration Guide</i>.</p>
KVM Virtualization Guest	No	Yes	Of the two OES virtualization solutions (KVM and Xen), only Xen is supported for running Netware.
KVM Virtualization Host Server	No	Yes	No functional differences.
LDAP Server for eDirectory	Yes	Yes	No functional differences.
Multipath Device Management	Yes	Yes	NetWare uses NSS multipath I/O. Linux uses Device Mapper - Multipath that runs underneath other device management services.
MySQL	Yes - NetWare port of open source product	Yes - Standard Linux	<p>See MySQL.com on the Web (http://www.mysql.com).</p> <p>See “Overview: MySQL” in the <i>NW 6.5 SP8: Novell MySQL Administration Guide</i>.</p> <p>See also “Configuring MySQL with Novell Cluster Services” in the <i>OES 2015 SP1: Web Services and Applications Guide</i>.</p>
NCP Volumes	No	Yes	<p>NCP Server on Linux supports creating NCP volumes on Linux POSIX file systems such as btrfs, Reiser, Ext2, Ext3, and XFS.</p> <p>OES includes support for much larger NCP volumes.</p> <p>For information, see “Managing NCP Volumes” in the <i>OES 2015 SP1: NCP Server for Linux Administration Guide</i>.</p>
NCP Server	Yes	Yes	<p>NCP services are native to NetWare 6.5 and NSS volumes; to have NCP services on OES, the NCP Server must be installed.</p> <p>See “Benefits of NCP Server” in the <i>OES 2015 SP1: NCP Server for Linux Administration Guide</i>.</p>

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
NetStorage	Yes	Yes	NetStorage on Linux offers connectivity to storage locations through the CIFS, NCP, and SSH protocols. NetWare uses only NCP.
NetWare Traditional File System	Yes	No	No plans to port the NetWare Traditional File System to Linux.
NetWare Traditional Volumes	Yes	N/A	
NFARM	No	Yes	<p>The Novell Access Rights Management (NFARM) shell extension for Windows Explorer lets you manage Novell Trustee ACLs for AD users and groups who have access to AD-enabled NSS volumes.</p> <p>For more information, see “Managing the Rights of Active Directory Users Using NFARM” in the <i>OES 2015 SP1: NSS AD Administration Guide</i>.</p>
NFS	Yes - NFAP	Yes - native to Linux	For NetWare, see “Working with UNIX Machines” in the <i>NW 6.5 SP8: AFP, CIFS, and NFS (NFAP) Administration Guide</i> .
NICI (Novell International Cryptography Infrastructure)	Yes	Yes	No functional differences.
NIT	No	Yes	<p>The Novell Identity Translator provides UID support for eDirectory and Active Directory users accessing NSS data through CIFS.</p> <p>For more information, see “NIT (Novell Identity Translator)” in the <i>OES 2015 SP1: NSS AD Administration Guide</i></p>
NMAS (Novell Modular Authentication Services)	Yes	Yes	No functional differences.
Novell Audit	Yes	No	Novell Audit is not included with OES. However, the Novell Audit 2.0 Starter pack is available for download at no cost on Novell.com (http://www.novell.com/downloads) .
Novell Client for Windows and Linux support	Yes	Yes	<p>Novell Client connectivity to OES requires that the NCP Server be installed.</p> <p>Access to the larger NCP volumes supported by OES requires the latest Novell Client software.</p>
Novell Cluster Services (NCS)	Yes	Yes	<p>See “Product Features” in the <i>OES 2015 SP1: Novell Cluster Services for Linux Administration Guide</i>.</p> <p>See “Product Features” in the <i>NW6.5 SP8: Novell Cluster Services 1.8.5 Administration Guide</i>.</p>

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
Novell Filr	No	Yes	<p>Organizations with a current maintenance agreement are entitled to deploy Novell Filr at no cost.</p> <p>For more information, see the Novell website.</p> <p>Filr supports NSS-AD integration in OES 2015 or later.</p>
Novell iFolder 2.x	Yes	No	<p>For migration information, see “Migrating iFolder 2.x” in the <i>OES 2015 SP1: Migration Tool Administration Guide</i></p>
Novell iFolder 3.9	No	Yes	<p>OES includes Linux, Macintosh, and Windows clients.</p>
Novell Licensing Services	Yes	No	<p>For more information, see “OES Doesn’t Support NLS” in the <i>OES 2015 SP1: Planning and Implementation Guide</i>.</p>
Novell Linux Volume Manager	No	Yes	<p>The Novell Linux Volume Manager (NLVM) command line interface can be used to create and manage Linux POSIX file systems.</p> <p>For information about the syntax and options for the NLVM commands used in this section, see the <i>OES 2015 SP1: NLVM Reference</i>.</p>
NSS (Novell Storage Services)	Yes	Yes	<p>Most NSS services are available on both platforms. For a list of NSS features that are not used on Linux, see “Cross-Platform Issues for NSS” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>.</p> <p>In OES 11 and later, NSS supports both the DOS and GPT partitioning scheme.</p> <p>In OES 11 SP1 and later, NSSMU supports Linux volumes in addition to NSS pools and volumes.</p>
NTPv3	Yes	Yes	<p>The <code>ntpd.conf</code> file on NetWare can replace an OES server’s NTP configuration file without modification.</p>
OpenSSH	Yes	Yes	<p>NetWare includes a port of the open source product. Linux includes the open source product itself.</p> <p>See “Functions Unique to the NetWare Platform” in the <i>NW 6.5 SP8: OpenSSH Administration Guide</i>.</p>
PAM (Pluggable Authentication Modules)	No	Yes	<p>PAM is a Linux service that Novell leverages to provide eDirectory authentication. eDirectory authentication is native on NetWare.</p>
Pervasive.SQL	Yes	No	<p>Pervasive.SQL is available for Linux from the Web (http://www.pervasive.com).</p>
PKI (Public Key Infrastructure)	Yes	Yes	<p>No functional differences.</p>

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
Printing	Yes	Yes	See iPrint .
QuickFinder	Yes	No	See Search .
RADIUS	Yes	Yes	See the information on forge.novell.com (http://forge.novell.com/modules/xfmod/project/?edirfreeradius) .
Salvage	Yes	Yes	Salvage is now supported for eDirectory and AD users using NFARM utility.
Samba	No	Yes	Samba is an open source technology available on OES. Novell provides automatic configuration for authentication through eDirectory. For more information, see the OES 2015 SP1: Novell Samba Administration Guide .
Search (QuickFinder)	Yes	No	Discontinued from OES 2015.
SLP	Yes - Novell SLP	Yes - OpenSLP	<p>For more information, see “SLP” in the OES 2015 SP1: Planning and Implementation Guide.</p> <p>NetWare uses Novell SLP, which provides caching of Directory Agent scope information in eDirectory. This provides for sharing of scope information among DAs.</p> <p>OpenSLP on Linux is customized to provide DA information retention and sharing as well.</p>
Software RAIDS (NSS volumes)	Yes (0, 1, 5, 0 1, 5 1)	Yes (0, 1, 5, 0 1, 5 1)	See “ Understanding Software RAID Devices ” in the OES 2015 SP1: NSS File System Administration Guide for Linux .
Storage Management Services (SMS)	Yes	Yes	<p>The SBCON backup engine is not supported on Linux.</p> <p>The nbackup engine is available for exploring SMS capabilities, but in a production environment, you should use a third-party, full-featured backup engine.</p> <p>Beginning with OES 2015, SMS is enhanced to support the 64-bit storage enhancements and AD-user ACLs on AD-enabled NSS volumes.</p>
TCP/IP	Yes	Yes	No functional differences.
Timesync NLM	Yes	No	<p>Timesync will not be ported to Linux. However, NTPv3 is available on both Linux and NetWare.</p> <p>For more information, see “Time Services” in the OES 2015 SP1: Planning and Implementation Guide.</p>

Service	NetWare 6.5 SP8	OES 2015 SP1	Platform Differences / Migration Issues
Tomcat	Yes	Yes	NetWare includes Tomcat 4 and a Tomcat 5 servlet container for iManager 2.7. OES includes Tomcat 6. There is no impact to any of the administration tools, which are tested and supported on both platforms. For more information, see " Administration Instance vs. Public Instance on NetWare "
Virtual Office (Collaboration)	Yes	No	Virtual Office has been replaced by Novell Vibe A separate purchase is required. For more information, see the Novell Vibe website (https://www.novell.com/products/vibe/) .
WAN Traffic Manager	Yes	No	
Xen Virtualization Guest	Yes	Yes	NetWare 6.5 SP8 (and NetWare 6.5 SP 7) can run as a paravirtualized machine. OES can run as a paravirtualized machine or fully virtualized machine.
Xen Virtualization Host Server	N/A	Yes	

Table 3-2 OES 2015 SP1 Service Changes

Service	OES 2015 SP1 Changes and Information
Access Control Lists	<ul style="list-style-type: none"> You can grant Active Directory users native CIFS access to NSS volumes with support for the Novell trustee model. For more information, see "Understanding the OES Trustee Model for File System Access" in the <i>OES 2015 SP1: File Systems Management Guide</i>.
AFP (Apple File Protocol)	<ul style="list-style-type: none"> Unaffected by changes in OES 2015 SP1. Novell AFP is not integrated with NSS-AD.
Apache Web Server	<ul style="list-style-type: none"> Apache functionality is unaffected by changes in OES 2015 SP1.
Archive and Version Services (AVS) (Novell)	<ul style="list-style-type: none"> Archive and Version Services is discontinued. If you need to manage AVS on a pre-OES 2015 server from an OES 2015 or later server, the AVS iManager plug-in is available for installation.
Backup (SMS)	<ul style="list-style-type: none"> Unaffected by changes in OES 2015 SP1. <ul style="list-style-type: none"> SMS NSS-Xattr
CIFS (Windows File Services)	<ul style="list-style-type: none"> Beginning with OES 2015 SP1, Active Directory and eDirectory users can perform Salvage or Purge operation through NFARM utility. CIFS users can access NSS resources in a multi-forest environment. novcifs: Lets you enable or disable DFS support for the CIFS server. By default, this option is disabled.
Cluster Services	<ul style="list-style-type: none"> Unaffected by changes in OES 2015 SP1.

Service	OES 2015 SP1 Changes and Information
DFS (Novell Distributed File Services)	◆ Unaffected by changes in OES 2015 SP1.
DHCP	◆ Unaffected by changes in OES 2015 SP1.
DNS	◆ Unaffected by changes in OES 2015 SP1.
Dynamic Storage Technology (DST)	◆ Unaffected by changes in OES 2015 SP1. For more information, see “What’s New or Changed in Dynamic Storage Technology” in the <i>OES 2015 SP1: Dynamic Storage Technology Administration Guide</i> .
eDirectory 8.8	◆ Unaffected by changes in OES 2015 SP1.
eDirectory Certificate Server	◆ Unaffected by changes in OES 2015 SP1.
Filr	◆ Filr 2.0 supports the NSS-AD integration service in OES 2015 and later.
FTP Server	◆ Beginning with OES 2015 SP1, FTP server supports NSS AD integration service.
Health Monitoring Services	◆ Unaffected by changes in OES 2015 SP1.
Identity Manager 4.0.2 Bundled Edition	◆ Unaffected by changes in OES 2015 SP1.
iPrint	◆ iPrint doesn’t currently support the NSS-AD integration service in OES 2015 SP1.
iSCSI	◆ Unaffected by changes in OES 2015 SP1.
KVM Virtualization Guest	◆ Unaffected by changes in OES 2015 SP1.
KVM Virtualization Host Server	◆ Unaffected by changes in OES 2015 SP1.
LDAP Server for eDirectory	◆ Unaffected by changes in OES 2015 SP1.
Linux User Rights Management	◆ For LUM to coexist with the Novell ID Translator service, UIDs generated by LUM must not overlap those generated by NIT.
Multipath Device Management	◆ Unaffected by changes in OES 2015 SP1.
MySQL	◆ Unaffected by changes in OES 2015 SP1.
NCP Volumes	◆ Unaffected by changes in OES 2015 SP1.
NCP Server	◆ Unaffected by changes in OES 2015 SP1.
NetStorage	◆ NetStorage doesn’t currently support the NSS-AD integration service in OES 2015 SP1.
NICI (Novell International Cryptography Infrastructure)	◆ Unaffected by changes in OES 2015 SP1.

Service	OES 2015 SP1 Changes and Information
Novell ID Translator (NIT)	♦ Multi-forest support for AD users.
NMAS (Novell Modular Authentication Services)	♦ Unaffected by changes in OES 2015 SP1.
Novell Client for Windows and Linux support	♦ Unaffected by changes in OES 2015 SP1.
Novell iFolder 3.9	♦ iFolder doesn't support the NSS-AD integration service in OES 2015 SP1.
Novell Linux Volume Manager	♦ Unaffected by changes in OES 2015 SP1.
NSS (Novell Storage Services)	<p>NSS enhancements in OES 2015 SP1 include the following:</p> <ul style="list-style-type: none"> ♦ Delayed Block Allocation: Improvements in block allocation algorithm leading to reduced disk fragmentation. ♦ nsscon utility was enhanced. ♦ sputil was introduced for performing purge operations on files deleted by eDirectory and AD users.
NTPv3	♦ Unaffected by changes in OES 2015 SP1.
PKI (Public Key Infrastructure)	♦ Unaffected by changes in OES 2015 SP1.
QuickFinder	<p>♦ QuickFinder is discontinued, starting with OES 2015.</p> <p>If you need to manage QuickFinder on a pre-OES 2015 server from an OES 2015 SP1 server, the iManager plug-in is available for installation.</p>
RADIUS	♦ Unaffected by changes in OES 2015 SP1.
Salvage	♦ Salvage is now supported for eDirectory and AD users using NFARM utility.
Samba	♦ Samba cannot run on the same server as Novell CIFS and is unaffected by changes in OES 2015 SP1.
SLP	♦ Unaffected by changes in OES 2015 SP1.
Software RAIDS (NSS volumes)	♦ Software RAID support is unaffected by the Pool and volume size changes in OES 2015 SP1.
Storage Management Services (SMS)	♦ Unaffected by changes in OES 2015 SP1.
TCP/IP	♦ Unaffected by changes in OES 2015 SP1.
Tomcat	♦ Unaffected by changes in OES 2015 SP1.
Xen Virtualization Guest	♦ Unaffected by changes in OES 2015 SP1.
Xen Virtualization Host Server	♦ Unaffected by changes in OES 2015 SP1.

Table 3-3 OES 2015 SP1 Utility Changes

Utility	Changes and Information
Hard Link Support	<p>Hard link support has changed as follows:</p> <ul style="list-style-type: none"> ◆ All volumes created or migrated to OES 2015 SP1 are automatically hard link media upgraded. <p>For more information, see Hard Links Commands in the OES 2015 SP1: NSS File System Administration Guide for Linux.</p> <ul style="list-style-type: none"> ◆ Because all volumes on OES 2015 SP1 servers are automatically hard-link media upgraded, the hard link media upgrade commands <code>/ZLSSUpgradeCurrentVolumeMediaFormat</code> and <code>/ZLSSUpgradeNewVolumeMediaFormat</code> have been removed from OES beginning with OES 2015.
iManager Storage Plug-ins	<p>The following capabilities have been added to the iManager Storage plug-in:</p> <ul style="list-style-type: none"> ◆ Pool Type: Creating NSS 64-bit pools and volumes and displaying pool type information. ◆ AD media: Support for creating, upgrading, and enabling pools and volumes to support AD users. <p>For more information, see Managing NSS Pools in the OES 2015 SP1: NSS File System Administration Guide for Linux.</p>
NFARM	<p>Beginning with OES 2015 SP1, Active Directory and eDirectory users can perform salvage and purge operation. eDirectory users can perform salvage and purge operations through CIFS using NFARM utility without AD integration.</p> <p>For more information, see Salvage and Purge in the OES 2015 SP1: NSS AD Administration Guide.</p>
nitconfig	<p>Introduced in OES 2015, <code>nitconfig</code> lets administrators configure the Novell Identity Translator (NIT) configuration parameters contained in the <code>nitd.conf</code> file.</p> <p>For more information, see nitconfig utility: in the OES 2015 SP1: NSS AD Administration Guide.</p>
novcifs	<p>You can enable or disable DFS support for the CIFS server.</p> <pre>[--dfs-support=yes no]</pre>
novell-ad-util	<p>Introduced in OES 2015, <code>novell-ad-util</code> lets administrators join an OES 2015 or later server or a Novell cluster resource to an Active Directory domain and manage the Kerberos keytabs for the joined components.</p> <p>For more information, see Domain Join Tool to Join the OES 2015 Servers to an Active Directory Domain in the OES 2015 SP1: NSS AD Administration Guide.</p>
nsschown	<p>Options are added for changing file and directory ownership based on the owner's Security Identifier (SID) or AD Username. There is also an option to change the ownership of extended attributes at the same time.</p>
nsscon	<p>Commands are enhanced for this release.</p> <p>For more information, see nsscon and NSS Commands in the OES 2015 SP1: NSS File System Administration Guide for Linux.</p>

Utility	Changes and Information
nssmu	The utility is enhanced for this release. For more information, see nssmu and NSS Commands in the OES 2015 SP1: NSS File System Administration Guide for Linux .
nssquota	Options are added for setting quotas for AD users and groups. ♦ -a or --activedirectory
nsssettings	Displays the settings of active NSS pools and volumes. For more information, see nsssettings in the OES 2015 SP1: NSS File System Administration Guide for Linux .
NURM	Beginning with OES 2015 SP1, NURM provides the following enhancements and changes: Contextless login, Refreshing user maps, Two way synchronization of rights, Secure LDAP port to connect to the AD server, Map rights using multiple user maps, and Pagination and filtering. For more information, see NURM (OES User Rights Management) in the OES 2015 SP1: NSS AD Administration Guide .
querylog	Lets you view recent cluster events. This functionality is also available within <code>sbdutil</code> and iManager.
sbdutil	<code>sbdutil</code> lets you manage split-brain support in NCS clusters.
sputil	Introduced in OES 2015 SP1, <code>sputil</code> let administrators perform the purge operation. For more information, see sputil in the OES 2015 SP1: NSS File System Administration Guide for Linux .
rights	Options are added for managing rights for AD users and groups. ♦ -a or --activedirectory

3.2 Which Services Do I Need?

We recommend that you review the brief overviews included at the beginning of each service section in this guide to get a full picture of the solutions that OES 2015 SP1 offers. It is not uncommon that administrators discover capabilities in OES that they didn't know existed.

3.3 Plan for eDirectory

eDirectory is the heart of OES network services and security.

- ♦ [Section 3.3.1, "Installing Into a New Tree," on page 37](#)
- ♦ [Section 3.3.2, "Installing Into an Existing Tree," on page 37](#)

3.3.1 Installing Into a New Tree

If you are creating a new eDirectory tree on your network, you must do some additional planning before you install the first server into the tree. The first server is important for two reasons:

- ♦ You create the basic eDirectory tree structure during the first installation
- ♦ The first server permanently hosts the Certificate Authority for your organization

To ensure that your eDirectory tree meets your needs, take time to plan the following:

- ♦ **Structure of the eDirectory tree:** A well-designed tree provides containers for servers, users, printers, etc. It is also optimized for efficient data transfer between geographically dispersed locations. For more information, see “[Designing Your NetIQ eDirectory Network](#)” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.
- ♦ **Time synchronization:** eDirectory requires that all servers, both NetWare and OES, be time synchronized. For more information, see [Chapter 12.3, “Time Services,”](#) on page 100.
- ♦ **Partitions and replicas:** eDirectory allows the tree to be partitioned for scalability. Replicas (copies) of the partitions provide fault tolerance within the tree. The first three servers installed into an eDirectory tree automatically receive replicas of the tree’s root partition. You might want to create additional partitions and replicas. For more information, see “[Managing Partitions and Replicas](#)” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

For information on these and other eDirectory planning tasks, see the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

3.3.2 Installing Into an Existing Tree

When installing into an existing tree, make sure you observe the following best practices whenever possible:

- ♦ **Use Existing eDirectory Objects:** Whenever possible, existing eDirectory objects, organizational units, users, groups, password policies, etc. should be used during the installation.

If new contexts or users are needed, it is best to create these prior to the installation.

- ♦ **Synchronize Replicas Before and After:** Ensure that all eDirectory partitions affected by the installation are synchronized before you begin and after you finish the installation.

Also, before installing into an existing tree, be sure you understand the information in [Section 14.2.3, “eDirectory Coexistence and Migration,”](#) on page 145.

3.4 Prepare Your Existing eDirectory Tree for OES

Complete all of the instructions in “[Preparing eDirectory for OES 2015 SP1](#)” in the *OES 2015 SP1: Installation Guide*.

NOTE: If you are installing the first OES server into an existing tree on a NetWare server, you must use Deployment Manager (located on the NetWare 6.5 SP8 DVD) to see whether your tree requires any updates.

For instructions on running Deployment Manager, see “[Preparing to Install NetWare 6.5 SP8](#)” in the *NW65 SP8: Installation Guide*.

3.5 Identify a Purpose for Each Server

Large networks usually have one or more servers dedicated to providing a single network service. For example, one or more servers might be designated to provide Novell iFolder file services to network users while other servers provide iPrint printing services for the same users.

For smaller organizations, it is often not practical or cost effective to dedicate servers to providing a single service. For example, the same server might provide both file and print services to network users.

Prior to installing a new server on your network, you should identify the service or services that it will provide and see how it will integrate into your overall network service infrastructure.

3.6 Understand Server Requirements

OES 2015 SP1 has specific hardware and software requirements.

Prior to installing OES, make sure your server machine and network environment meet the requirements outlined in the following sections:

- ♦ **OES 2015 SP1 Server (Physical):** “Preparing to Install OES 2015 SP1” in the *OES 2015 SP1: Installation Guide*.
- ♦ **OES 2015 SP1 Server (Virtual):** “System Requirements” in the *OES 2015 SP1: Installation Guide*.

3.7 Understand User Restrictions and Linux User Management

If you plan to use Linux User Management, be sure you understand the security implications before you accept the default PAM-enabled service settings. The implications are explained in [Section 21.2.2, “User Restrictions: Some OES Limitations,” on page 229](#).

3.8 Caveats to Consider Before You Install

IMPORTANT: As support packs are released, there are sometimes new caveats identified. Be sure to always check the [OES Readme \(http://www.novell.com/documentation/oes11/oes_readme/data/readme.html\)](http://www.novell.com/documentation/oes11/oes_readme/data/readme.html) for items specific to each support pack.

This section discusses the following installation/migration caveats:

- ♦ [Section 3.8.1, “Adding a Linux Node to a Cluster Ends Adding More NetWare Nodes,” on page 39](#)
- ♦ [Section 3.8.2, “Always Double-Check Service Configurations Before Installing,” on page 39](#)
- ♦ [Section 3.8.3, “Back Button Doesn’t Reset Configuration Settings,” on page 39](#)
- ♦ [Section 3.8.4, “Cluster Upgrades Must Be Planned Before Installing OES,” on page 40](#)
- ♦ [Section 3.8.5, “Common Proxy Password Policy Should Be Assigned,” on page 40](#)
- ♦ [Section 3.8.6, “Cross-Protocol File Locking Might Need To Be Reconfigured if AFP or CIFS Is Functioning on an NCP Server,” on page 41](#)
- ♦ [Section 3.8.7, “Do Not Create Local \(POSIX\) Users,” on page 41](#)

- [Section 3.8.8, “Do Not Upgrade to eDirectory 8.8 Separately,” on page 41](#)
- [Section 3.8.9, “Follow the Instructions for Your Chosen Platforms,” on page 41](#)
- [Section 3.8.10, “If You’ve Ever Had OES 1 Servers with LUM and NSS Installed,” on page 42](#)
- [Section 3.8.11, “Novell Identity Translator \(NIT\),” on page 45](#)
- [Section 3.8.12, “iFolder 3.9.2 Considerations,” on page 45](#)
- [Section 3.8.13, “Incompatible TLS Configurations Give No Warning,” on page 45](#)
- [Section 3.8.14, “Installing into an Existing eDirectory Tree,” on page 45](#)
- [Section 3.8.15, “NetStorage Caveats,” on page 46](#)
- [Section 3.8.16, “NetWare Caveats,” on page 47](#)
- [Section 3.8.17, “Novell Distributed Print Services Cannot Migrate to Linux,” on page 48](#)
- [Section 3.8.18, “NSS Caveats,” on page 48](#)
- [Section 3.8.19, “Plan eDirectory Before You Install,” on page 49](#)
- [Section 3.8.20, “Samba Enabling Disables SSH Access,” on page 49](#)
- [Section 3.8.21, “Unsupported Service Combinations,” on page 49](#)
- [Section 3.8.22, “VNC Install Fails to Set the IP Address in /etc/hosts,” on page 51](#)

3.8.1 Adding a Linux Node to a Cluster Ends Adding More NetWare Nodes

After you add a Linux node to a cluster, you cannot add more NetWare nodes. For more information, see the [OES 2015 SP1: Novell Cluster Services NetWare to Linux Conversion Guide](#).

3.8.2 Always Double-Check Service Configurations Before Installing

It is critical and you double-check your service configurations on the Novell Open Enterprise Server Configuration summary page before proceeding with an installation. One reason for this is explained in [the next section](#).

3.8.3 Back Button Doesn’t Reset Configuration Settings

During an installation, after you configure eDirectory and reach the Novell Open Enterprise Server Configuration summary screen, service configuration settings have been “seeded” from the eDirectory configuration.

If you discover at that point that something in the eDirectory configuration needs to change, you can change the settings by clicking the **eDirectory** link on the summary page or by clicking the Back button.

In both cases when you return to the summary page, the eDirectory configuration has changed, but the individual service configurations have the same eDirectory settings you originally entered. These must each be changed manually.

For example, if you specified the wrong server context while initially configuring eDirectory, the NSS and LUM configurations still have the wrong context. You must select each service individually and change the server context in them.

Unless you manually change the services affected by changes to eDirectory, your services will at best not work as expected and at worst completely fail.

3.8.4 Cluster Upgrades Must Be Planned Before Installing OES

Because of differences between Novell Cluster Services on NetWare 6.5 SP8 and OES, there are important issues to consider before combining them into a mixed node cluster, as explained in the following sections.

- ♦ [“Service Failover in a Mixed Cluster” on page 40](#)
- ♦ [“Working with Mixed Node Clusters” on page 40](#)
- ♦ [“Working with NSS-AD Enabled Pools” on page 40](#)

Service Failover in a Mixed Cluster

The only cluster-enabled service that can fail over cross-platform (run on either OES 2015 SP1 or NetWare 6.5 SP8) is cluster-enabled NSS pools. All other services (iPrint, iFolder, etc.) can only fail over between servers that are the same platform. For example, an iPrint service that is running on an OES 2015 SP1 server can fail over to another OES 2015 SP1 server in the cluster, but the service cannot fail over to a NetWare 6.5 SP8 server.

Working with Mixed Node Clusters

See the following sections before working with mixed NetWare and OES clusters:

- ♦ [“Planning the Cluster Conversion”](#) and [“Planning the Conversion of Load and Unload Scripts”](#) in the *OES 2015 SP1: Novell Cluster Services NetWare to Linux Conversion Guide*.
- ♦ [“What’s New or Changed for Novell Cluster Services”](#) and [“Requirements and Guidelines for Upgrading Clusters from OES 2 SP3”](#) in the *OES 2015 SP1: Novell Cluster Services for Linux Administration Guide*.

Working with NSS-AD Enabled Pools

If you are deploying 64-bit pools or planning to deploy NSS-AD for AD user and group CIFS access to NSS, be aware that AD-enabled pools cannot failover to pre-OES 2015 SP1 nodes and will go comatose. For more information, see [“Upgrading to OES 2015 SP1 and Deploying NSS AD \(Clustered Environment\)”](#) in the *OES 2015 SP1: NSS AD Administration Guide*.

3.8.5 Common Proxy Password Policy Should Be Assigned

When you install a Common Proxy user, it is possible to deselect the **Assign Common Proxy Password Policy to Proxy User** check box. This is not recommended because then the user inherits the password policies of the container where it is installed, and that can lead to service failures.

3.8.6 Cross-Protocol File Locking Might Need To Be Reconfigured if AFP or CIFS Is Functioning on an NCP Server

Cross-protocol file locking (CPL) default behavior works as follows:

- ♦ All new servers with NCP installed have CPL turned on.
- ♦ If an upgraded server was not configured for CPL prior to the upgrade, CPL will be turned on.
- ♦ If an upgraded server was configured for CPL prior to the upgrade, the CPL setting immediately preceding the upgrade is retained.

If a server is only accessed through NCP (AFP and CIFS are not installed), you can achieve an NCP performance gain of about 10% by disabling CPL. However, there is a critical caveat. If you later install AFP or CIFS and you forget to re-enable CPL, data corruption can occur.

There are also obvious implications for clustering. The CPL settings for clustered nodes must match.

For more information about cross-protocol locking, see [“Configuring Cross-Protocol File Locks for NCP Server”](#) in the *OES 2015 SP1: NCP Server for Linux Administration Guide*.

3.8.7 Do Not Create Local (POSIX) Users

During the OES 2015 SP1 install you are prompted by the SLES portion of the install to create at least one local user besides `root`, and you are warned if you bypass the prompt.

Creating local users is not recommended on OES servers because user management in OES is managed entirely in eDirectory. The only local user you need on the server is the `root` user. Creating other local users can, in fact, cause unnecessary confusion and result in service-access problems that are difficult to troubleshoot.

eDirectory users are enabled for POSIX access to servers through the Linux User Management (LUM) technology installed by default on every OES server.

Also be aware that not all OES services require that users are LUM-enabled. Novell Client users, for example, can access NCP and NSS volumes on OES servers just as they do on NetWare without any additional configuration.

For more information about this topic, see [Section 15.2, “Linux User Management: Access to Linux for eDirectory Users,”](#) on page 153.

3.8.8 Do Not Upgrade to eDirectory 8.8 Separately

Do not upgrade to eDirectory 8.8 independently of upgrading to OES 2015 SP1.

Doing so causes configuration problems that the OES 2015 SP1 install is not designed to handle.

3.8.9 Follow the Instructions for Your Chosen Platforms

Although installing Novell services on Linux or NetWare is a straightforward process, the installation processes are platform-specific, requiring different sets of media and different installation programs.

3.8.10 If You've Ever Had OES 1 Servers with LUM and NSS Installed

Having NSS volumes on OES servers requires certain system-level modifications, most of which are automatic. For more information, see [Appendix H, "System User and Group Management in OES 2015 SP1,"](#) on page 257.

However, as OES has evolved, some initially defined conventions regarding system Users have needed adjustment. Be sure to read the information and follow the instructions in this section if your network has ever included an OES 1 server with both LUM and NSS installed.

- ◆ ["NetStorage, XTier, and Their System Users" on page 42](#)
- ◆ ["An NSS Complication" on page 42](#)
- ◆ ["eDirectory Solves the Basic Problem" on page 42](#)
- ◆ ["ID Mismatches on OES 1" on page 43](#)
- ◆ ["The OES 1 Solution: The nssid.sh Script" on page 43](#)
- ◆ ["OES 2 SP1 or Later Requires a New Approach" on page 43](#)
- ◆ ["The Solution: Standardizing the UIDs on all OES servers" on page 43](#)

NetStorage, XTier, and Their System Users

By default, certain OES services, such as NetStorage, rely on a background Novell service named XTier.

To run on an OES server, XTier requires two system-created users (named `novlxsrvd` and `novlxregd`) and one system-created group that the users belong to (named `novlxtier`).

An NSS Complication

The two system users and their group are created on the local system when XTier is installed. For example, they are created when you install NetStorage, and their respective UIDs and GID are used to establish ownership of the service's directories and files.

For NetStorage to run, these XTier users and group must be able to read data on all volume types that exist on the OES server.

As long as the server only has Linux traditional file systems, such as Ext3, Reiser, or XFS, NetStorage runs without difficulties.

However, if the server has NSS volumes, an additional requirement is introduced. NSS data can only be accessed by eDirectory users. Consequently, the local XTier users can't access NSS data, and NetStorage can't run properly.

eDirectory Solves the Basic Problem

Therefore, when NSS volumes are created on the server, the XTier users are moved to eDirectory and enabled for Linux User Management (LUM). See [Section 15.2, "Linux User Management: Access to Linux for eDirectory Users,"](#) on page 153.

After the move to eDirectory, they can function as both eDirectory and POSIX users, and they no longer exist on the local system.

ID Mismatches on OES 1

Problems with OES 1 occurred when additional OES NetStorage servers with NSS volumes were installed in the same eDirectory container. Because the UIDs and GID were assigned by the Linux system, unless the installation process was exactly the same for each OES 1 server, the UIDs and GID didn't match server-to-server.

When the local XTier UIDs and GID on subsequently installed servers didn't match the XTier UIDs and GID in eDirectory, NetStorage couldn't access the NSS volumes on the server.

The OES 1 Solution: The `nssid.sh` Script

To solve this problem, the OES 1 installation program looked for XTier ID conflicts, and if the IDs on a newly installed server didn't match the IDs in eDirectory, the program generated a script file named `nssid.sh`. The documentation instructed installers to always check for an `nssid.sh` file on a newly installed server, and if the file was found, to run it. The `nssid.sh` script synchronized all of the XTier IDs with those that had already been stored in eDirectory.

This solution remained viable through the first release of OES 2.

OES 2 SP1 or Later Requires a New Approach

IMPORTANT: The following processes described in the next section (“[The Solution: Standardizing the UIDs on all OES servers](#)”) only need to be done once per eDirectory tree.

Unfortunately, system-level changes in SUSE Linux Enterprise Server 10 SP2 invalidated the `nssid.sh` script solution for OES 2 SP1 and later. Synchronizing the XTier IDs with an OES 1 installation can cause instability in other non-OES components. Therefore, if you have not already done so, you should standardize all XTier IDs on existing servers before installing a new OES 2015 SP1 server with XTier-dependent services.

The Solution: Standardizing the UIDs on all OES servers

If your eDirectory tree has ever contained an OES 1 server with NSS and LUM installed, and if you have not already standardized the UIDs for a prior OES 2 SP1 or later release, do the following on each server that has NSS and LUM installed:

- 1 Log in as `root` and open a terminal prompt. Then enter the following commands:

```
id novlxregd
```

```
id novlxsrvd
```

The standardized XTier IDs are UID 81 for `novlxregd`, UID 82 for `novlxsrvd`, and GID 81 for `novlxtier`.

- 2 (Conditional) If you see the following ID information, the XTier IDs are standardized and you can start over with [Step 1](#) for the next server:

```
uid=81(novlxregd) gid=81(novlxtier) groups=81(novlxtier)
uid=82(novlxsrvd) gid=81(novlxtier) groups=81(novlxtier),8(www)
```

- 3 (Conditional) If you see different IDs than those listed above, such as 101, 102, 103, etc., record the numbers for both XTier users and the `novlxtier` group, then continue with [Step 4](#).

You need these numbers to standardize the IDs on the server.

4 Download the following script file:

- ♦ `fix_xtier_ids.sh` (http://www.novell.com/documentation/oes11/scripts/fix_xtier_ids.sh)

5 Customize the template file by replacing the variables marked with angle brackets (<>) as follows:

- ♦ **<server_name>**: The name of the server object in eDirectory.

This variable is listed on line 38 in the file. Replace it with the server name.

For example, if the server name is myserver, replace `<server_name>` with `myserver` so that the line in the settings section of the script reads

```
server=myserver
```

- ♦ **<context>**: This is the context of the XTier user and group objects.

Replace this variable with the fully distinguished name of the context where the objects reside.

For example, if the objects are an Organizational Unit object named servers, replace `ou=servers,o=company` with the fully distinguished name.

- ♦ **<admin_fdn>**: The full context of an eDirectory admin user, such as the Tree Admin, who has rights to modify the XTier user and group objects.

Replace this variable with the admin name and context, specified with comma-delimited syntax.

For example, if the tree admin is in an Organization container named company, the full context is `cn=admin,o=company` and the line in the settings section of the script reads

```
admin_fdn="cn=admin,o=company"
```

- ♦ **<novlxregd_uid>**: This is the UID that the system assigned to the local `novlxregd` user. It might or might not be the same on each server, depending on whether the `nssid.sh` script ran successfully.

Replace this variable with the UID reported for the `novlxregd` user on this server as listed in [Step 1 on page 43](#).

For example, if the UID for the `novlxregd` user is 101, change the line to read

```
novlxregd_uid=101
```

- ♦ **<novlxsvrd_uid>**: This is the UID that the system assigned to the local `novlxsvrd` user. It might or might not be the same on each server, depending on whether the `nssid.sh` script ran successfully.

Replace this variable with the UID reported for the `novlxsvrd` user on this server as listed when you ran the commands in [Step 1 on page 43](#).

For example, if the UID for `novlxsvrd_uid` is 102, change the line to read

```
novlxsvrd_uid=102
```

- ♦ **<novlxtier_gid>**: This is the GID that the system assigned to the local `novlxtier` group. It might or might not be the same on each server, depending on whether the `nssid.sh` script ran successfully.

Replace this variable with the GID reported for the `novlxtier` group on this server as listed when you ran the commands in [Step 1 on page 43](#).

For example, if the GID for `novlxtier_gid` is 101, change the line to read

```
novlxtier_gid=101
```

6 Make the script executable and then run it on the server.

IMPORTANT: Changes to the XTier files are not reported on the terminal.

Error messages are reported, but you can safely ignore them. The script affects the entire file system, and some files are locked because the system is running.

7 Repeat from [Step 1](#) for each of the other servers in the same context.

3.8.11 Novell Identity Translator (NIT)

In OES 2015 SP1, Novell CIFS utilizes a new service that manages the UIDs required for eDirectory and Active Directory users on Linux systems.

Novell Identify Translator works seamlessly with LUM and its configuration requires that its UID range not overlap the UID set for LUM.

For more information, see “[NIT \(Novell Identity Translator\)](#)” in the [OES 2015 SP1: NSS AD Administration Guide](#).

3.8.12 iFolder 3.9.2 Considerations

For best results, be sure you read and carefully follow the instructions in the [Novell iFolder 3.9.2 Administration Guide](#) and the [Novell iFolder 3.9.2 Deployment Guide](#). This is especially critical if you plan to use NSS for your iFolder 3.9.2 data volume.

3.8.13 Incompatible TLS Configurations Give No Warning

When you install a new eDirectory tree, the eDirectory Configuration - New or Existing Tree screen has the **Require TLS for Simple Binds with Password** option selected by default. If you keep this configuration setting, the eDirectory LDAP server requires that all communications come through the secure LDAP port that you specified on the eDirectory Configuration - Local Server Configuration screen. By default, this is port 636.

Unfortunately, the OES install doesn't display a warning if you subsequently configure OES services to use non-TLS (non-secure) LDAP communications (port 389). The installation proceeds normally but the service configuration fails.

For example, if you accept the TLS default, then configure Novell DHCP to use non-secure communications (by deselecting the **Use secure channel for configuration** option), the OES install doesn't warn that you have created an incompatible configuration.

After eDirectory and the iManager plug-ins install successfully, the Novell DHCP configuration fails. You must then use iManager to change either the LDAP server configuration or the Novell DHCP configuration to support your preferred communication protocol.

Simply enabling non-TLS LDAP communications doesn't disable TLS. It merely adds support for non-secure communications with the LDAP server.

3.8.14 Installing into an Existing eDirectory Tree

Novell Support has reported a significant number of installation incidents related to eDirectory health and time synchronization. To avoid such problems, do the following prior to installing OES:

- ◆ [“Consider Coexistence and Migration Issues” on page 46](#)
- ◆ [“Do Not Add OES to a Server That Is Already Running eDirectory” on page 46](#)
- ◆ [“Be Sure That eDirectory Is Healthy” on page 46](#)

- ♦ [“Be Sure That Network Time Is Synchronized”](#) on page 46
- ♦ [“Be Sure that OpenSLP on OES Is Configured Properly”](#) on page 46

Consider Coexistence and Migration Issues

If you are installing a new OES 2015 SP1 server into an existing eDirectory tree, be sure to read and follow the instructions in [“Preparing eDirectory for OES 2015 SP1”](#) in the *OES 2015 SP1: Installation Guide*.

Do Not Add OES to a Server That Is Already Running eDirectory

Although you can add OES to an existing SLES 11 server if needed, you cannot install OES on a SLES 11 server that is already running eDirectory.

eDirectory must be installed in conjunction with the installation of OES services.

Be Sure That eDirectory Is Healthy

Review and follow the guidelines in [“Keeping eDirectory Healthy”](#) in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

Be Sure That Network Time Is Synchronized

OES and NetWare 6.5 SP8 servers can receive network time from either an existing eDirectory server or from an NTP time source. The critical point is that the entire tree must be synchronized to the same time source. For example, do not set your new OES 2015 SP1 server to receive time from an NTP source unless the whole tree is synchronized to the same NTP source.

For an in-depth explanation of OES time synchronization, see [Chapter 12.3, “Time Services,”](#) on [page 100](#).

Be Sure that OpenSLP on OES Is Configured Properly

Novell SLP (NetWare) and OpenSLP (Linux) can coexist, but there are differences between the services that you should understand before deciding which to use or before changing your existing SLP service configuration. For more information, see [Section 12.5, “SLP,”](#) on [page 112](#).

3.8.15 NetStorage Caveats

- ♦ [“NetStorage Access to a Cluster Resource Fails When the Resource Comes Online from a Comatose State”](#) on page 47
- ♦ [“Unable to Use a Common Proxy if ZENworks and NetStorage Are Installed on the Same System”](#) on page 47
- ♦ [“Common Proxy Password Cannot Exceed 20 Characters”](#) on page 47
- ♦ [“NetStorage Purge and Salvage Options Do Not Work on Macintosh with Safari 4.0.x”](#) on page 47

NetStorage Access to a Cluster Resource Fails When the Resource Comes Online from a Comatose State

To restore access to the storage object, restart the `novell-xsrxd` process by running the following command:

```
/etc/init.d/novell-xsrxd restart
```

Unable to Use a Common Proxy if ZENworks and NetStorage Are Installed on the Same System

If you are using ZENworks along with NetStorage on the same OES server, you must not use a common proxy user.

Common Proxy Password Cannot Exceed 20 Characters

If a common proxy user used by NetStorage is assigned a password policy, you must ensure that the password size specified in the policy does not exceed 20 characters.

NetStorage Purge and Salvage Options Do Not Work on Macintosh with Safari 4.0.x

If you are using Safari 4.0.x with Macintosh, the Salvage and Purge options do not work.

3.8.16 NetWare Caveats

- ♦ [“NetWare Licenses and OES Trees” on page 47](#)
- ♦ [“NetWare 6.5 Servers Must Be Running SP8” on page 48](#)

NetWare Licenses and OES Trees

OES doesn't use Novell Licensing Services ([Section 4.6, “Licensing,” on page 58](#)). As a result, OES servers don't need a license container in eDirectory as part of the server installation.

In a mixed OES and NetWare eDirectory tree, at least one NetWare server must hold a replica for each partition where there is a NetWare server object. Without this configuration, it is impossible to install licenses or to service requests from NetWare servers to consume those licenses.

If you need to install a NetWare server in an OES tree, you must do the following after installing the first NetWare server in a partition:

- 1 Install iManager on the NetWare server, or use iManager Workstation.
You can do this during initial installation or later as described in [“Installing iManager” in the *NetIQ iManager Installation Guide*](#).
- 2 Add a Read/Write replica to the server as described in [“Adding a Replica” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*](#).

- 3 Install the NetWare license as described in “[Installing and Removing License Certificates](#)” in the *NW 6.5 SP8: Licensing Services Administration Guide*.

The iManager Licensing plug-in is not installed on OES servers. If you have configured Role-Based Services, you need to make sure the licensing plug-in is installed and added to the RBS collection. For more information, see “[Upgrading iManager](#)” in the *NetIQ iManager Installation Guide*.

NetWare 6.5 Servers Must Be Running SP8

If you are installing OES servers into a tree containing NetWare 6.5 servers, be sure that the following server types have been updated to SP8 prior to installing OES:

- ♦ **SLP Directory Agents:** If the SLP Directory Agents on your network are not running NetWare 6.5 SP8, installing an OES server into the tree can cause the DA servers to abend.
- ♦ **LDAP Servers:** If the LDAP servers referenced in your installation are not running NetWare 6.5 SP8, the servers might abend during a schema extension operation.

3.8.17 Novell Distributed Print Services Cannot Migrate to Linux

NDPS clients are not supported on OES. You must therefore migrate any NDPS clients to iPrint before you migrate your print services to OES. For more information, see “[Migrating NDPS Printers to iPrint](#)” in the *NW 6.5 SP8: iPrint Administration Guide*.

3.8.18 NSS Caveats

- ♦ “[About New Media Support and Clusters](#)” on page 48
- ♦ “[Removable Media Cannot Be Mounted on OES](#)” on page 48

About New Media Support and Clusters

The new media support for hard links on OES NSS volumes was not available for OES 1 SP2 Linux and earlier, but it was available for NetWare 6.5 SP4 and later.

If you've already upgraded the media format of the volume, you cannot fail over to a node that is running OES 1 SP2 until you have upgraded the node to a later version of OES.

Removable Media Cannot Be Mounted on OES

CD and DVD media and image files cannot be mounted as NSS volumes on OES; instead, they are mounted as Linux POSIX file systems.

For more details about NSS compatibility, see “[Cross-Platform Issues for NSS Volumes](#)” in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

3.8.19 Plan eDirectory Before You Install

Although the default eDirectory settings work for simple trees, they are not usually practical for a production implementation. For example, by default the tree Admin user and the server are installed in the same context.

Some administrators, when they discover that the tree structure doesn't meet their needs, assume they can rectify the situation by uninstalling and then reinstalling eDirectory. This simply cannot be done.

In fact, OES services cannot be uninstalled. For more information, see [“Disabling OES 2015 Services”](#) in the *OES 2015 SP1: Installation Guide*.

3.8.20 Samba Enabling Disables SSH Access

Enabling users for Samba automatically disables SSH access for them. However, this default configuration can be changed. For more information, see [Section 11.4, “SSH Services on OES 2015 SP1,”](#) on page 92.

3.8.21 Unsupported Service Combinations

Do not install any of the following service combinations on the same server. Although not all of the combinations shown in [Table 3-4](#) cause pattern conflict warnings, Novell does not support any of them.

Table 3-4 Unsupported Service Combinations

Service	Unsupported on the Same Server
Novell AFP	<ul style="list-style-type: none">◆ File Server (Samba)◆ Netatalk◆ Novell Domain Services for Windows◆ Novell Samba◆ Xen Virtual Machine Host Server
Novell Backup / Storage Management Services	No restrictions
Novell CIFS	<ul style="list-style-type: none">◆ File Server (Samba)◆ Novell Domain Services for Windows◆ Novell Samba◆ Xen Virtual Machine Host Server
Novell Cluster Services (NCS)	<ul style="list-style-type: none">◆ High Availability◆ Novell Domain Services for Windows <p>DSfW can actually be installed and run on the same server as NCS, but DSfW cannot run as a clustered service.</p>
Novell DHCP	<ul style="list-style-type: none">◆ Xen Virtual Machine Host Server
Novell DNS	<ul style="list-style-type: none">◆ Xen Virtual Machine Host Server

Service	Unsupported on the Same Server
Novell Domain Services for Windows	<ul style="list-style-type: none"> ◆ File Server (Samba) ◆ Novell AFP ◆ Novell CIFS ◆ Novell Cluster Services (NCS) <ul style="list-style-type: none"> NCS can actually be installed and run on the server, but DSfW cannot run as a clustered service. ◆ Novell FTP ◆ Novell iFolder ◆ Novell NetStorage ◆ Novell Pre-Migration Server ◆ Novell Samba ◆ Xen Virtual Machine Host Server
NetIQ eDirectory	<ul style="list-style-type: none"> ◆ Directory Server (LDAP) ◆ Xen Virtual Machine Host Server
Novell FTP	<ul style="list-style-type: none"> ◆ Novell Domain Services for Windows ◆ Xen Virtual Machine Host Server
Novell iFolder	<ul style="list-style-type: none"> ◆ Novell Domain Services for Windows ◆ Xen Virtual Machine Host Server
Novell iManager	<ul style="list-style-type: none"> ◆ Xen Virtual Machine Host Server
Novell iPrint	<ul style="list-style-type: none"> ◆ Print Server (CUPS) <ul style="list-style-type: none"> CUPS components are actually installed, but CUPS printing is disabled. For more information, see Section 6.8.6, “iPrint Disables CUPS Printing on the OES Server,” on page 70. ◆ Xen Virtual Machine Host Server
Novell Linux User Management (LUM)	No restrictions
Novell NCP Server / Dynamic Storage Technology	<ul style="list-style-type: none"> ◆ Xen Virtual Machine Host Server
Novell NetStorage	<ul style="list-style-type: none"> ◆ Novell Domain Services for Windows ◆ Xen Virtual Machine Host Server
Novell Pre-Migration Server	<ul style="list-style-type: none"> ◆ Novell Domain Services for Windows ◆ Xen Virtual Machine Host Server
Novell Remote Manager (NRM)	<ul style="list-style-type: none"> ◆ Xen Virtual Machine Host Server
Novell Samba	<ul style="list-style-type: none"> ◆ File Server (Samba) ◆ Novell CIFS ◆ Novell Domain Services for Windows ◆ Xen Virtual Machine Host Server

Service	Unsupported on the Same Server
Novell Storage Services (NSS)	<ul style="list-style-type: none"> ◆ Xen Virtual Machine Host Server
Novell Storage Services AD Support	<ul style="list-style-type: none"> ◆ File Server (Samba) ◆ Novell Domain Services for Windows ◆ Novell Samba ◆ Xen Virtual Machine Host Server
Xen Virtual Machine Host Server	<ul style="list-style-type: none"> ◆ File Server (Samba) ◆ Novell AFP ◆ Novell CIFS ◆ Novell DHCP ◆ Novell DNS ◆ Novell Domain Services for Windows ◆ NetIQ eDirectory ◆ Novell FTP ◆ Novell iFolder ◆ Novell iManager ◆ Novell iPrint ◆ Novell NCP Server / Dynamic Storage Technology ◆ Novell NetStorage ◆ Novell Pre-Migration Server ◆ Novell Remote Manager (NRM) ◆ Novell Samba ◆ Novell Storage Services ◆ Print Server (CUPS)

3.8.22 VNC Install Fails to Set the IP Address in /etc/hosts

If you install through a VNC connection, the `/etc/hosts` file is configured with a loop back address assigned to the hostname. This can cause problems with services.

Using a text editor, modify `/etc/hosts` so that the hostname is associated with its actual IP address.

3.9 Consider Coexistence and Migration Issues

You probably have a network that is already providing services to network users. In many cases, the services you are currently running will influence your approach to implementing OES. In some cases, there are specific paths to follow so that the OES integration process is as smooth as possible.

Novell has invested considerable effort in identifying service coexistence and migration issues you might face. We understand, however, that we can't anticipate every combination of services that you might have. Therefore, we intend to continue developing coexistence and migration information.

For information about coexistence of OES 2015 SP1 servers with existing NetWare and Linux networks, see [Chapter 8, “Migrating Existing Servers and Data,” on page 81](#).

3.10 Understand Your Installation Options

Before installing OES, you should be aware of the information in the following sections:

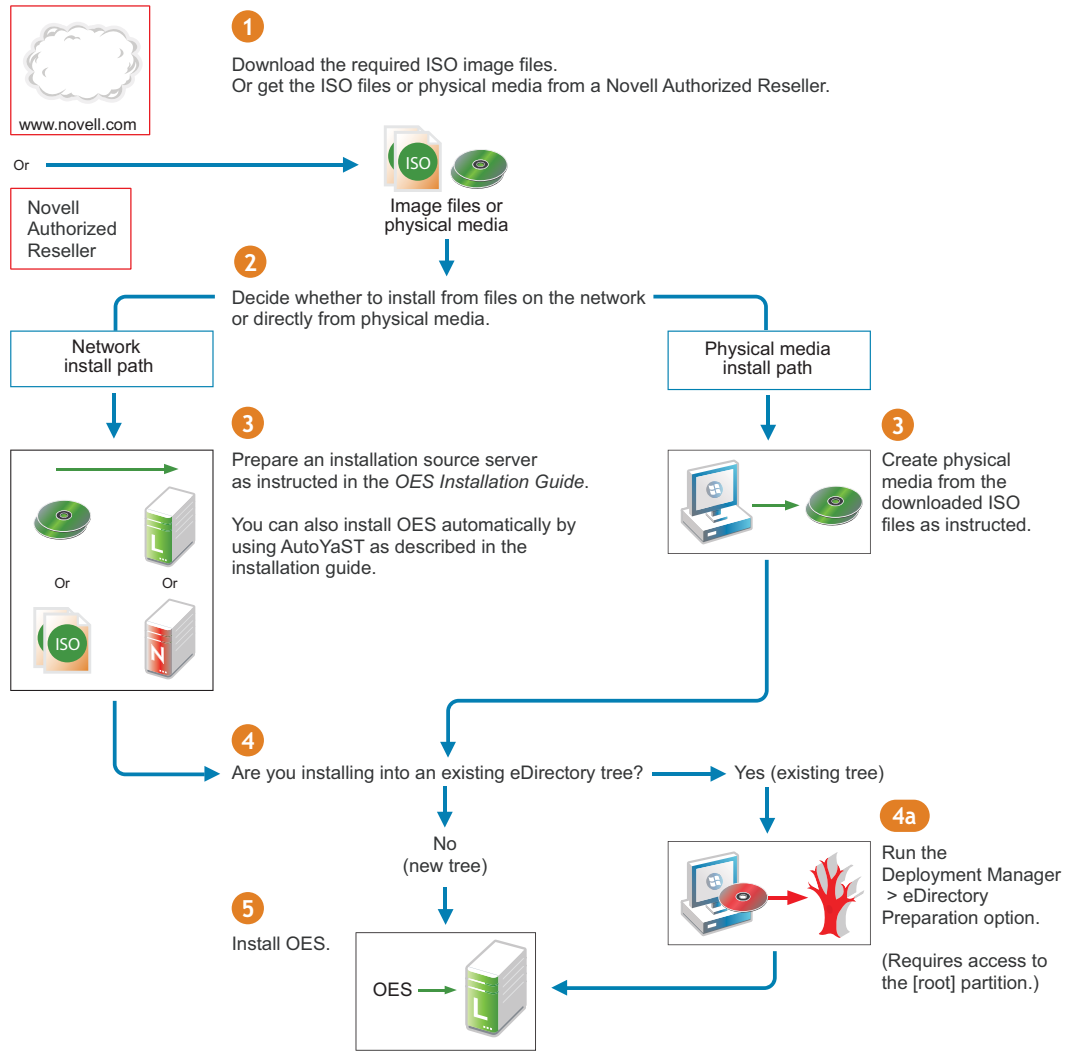
- ♦ [Section 3.10.1, “OES 2015 SP1 Installation Overview,” on page 52](#)
- ♦ [Section 3.10.2, “About Your Installation Options,” on page 53](#)
- ♦ [Section 3.10.3, “Use Predefined Server Types \(Patterns\) When Possible,” on page 54](#)

3.10.1 OES 2015 SP1 Installation Overview

The software and network preparation processes required to install OES 2015 SP1 are outlined in [Figure 3-1](#).

NOTE: [Chapter 4, “Getting and Preparing OES 2015 SP1 Software,” on page 55](#) contains instructions for obtaining the ISO image files referred to in the following illustration.

Figure 3-1 OES 2015 SP1 Install Preparation



For detailed instructions, see “[Setting Up a Network Installation Source](#)” in the *OES 2015 SP1: Installation Guide*.

For information about preparing the tree, see “[NetIQ eDirectory Rights Needed for Installing OES](#)” and “[Preparing eDirectory for OES 2015 SP1](#)” in the *OES 2015 SP1: Installation Guide*.

3.10.2 About Your Installation Options

As illustrated in the previous section, OES 2015 SP1 lets you install from either physical media or from files on the network.

- ◆ “[OES 2015 SP1 Options](#)” on page 54
- ◆ “[Virtual Machine Installation Options](#)” on page 54

OES 2015 SP1 Options

OES 2015 SP1 includes numerous installation options as documented in the [OES 2015 SP1: Installation Guide](#).

- ♦ **Integrated Media Install:** You can install SLES 11 SP4 and OES 2015 SP1 from a single ISO or DVD obtained from a Novell Authorized Reseller or created from a downloaded ISO image file.

See “[Preparing Physical Media for a New Server Installation or an Upgrade](#)” in the [OES 2015 SP1: Installation Guide](#).
- ♦ **CD/DVD Install:** You can install SLES 11 SP4 by using a DVD and then install OES 2015 SP1 from a CD, both of which can be either obtained from a Novell Authorized Reseller or created from downloaded ISO image files.

See “[Preparing Physical Media for a New Server Installation or an Upgrade](#)” in the [OES 2015 SP1: Installation Guide](#).
- ♦ **Network Install:** You can install from the network by using the NFS, FTP, or HTTP protocol.
If you are installing from both SLES and OES media, using the network saves you from swapping media on the server during the installation.

See “[Setting Up a Network Installation Source](#)” in the [OES 2015 SP1: Installation Guide](#).
- ♦ **Automated Install:** You can install from the network by using an AutoYaST file.
This lets you install without providing input during the installation process. It is especially useful for installing multiple servers with similar configurations.

See “[Using AutoYaST to Install and Configure Multiple OES Servers](#)” in the [OES 2015 SP1: Installation Guide](#).

Virtual Machine Installation Options

Virtual machine installations offer additional options. For more information, see

- ♦ “[Installing, Upgrading, or Updating OES on a VM](#)” in the [OES 2015 SP1: Installation Guide](#)
- ♦ “[Installing and Managing NetWare on a Xen-based VM](#)” in the [OES 2015 SP1: Installation Guide](#)

3.10.3 Use Predefined Server Types (Patterns) When Possible

OES 2015 SP1 includes predefined server installation options that install only the components required to provide a specific set of network services. These server types are called *patterns*.

For example, if you want to install an OES 2015 SP1 server that provides enterprise level print services, you should select the **Novell iPrint Server** pattern during the installation.

You should always choose a predefined server type if one fits the intended purpose of your server. If not, you can choose to install a customized OES 2015 SP1 server with only the service components you need.

More information about server patterns is available in “[OES Services Pattern Descriptions](#)” in the [OES 2015 SP1: Installation Guide](#).

4 Getting and Preparing OES 2015 SP1 Software

This section contains instructions for getting and preparing Open Enterprise Server 2015 or later software and discusses the following topics:

- ◆ Section 4.1, “Do You Have Upgrade Protection?,” on page 55
- ◆ Section 4.2, “64-Bit Only,” on page 55
- ◆ Section 4.3, “Do You Want to Purchase OES 2015 SP1 or Evaluate It?,” on page 55
- ◆ Section 4.4, “Evaluating OES 2015 SP1 Software,” on page 56
- ◆ Section 4.5, “Downloading and Preparing OES Software,” on page 57
- ◆ Section 4.6, “Licensing,” on page 58

If you have not already done so, we recommend that you review the information in [Section 3.10, “Understand Your Installation Options,”](#) on page 52.

4.1 Do You Have Upgrade Protection?

If you have Novell Upgrade Protection, you can upgrade to OES 2015 SP1 and the associated support packs, free of charge until your upgrade protection expires. After your protection expires, the OES 2015 SP1 upgrade link disappears from your account page.

For more information and to start the upgrade process, do the following:

- 1 Using your Novell account information, log in to the [Novell Web Site \(https://secure-www.novell.com/center/regadmin/jsps/home_app.jsp\)](https://secure-www.novell.com/center/regadmin/jsps/home_app.jsp).
- 2 Follow the instructions on the page to obtain the upgrade to Open Enterprise Server 2015 or later.

4.2 64-Bit Only

Compatibility is the first thing to consider as you start planning which software to download and install.

OES 2015 SP1 is a set of services or an “add-on product” that runs on SUSE Linux Enterprise Server (SLES 11 SP4) and is available in 64-bit only.

4.3 Do You Want to Purchase OES 2015 SP1 or Evaluate It?

If you want to evaluate OES prior to purchasing it, skip to the next section, [Evaluating OES 2015 SP1 Software](#).

If you have decided to purchase OES 2015 SP1, visit the Novell [How to Buy OES 2015 SP1 Web page \(http://www.novell.com/products/openenterpriseserver/howtobuy.html\)](http://www.novell.com/products/openenterpriseserver/howtobuy.html).

When you purchase OES 2015 SP1, you receive two activation codes for OES 2015 SP1 (one for OES 2015 SP1 services and one for SUSE Linux Enterprise Server 11). Both codes are required for registering an OES 2015 SP1 system in the Novell Customer Center. After it is registered, your server can receive online updates, including the latest support pack.

As part of the purchase process, it is important that you understand the OES 2015 SP1 licensing model. For a brief description, see [Section 4.6, “Licensing,” on page 58](#).

After completing your purchase, the installation process goes more smoothly if you understand your installation options. If you haven't already done so, be sure to review the information in [Section 3.10, “Understand Your Installation Options,” on page 52](#) and then skip to [Chapter 5, “Installing OES 2015 SP1,” on page 61](#).

4.4 Evaluating OES 2015 SP1 Software

This section walks you through the OES 2015 SP1 software evaluation process and discusses the following topics:

- ♦ [Section 4.4.1, “Understanding OES 2015 SP1 Software Evaluation Basics,” on page 56](#)
- ♦ [Section 4.4.2, “Evaluating OES 2015 SP1,” on page 56](#)
- ♦ [Section 4.4.3, “Installing OES 2015 SP1 for Evaluation Purposes,” on page 56](#)

4.4.1 Understanding OES 2015 SP1 Software Evaluation Basics

You can evaluate the full OES 2015 SP1 product. The evaluation software is the complete, fully functional OES 2015 SP1 product.

As you install each server, you are required to accept an end user license agreement (EULA). Your rights to evaluate and use the OES 2015 SP1 product are limited to the rights set forth in the EULA.

Briefly, the evaluation period for OES 2015 SP1 servers is 60 days. To receive software updates during this time, you must have or create an account with the Customer Center, receive evaluation codes for OES 2015 SP1 and SLES 11 while downloading the software, and use these codes to register your server. No software updates can be downloaded after the 60-day evaluation period expires until you purchase the product.

4.4.2 Evaluating OES 2015 SP1

During the evaluation period, we recommend that you fully explore the many services available in OES 2015 SP1.

4.4.3 Installing OES 2015 SP1 for Evaluation Purposes

After completing the instructions in [Section 4.5.1, “Downloading OES 2015 SP1 Software from the Novell Web Site,” on page 57](#), you will have two activation/evaluation codes: one for OES 2015 SP1 and another for SLES 11. As you install OES 2015 SP1, you should register with the Novell Customer Center and use these codes to enable your server for online updates from the OES 2015 SP1 and SLES 11 patch channels.

IMPORTANT: Always download the current patches during an installation.

Instructions for using the activation codes during an installation are found in “[Specifying Novell Customer Center Configuration Settings](#)” in the *OES 2015 SP1: Installation Guide*.

The evaluation period begins when the codes are issued. Use the same activation codes for each OES 2015 SP1 server you install during the evaluation period.

4.5 Downloading and Preparing OES Software

- ♦ [Section 4.5.1, “Downloading OES 2015 SP1 Software from the Novell Web Site,”](#) on page 57
- ♦ [Section 4.5.2, “Preparing the Installation Media,”](#) on page 58
- ♦ [Section 4.5.3, “Installing Purchased Activation Codes after the Evaluation Period Expires,”](#) on page 58

4.5.1 Downloading OES 2015 SP1 Software from the Novell Web Site

If you already have OES 2015 SP1 ISO image files, skip to [Section 4.5.2, “Preparing the Installation Media,”](#) on page 58.

If you have OES 2015 SP1 product media (CDs and DVDs), skip to [Section 4.4.3, “Installing OES 2015 SP1 for Evaluation Purposes,”](#) on page 56.

To download ISO image files from the Web:

- 1 If you don't already have a Novell account, register for one on the [Web \(https://secure-www.novell.com/selfreg/jsp/createAccount.jsp?\)](https://secure-www.novell.com/selfreg/jsp/createAccount.jsp?).
- 2 Access the [Novell Downloads Web page \(http://download.novell.com\)](http://download.novell.com).
- 3 Do a keyword search for **Open Enterprise Server 2015 SP1**.
- 4 Click the **proceed to download** button (upper right corner of the first table).
- 5 If you are prompted to log in, type your **Novell Account > username** and **password**, then click **login**.
- 6 Accept the **Export Agreement** (required for first downloads only) and answer the survey questions about your download (optional).
- 7 Print the download page. You need the listed MD5 verification numbers to verify your downloads.
- 8 Scroll down to the **Download Instructions** section and click the **Download Instructions** link.
- 9 Print the Download Instructions page for future reference.
- 10 Use the information on the Download Instructions page to decide which files you need to download for the platforms you plan to evaluate, then mark them on the MD5 verification list on the page you printed in [Step 7](#).
- 11 On the download page, start downloading the files you need by clicking the **download** button for each file.
- 12 If you have purchased OES 2015 SP1 previously and received your OES 2015 SP1 and SLES 11 activation codes, skip to [Step 15](#).

Otherwise, in the **Evaluating Open Enterprise Server 2015 SP1** section, click the **Get Activation Codes** link in the **Novell Open Enterprise Server 2015 SP1** paragraph.

60-day evaluation codes are sent in separate e-mail messages to the e-mail address associated with your Novell account.

- 13 Access your e-mail account and print the messages or write down the activation codes.

Both the OES 2015 SP1 and the SLES 11 codes are required for product registration and downloading software updates.

- 14 Click **Back** to return to the download page.
- 15 In the download table at the top of the page, click the **Install Instructions > View** link at the end of the list of files to download.

Although you might have printed this file earlier, the online version is required for the steps that follow.

- 16 Scroll past the download decision tables; while you wait for the downloads, read through the brief installation instructions, clicking the links for more information.
- 17 Verify the integrity of each downloaded file by running an MD5-based checksum utility on it and comparing the values against the list you printed in [Step 15](#).

For example, on a Linux system you can enter the following command:

```
md5sum filename
```

where *filename* is the name of the `.iso` file you are verifying.

For a Windows system, you need to obtain a Windows-compatible MD5-based checksum utility from the Web and follow its usage instructions.

- 18 (Optional) If you plan to install OES 2015 SP1 from files on your network, see the instructions in [“Setting Up a Network Installation Source”](#) in the *OES 2015 SP1: Installation Guide*.

4.5.2 Preparing the Installation Media

IMPORTANT: If you have downloaded `.iso` image files from the Web, it is critical that you verify the integrity of each file as explained in [Step 17 on page 58](#). Failure to verify file integrity can result in failed installations, especially in errors that report missing files.

Instructions for preparing installation media are located in [“Setting Up a Network Installation Source”](#) in the *OES 2015 SP1: Installation Guide*.

4.5.3 Installing Purchased Activation Codes after the Evaluation Period Expires

After purchasing Open Enterprise Server, use the instructions in [“Registering the Server in the Novell Customer Center Using the Command Line”](#) in the *OES 2015 SP1: Installation Guide* to enter the purchased activation codes that you received with your purchase. After logging in as `root`, complete the step where you enter the activation codes, replacing the evaluation codes with the purchased codes.

4.6 Licensing

This section explains the following:

- ♦ [Section 4.6.1, “The OES 2015 SP1 Licensing Model,”](#) on page 59
- ♦ [Section 4.6.2, “OES Doesn’t Support NLS,”](#) on page 59

4.6.1 The OES 2015 SP1 Licensing Model

The only OES 2015 SP1 licensing restriction is the number of user connections allowed to use OES 2015 SP1 services on your network. You are authorized to install as many OES 2015 SP1 servers as you need to provide OES 2015 SP1 services to those users.

For example, if your OES 2015 SP1 license is for 100 user connections, you can install as many OES 2015 SP1 servers as desired. Up to 100 users can then connect to and use the services provided by those OES 2015 SP1 servers. When you install OES 2015 SP1, you must accept an end user license agreement (EULA). Your rights to use the OES 2015 SP1 product are limited to the rights set forth in the EULA. Violators of the Novell license agreements and intellectual property are prosecuted to the fullest extent of the law.

To report piracy and infringement violations, please call 1-800-PIRATES (800-747-2837) or send e-mail to pirates@novell.com.

For more information on OES licensing, see the [Novell Licensing EULA page on the Novell Web site \(http://www.novell.com/licensing/eula/\)](http://www.novell.com/licensing/eula/).

4.6.2 OES Doesn't Support NLS

Novell Licensing Services (NLS) are not available on OES, nor does an OES installation require a license/key file pair (*.nlf and *.nfk). Therefore, in a mixed OES and NetWare eDirectory tree, at least one NetWare server must hold a replica for each partition where there is a NetWare server object. For more information about licensing for NetWare servers in OES trees, see [“NetWare Licenses and OES Trees” on page 47](#).

5 Installing OES 2015 SP1

IMPORTANT: Before you install Open Enterprise Server 2015 SP1, be sure to review the information in [Chapter 3, “Planning Your OES 2015 SP1 Implementation,”](#) on page 25, especially [Section 3.8, “Caveats to Consider Before You Install,”](#) on page 38.

This section briefly covers the following:

- ♦ [Section 5.1, “Installing OES 2015 SP1 on Physical Servers,”](#) on page 61
- ♦ [Section 5.2, “Installing OES 2015 SP1 Servers in a Xen VM,”](#) on page 62
- ♦ [Section 5.3, “Installing OES 2015 SP1 Servers in a KVM Virtual Machine,”](#) on page 62

5.1 Installing OES 2015 SP1 on Physical Servers

The OES 2015 SP1 installation leverages the SUSE Linux YaST graphical user interface. You can install OES 2015 SP1 services on an existing SUSE Linux Enterprise Server 11 SP4 server, or you can install both OES 2015 SP1 and SLES 11 SP4 at the same time, making installation a seamless process.

To ensure a successful installation:

1. Read and follow all instructions in the [OES 2015 SP1: Readme](#).
2. Carefully follow the instructions in the [OES 2015 SP1: Installation Guide](#), especially those found in
 - ♦ [“Preparing to Install OES 2015 SP1”](#)
 - ♦ [“Installing OES 2015 SP1 as a New Installation”](#)
3. Make sure you always download the latest patches as part of the Customer Center configuration during the install. This ensures the most stable configuration and installation process and prevents some issues that are documented in the product Readme.
4. After updating the server, you are prompted for the root password.

This happens because the server reboots as part of the update process and the `root` password is no longer in memory.
5. During the installation, you have the option to disable each service for later configuration. However, we recommend that you configure all services at install time simply because the process is more streamlined.

For more information on configuring services later, see [“Installing or Configuring OES 2015 SP1 on an Existing Server”](#) in the [OES 2015 SP1: Installation Guide](#).

5.1.1 What's Next

After installing OES 2015 SP1 and before starting to use your new server, be sure to review the information in [Chapter 6, “Caveats for Implementing OES 2015 SP1 Services,”](#) on page 63.

The various service sections in this guide contain information about completing your OES 2015 SP1 services implementation. See the sections for the services you have installed, beginning with [Chapter 11, “Managing OES 2015 SP1,”](#) on page 89.

5.2 Installing OES 2015 SP1 Servers in a Xen VM

Installing OES 2015 SP1 servers on a Xen virtual machine involves installing an OES 2015 SP1 or SUSE Linux Enterprise Server (SLES) 11 SP4 VM host server, creating a VM, and then installing a NetWare or OES server in the VM.

To get started with Xen virtualization in OES 2015 SP1, see the following:

- ♦ “Introduction to Xen Virtualization (http://www.suse.com/documentation/sles11/book_xen/data/cha_xen_basics.html)” in the *Virtualization with Xen* (http://www.suse.com/documentation/sles11/book_xen/data/book_xen.html)guide.
- ♦ “Installing OES as a VM Host Server” in the *OES 2015 SP1: Installation Guide*.
- ♦ “Installing, Upgrading, or Updating OES on a VM” in the *OES 2015 SP1: Installation Guide*.
- ♦ “Installing and Managing NetWare on a Xen-based VM” in the *OES 2015 SP1: Installation Guide*.

5.3 Installing OES 2015 SP1 Servers in a KVM Virtual Machine

Installing OES 2015 SP1 servers on a KVM virtual machine involves installing an OES 2015 SP1 or SUSE Linux Enterprise Server (SLES) 11 SP4 VM host server, creating a VM, and then installing an OES server in the VM.

To get started with KVM virtualization in OES 2015 SP1, see the following:

- ♦ The *Virtualization with KVM* (http://www.suse.com/documentation/sles11/book_kvm/data/book_kvm.html)guide.
- ♦ “Installing OES as a VM Host Server” in the *OES 2015 SP1: Installation Guide*.
- ♦ “Installing, Upgrading, or Updating OES on a VM” in the *OES 2015 SP1: Installation Guide*.

6 Caveats for Implementing OES 2015 SP1 Services

This section presents a few pointers for avoiding common Open Enterprise Server 2015 SP1 implementation problems.

The list that follows is not comprehensive. Rather, it simply outlines some of the more common problems reported by network administrators. To ensure successful service implementations, you should always follow the instructions in the documentation for the services you are implementing.

- ◆ [Section 6.1, “AFP,” on page 64](#)
- ◆ [Section 6.2, “Avoiding POSIX and eDirectory Duplications,” on page 64](#)
- ◆ [Section 6.3, “CIFS,” on page 66](#)
- ◆ [Section 6.4, “CUPS on OES,” on page 67](#)
- ◆ [Section 6.5, “DSfW: MMC Password Management Limitation,” on page 67](#)
- ◆ [Section 6.6, “eDirectory,” on page 67](#)
- ◆ [Section 6.7, “iFolder 3.9.2,” on page 69](#)
- ◆ [Section 6.8, “iPrint,” on page 69](#)
- ◆ [Section 6.9, “LDAP—Preventing “Bad XML” Errors,” on page 70](#)
- ◆ [Section 6.10, “LUM Cache Refresh No Longer Persistent,” on page 71](#)
- ◆ [Section 6.11, “Management,” on page 71](#)
- ◆ [Section 6.12, “McAfee Antivirus Requires Additional Configuration,” on page 73](#)
- ◆ [Section 6.13, “NCP,” on page 73](#)
- ◆ [Section 6.14, “Novell Identity Translator \(NIT\),” on page 74](#)
- ◆ [Section 6.15, “Novell-tomcat Is for OES Use Only,” on page 75](#)
- ◆ [Section 6.16, “NSS,” on page 75](#)
- ◆ [Section 6.17, “OpenLDAP on OES,” on page 75](#)
- ◆ [Section 6.18, “Samba,” on page 76](#)
- ◆ [Section 6.19, “SLP Registrations Are Not Retrieved from a Novell SLP DA,” on page 76](#)
- ◆ [Section 6.20, “Synchronizing NMAS Login Methods Is Required to Avoid Login Failures,” on page 76](#)
- ◆ [Section 6.21, “Using NLVM with Linux Software RAIDs,” on page 76](#)
- ◆ [Section 6.22, “Virtualization,” on page 77](#)

6.1 AFP

- ♦ [Section 6.1.1, “Anti-Virus Solutions and AFP,” on page 64](#)

6.1.1 Anti-Virus Solutions and AFP

The Apple Filing Protocol (AFP) support for NSS files on OES is implemented via a technology that bypasses the real-time scanning employed by most anti-virus solutions for OES.

NSS files shared through an AFP connection can be protected by on-demand scanning on the OES server or by real-time and on-demand scanning on the Apple client.

6.2 Avoiding POSIX and eDirectory Duplications

OES servers can be accessed by

- ♦ Local (POSIX) users that are created on the server itself.
- ♦ eDirectory users that are given local access through Linux User Manager (LUM).

However, there are some issues you need to consider:

- ♦ [Section 6.2.1, “The Problem,” on page 64](#)
- ♦ [Section 6.2.2, “Three Examples,” on page 64](#)
- ♦ [Section 6.2.3, “Avoiding Duplication,” on page 65](#)

6.2.1 The Problem

There is no cross-checking between POSIX and eDirectory to prevent the creation of users or groups with duplicate names.

When duplicate names occur, the resulting problems are very difficult to troubleshoot because everything on both the eDirectory side and the POSIX side appears to be configured correctly. The most common problem is that LUM-enabled users can't access data and services as expected but other errors could surface as well.

Unless you are aware of the users and groups in both systems, especially those that are system-created, you might easily create an invalid configuration on an OES server.

6.2.2 Three Examples

The following examples illustrate the issue.

- ♦ [“The shadow Group” on page 65](#)
- ♦ [“The users Group” on page 65](#)
- ♦ [“Other Non-System Groups” on page 65](#)

The shadow Group

There is a default [system-created group](#) named `shadow` that is used by certain Web-related services, but it has no relationship with Dynamic Storage Technology (DST) and shadow volumes.

Because `shadow` is a local POSIX group, there is nothing to prevent you from creating a LUM-enabled second group in eDirectory that is also named `shadow`. In fact, this could be a logical name choice for many administrators in conjunction with setting up shadow volume access for Samba/CIFS users.

However, using this group name results in LUM-enabled users being denied access by POSIX, which looks first to the local `shadow` group when determining access rights and only checks eDirectory for a group named `shadow` if no local group is found.

The users Group

There is another default system-created group named `users` that is not used by OES 2015 or later services but is nevertheless created on all SLES 11 (and therefore, OES 2015 SP1 or later) servers.

Creating an eDirectory group named `users` would seem logical to many administrators. And as with the shadow group, nothing prevents you from using this name.

Unfortunately, having a LUM-enabled eDirectory group named `users` is not a viable configuration for services requiring POSIX access. The local `users` group is always checked first, and the LUM-enabled `users` group in eDirectory won't be seen by POSIX.

NOTE: Do not confuse eDirectory Group objects with Organizational Unit (OU) container objects.

Creating an OU container in eDirectory named `users` is a valid option and does not create conflicts with POSIX.

Other Non-System Groups

Conflicts between group and user names also occur when administrators create local and eDirectory groups with the same name.

For example, one administrator creates a group named `myusers` on the local system and another creates a LUM-enabled group in eDirectory with the same name. Again, the LUM-enabled users who are members of the eDirectory group won't have access through POSIX.

This is why we recommend that, as a general rule, administrators should not create local users or groups on OES servers. You should only make exceptions when you have determined that using LUM-enabled users and groups is not a viable option and that objects with the same names as the POSIX users and groups will not be created in eDirectory in the future.

6.2.3 Avoiding Duplication

Having duplicate users and groups is easily avoided by following these guidelines:

- ◆ [“Use YaST to List All System-Created Users and Groups” on page 66](#)
- ◆ [“Create Only eDirectory Users and Groups” on page 66](#)

Use YaST to List All System-Created Users and Groups

We recommend that you use the YaST Group Management/User Management module to check for names you might duplicate by mistake.

1. Open the YaST Control Center.
2. Click either **Group Management** or **User Management**.
3. Click **Set Filter > Customize Filter**.
4. Select both options (**Local** and **System**), then click **OK**.

All users or groups as displayed, including those that exist only in eDirectory and are LUM-enabled.

5. To avoid duplication, keep this list in mind as you create eDirectory users and groups.

NOTE: The list of users and groups in [Appendix H, “System User and Group Management in OES 2015 SP1,” on page 257](#) is not exhaustive. For example, the `users` group is not listed.

Create Only eDirectory Users and Groups

The LUM technology eliminates the need for local users and groups. We recommend, therefore, that you avoid the problems discussed in this section by not creating local users and groups.

6.3 CIFS

- ♦ [Section 6.3.1, “Changing the Server IP Address,” on page 66](#)
- ♦ [Section 6.3.2, “Renaming CIFS Share Names on NSS Volumes Results in Two Share Names,” on page 66](#)

6.3.1 Changing the Server IP Address

Reconfiguring CIFS in YaST might not take effect if the server IP address was changed on the server but not in the OES LDAP server configuration.

To work around this:

- 1 Reconfigure the LDAP server IP address with the IP address changes.
- 2 Then change the CIFS IP address configuration.

6.3.2 Renaming CIFS Share Names on NSS Volumes Results in Two Share Names

When NSS volumes are added to an OES server, they are automatically added as CIFS shares.

If you rename these shares and restart CIFS, the original share names appear in addition to the new share names you specified.

6.4 CUPS on OES

iPrint is the print solution for OES and offers more robust and scalable print services than a CUPS installation can. iPrint actually uses CUPS to render print jobs prior to sending them to the printer, but for scalability and performance, printing from the server itself is disabled during iPrint installation.

If you plan to use iPrint, deselect **Print Server** in the **Primary Functions** category during the install and don't configure CUPS on the OES server.

6.5 DSfW: MMC Password Management Limitation

After creating a user, you cannot then force a password change through the Microsoft Management Console (MMC) because the **User must change password at next logon** option is disabled. You can work around this issue while creating the user by selecting the option as part of the creation task. For existing users, you can reset the password and select the same option as part of the reset task.

6.6 eDirectory

- [Section 6.6.1, “Avoid Uninstalling eDirectory When Possible,” on page 67](#)
- [Section 6.6.2, “Avoid Renaming Trees and Containers,” on page 67](#)
- [Section 6.6.3, “Default Static Cache Limit Might Be Inadequate,” on page 68](#)
- [Section 6.6.4, “eDirectory Not Restarting Automatically,” on page 68](#)
- [Section 6.6.5, “One Instance Only,” on page 68](#)
- [Section 6.6.6, “Special Characters in Usernames and Passwords,” on page 68](#)

6.6.1 Avoid Uninstalling eDirectory When Possible

OES services are tightly integrated with eDirectory and do not function without it.

The process of uninstalling and reinstalling eDirectory is documented in [“Reconfiguring eDirectory and OES Services”](#) in the *OES 2015 SP1: Installation Guide*. However, you should carefully consider the potential ramifications of doing this. The documented solution has been thoroughly tested, but it is impossible for Novell to anticipate all customer scenarios and the complications that might arise in them.

If you have an issue that you believe can only be resolved by uninstalling and reinstalling eDirectory, we recommend that you consult with Novell Technical Services before you attempt to do so.

IMPORTANT: Although the eDirectory 8.8 documentation describes how to remove and reinstall eDirectory, the processes described in that documentation do not cleanly decouple OES services, nor do they restore service connections. Therefore, they do not apply to OES servers.

6.6.2 Avoid Renaming Trees and Containers

The configuration files for many OES services point to configuration data stored within eDirectory.

Although eDirectory tracks all changes internally, OES services do not. Therefore, if you rename your eDirectory tree or one of the containers below [Root], you should expect that one or more of your OES services will break.

If you need to rename a container or tree, make sure that you

1. Identify all of the configuration files for your OES services.
2. Assess whether the changes that you are planning impact any of your service configurations.
3. Understand and articulate the changes that are required to restore your services after renaming.

There are no automated tools in OES for resolving the configuration errors and other problems that are caused by renaming a tree or its containers.

6.6.3 Default Static Cache Limit Might Be Inadequate

The eDirectory install in OES 2015 or later sets a default static cache of 200 MB if an `_ndsdb.ini` file is not present in the `dib` directory.

To improve performance, you can adjust the cache parameter in the `_ndsdb.ini` file after the install to meet your eDirectory performance requirements, depending on the database size and available system RAM. We recommend setting the cache to 200 MB on a 2 GB RAM system and 512 MB on a 4 GB RAM system.

6.6.4 eDirectory Not Restarting Automatically

After a system crash or power failure, eDirectory services (`nds`) might not automatically restart in some situations. To start eDirectory again, do the following:

- 1 Delete the `/var/opt/novell/eDirectory/data/nds.pid` file.
- 2 At a terminal prompt, enter `/etc/init.d/nds start`.

6.6.5 One Instance Only

OES supports only one instance of eDirectory (meaning one tree instance) per server.

If you need two or more instances running on a single server, you must install them on a non-OES server, such as SLES 11.

6.6.6 Special Characters in Usernames and Passwords

Using special characters in usernames and passwords can create problems when the values are passed during an eDirectory installation or schema extension.

If the username or password contains special characters, such as `$`, `#`, and so on, escape the character by preceding it with a backslash (`\`). For example, an administrator username of

```
cn=admin$name.o=container
```

must be passed as

```
cn=admin\$name.o=container
```

When entering parameter values at the command line, you can either escape the character or place single quotes around the value. For example:

```
cn=admin\$name.o=container
```

or

```
'cn=admin$name.o=container'
```

6.7 iFolder 3.9.2

Implementation caveats for iFolder 3.9.2 are documented in [“Caveats for Implementing iFolder Services”](#) in the *Novell iFolder 3.9.2 Administration Guide*.

6.8 iPrint

iPrint has the following implementation caveats:

- ♦ [Section 6.8.1, “Advanced Printing Options,”](#) on page 69
- ♦ [Section 6.8.2, “Authentication Dialog Not Displaying for Secure Printers from Terminal Servers,”](#) on page 69
- ♦ [Section 6.8.3, “Cluster Failover Between Mixed Platforms Not Supported,”](#) on page 69
- ♦ [Section 6.8.4, “iManager Plug-Ins Are Platform-Specific,”](#) on page 69
- ♦ [Section 6.8.5, “iPrint Client for Linux Doesn't Install Automatically,”](#) on page 70
- ♦ [Section 6.8.6, “iPrint Disables CUPS Printing on the OES Server,”](#) on page 70
- ♦ [Section 6.8.7, “Linux and Macintosh Client Printer Installation Fails When Communicating via Proxy,”](#) on page 70
- ♦ [Section 6.8.8, “Printer Driver Uploading on OES Might Require a CUPS Administrator Credential,”](#) on page 70

6.8.1 Advanced Printing Options

Some drivers, such as HP and Lexmark UPDs, have problems handling advanced printing options, such as watermarks and n-up printing when they are used from user workstations.

6.8.2 Authentication Dialog Not Displaying for Secure Printers from Terminal Servers

When you perform an automatic driver or profile update for secure printers from terminal servers, the authentication dialog box is not displayed.

6.8.3 Cluster Failover Between Mixed Platforms Not Supported

Clustered iPrint services can only fail over to the same platform, either OES or NetWare.

6.8.4 iManager Plug-Ins Are Platform-Specific

The iManager plug-ins are different for each server platform. Therefore, if you have both OES and NetWare 6.5 SP8 servers running iPrint services, you need two instances of iManager to manage iPrint—one on each platform.

6.8.5 iPrint Client for Linux Doesn't Install Automatically

Users who are used to installing the Windows iPrint Client expect to choose an **Open** option and have the client install automatically. However, installing the client on Linux workstations requires you to save the RPM package and then install it manually if a package manager is not already installed and configured as it is in the Novell Linux Desktop. For more information, see “[Linux: iPrint Client](#)” in the *OES 2015 SP1: iPrint Linux Administration Guide*.

6.8.6 iPrint Disables CUPS Printing on the OES Server

iPrint uses CUPS to render print jobs before sending the print job to the Print Manager. For performance and scalability, printing from the server itself is disabled during the OES installation of iPrint.

6.8.7 Linux and Macintosh Client Printer Installation Fails When Communicating via Proxy

Linux and Macintosh iPrint clients fail to install printers when communicating with the iPrint server through a proxy server.

6.8.8 Printer Driver Uploading on OES Might Require a CUPS Administrator Credential

A PPD is the Linux equivalent of a printer driver on Windows.

There are two versions of the iPrint Client: high security and low security. End users and administrators install the high-security client when using the iPrint Printer List Web page.

This means that administrators are prompted for a CUPS administrator credential when uploading PPDs. However, the prompt doesn't specify that a CUPS administrator credential is needed and the `root` user credential does not work.

6.9 LDAP—Preventing “Bad XML” Errors

If you are using NetIQ eDirectory 8.7.3x, time outs are possible when you search from iManager for eDirectory objects, such as NCP Server objects, Volume objects, and Cluster objects. This is because the Object Class attribute is not indexed by default. The LDAP sub-tree search can take over 30 seconds, which causes the query to time out. For example, a Cluster objects search from the Cluster Options page returns the error:

```
Bad XML found during parsing when accessing cluster options
```

We recommend that you create a value index on the objects' Object Class attribute. (Object Class is considered an attribute for indexing purposes.) This helps to reduce the time needed for the subtree search from over 30 seconds to 10 to 50 milliseconds. For instructions, see “[Creating an Index](#)” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

Building indexes speeds up the subtree search, even if some partitions being searched do not contain these types of objects. For example, searching for a Cluster object in a context that contains only users is not expected to return results; however, the Object Class search is still performed, and benefits from having an index present.

The subtree search performance issue is resolved in the eDirectory 8.8 release with the addition of the AncestorID feature.

6.10 LUM Cache Refresh No Longer Persistent

In response to customer requests for improved LDAP performance, persistent searching for new Linux-enabled users and groups was disabled in OES 2 and has been carried forward in OES 2015 or later. This means that when a user or group is enabled for Linux access, it is not immediately listed in some of the interfaces, such as the GUI file browser.

For most installations this is not an issue. However, persistent searching can be turned on by editing the `/etc/nam.conf` file and changing the `persistent-search` parameter from `no` to `yes`.

Alternatively, you can shorten the LUM cache refresh period (default is 8 hours). You can adjust the refresh period by editing the `persistent-cache-refresh-period` parameter in the `/etc/nam.conf` file and restarting LUM using the `rcnamcd restart` command.

You can also refresh the cache immediately by using the `namconfig cache_refresh` command.

For more information, see “[The namcd Linux User Management Caching Daemon](#)” in the *OES 2015 SP1: Linux User Management Administration Guide*.

6.11 Management

- ♦ [Section 6.11.1, “iManager RBS Configuration with OES,”](#) on page 71
- ♦ [Section 6.11.2, “Storage Error in iManager When Accessing a Virtual Server,”](#) on page 72
- ♦ [Section 6.11.3, “Truncated DOS-Compatible Short Filenames Are Not Supported at a Terminal Prompt,”](#) on page 72
- ♦ [Section 6.11.4, “LUM-Enabling Required for Full Administrative Access,”](#) on page 72

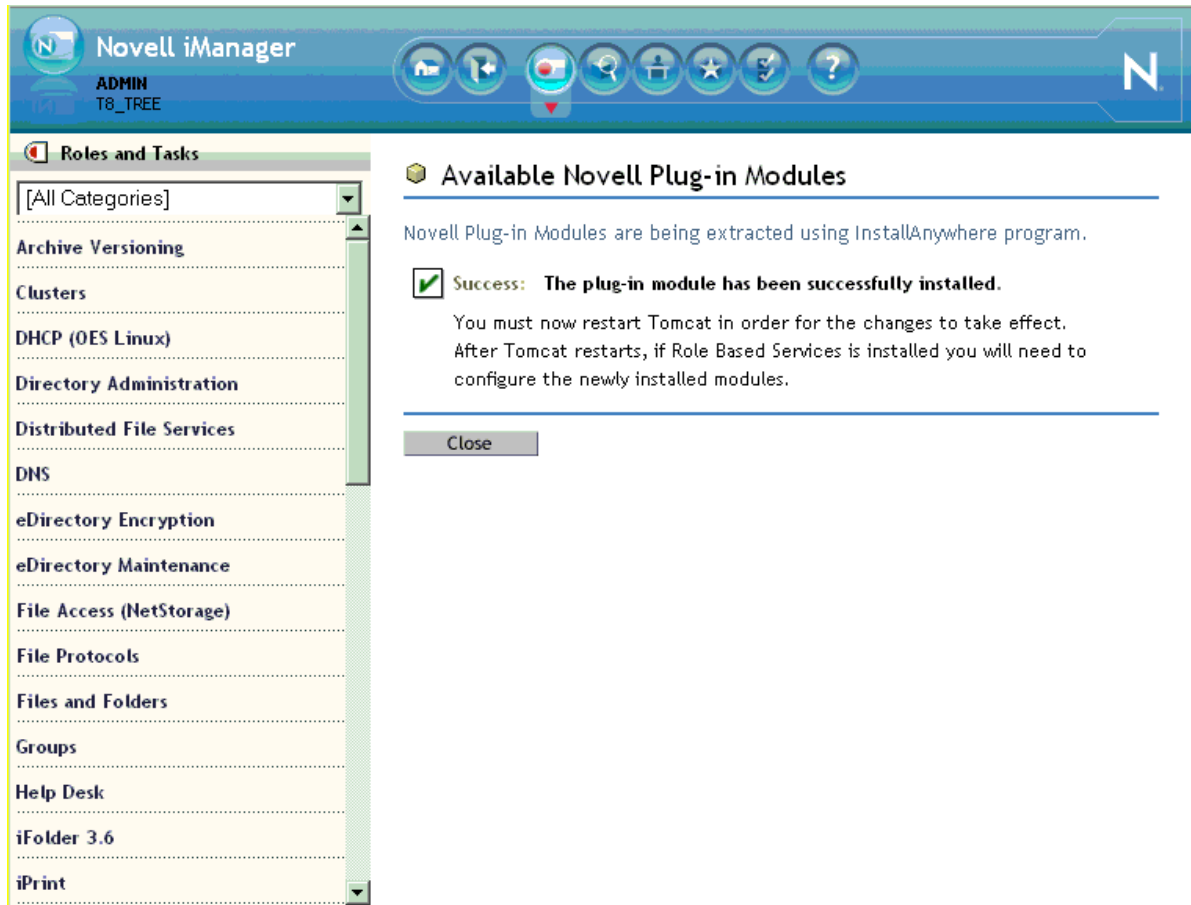
6.11.1 iManager RBS Configuration with OES

In “[Installing RBS](#)” in the *NetIQ® iManager Administration Guide*, you are instructed to run the iManager Configuration Wizard before using iManager.

When iManager is installed in connection with OES, various roles and tasks are configured, as shown in [Figure 6-1](#).

These roles and tasks are available to all the users you create until you run the configuration wizard. After that, the roles and tasks are available only to the Admin user and other users or groups you specifically designate.

Figure 6-1 iManager Roles and Tasks



For more information on iManager, see the [NetIQ® iManager Administration Guide](#).

6.11.2 Storage Error in iManager When Accessing a Virtual Server

iManager returns a `Storage Error` when you access the Authentication tab for a virtual server object. This is working as designed.

6.11.3 Truncated DOS-Compatible Short Filenames Are Not Supported at a Terminal Prompt

Use the actual filenames instead of names such as `filena~1.txt` during file operations from the command prompt.

6.11.4 LUM-Enabling Required for Full Administrative Access

The current LUM architecture requires that administrators, administrator equivalents, and RBS-enabled managers be LUM-enabled to have full management capabilities.

6.12 McAfee Antivirus Requires Additional Configuration

After installing McAfee Antivirus support on an OES server with NSS and/or NCP volumes, various problems might be seen, including clustered volumes going comatose because of mount failures with an error code of 150.

This happens because the antivirus software is locking `.trustee_database.xml` files on NSS and NCP volumes.

To prevent these problems, make sure you do the following, as described in the McAfee documentation. (References to OES 2 apply to OES 2015 or later as well.)

- 1 Exclude the `_NETWARE` and `/_admin/*` folders on all NSS and NCP volumes as documented in Chapter 5 > Anti-virus Exclusions in the [McAfee VirusScan Enterprise for Linux 1.7.0 Best Practices Guide](#), except that the `/_admin/*` path is documented incorrectly as `_ADMIN` in the McAfee guide.

For example:

- ♦ `/_admin/*` (for NSS)
 - ♦ `/admin/*` (for NCS)
 - ♦ `/media/nss/volume_name/._NETWARE`
- 2 Using iManager, create a `nails` user and a `nailsgroup` group in eDirectory and assign them administrative privileges on all NSS and/or NCP volumes as documented in Chapter 2 > Prerequisites in the [McAfee VirusScan Enterprise for Linux 1.7.0 Software Configuration Guide](#).

IMPORTANT: Be sure to configure any new NSS or NCP volumes you add to the server.

6.13 NCP

- ♦ [Section 6.13.1, “NCP Doesn’t Equal NSS File Attribute Support,” on page 73](#)
- ♦ [Section 6.13.2, “Opening MS Office Files Using Novell Client for Windows 7,” on page 74](#)

6.13.1 NCP Doesn’t Equal NSS File Attribute Support

NSS file attributes and NCP services tend to get mixed together in the minds of OES administrators, especially those with a lot of NetWare experience. It is important to remember that file and directory attributes are supported and enforced by the file system that underlies an NCP volume, not by the NCP server.

For example, even though the Rename Inhibit attribute appears to be settable in the NCP client interface, if the underlying file system is Linux POSIX (Ext3, XFS, and so on) there is no support for the attribute and it cannot be set.

Salvage (undelete) and Purge are other features that are available only on NSS and only where the Salvage attribute has been set (the NSS default). They can be managed in the NCP client and through NetStorage, but they are not available on NCP volumes where the underlying file system is Linux POSIX.

Some administrators assume they can provide NSS attribute support by copying or migrating files, directories, and metadata from an NSS volume to a defined NCP volume on a Linux POSIX partition. However, this doesn’t work, because NSS file attributes are only supported on NSS volumes.

6.13.2 Opening MS Office Files Using Novell Client for Windows 7

To open MS Office files through an NCP (Novell Client) connection, Windows 7 workstations must be running Novell Client 2 SP1 for Windows, version IR 9a or later. Otherwise, file open requests are denied. See [TID 7009540 \(http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7009540&sliceId=1&docTypeID=DT_TID_1_1&dialogID=273023280&stateId=0%200%20273025163\)](http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7009540&sliceId=1&docTypeID=DT_TID_1_1&dialogID=273023280&stateId=0%200%20273025163).

Windows XP workstations do not experience the problem. The latest version of Novell Client for Windows XP is version 4.91 SP5 (IR2).

6.14 Novell Identity Translator (NIT)

Novell Identity Translator is a [new service in OES 2015](#).

- ◆ [Section 6.14.1, “NIT and LUM UID Ranges Must Not Overlap,” on page 74](#)
- ◆ [Section 6.14.2, “Choosing the Best NIT Generate-Mode Settings for Your AD Users,” on page 74](#)
- ◆ [Section 6.14.3, “Actions that Require a Server Restart,” on page 75](#)

6.14.1 NIT and LUM UID Ranges Must Not Overlap

Ensure that Your LUM and NIT UID Ranges Don't Overlap.

For more information, see [“Not All Users Have UIDs by Default”](#) and [“Ensuring that Your CIFS-NSS Users Have UIDs”](#) in the *OES 2015 SP1: NSS AD Administration Guide*.

6.14.2 Choosing the Best NIT Generate-Mode Settings for Your AD Users

For AD users, NIT runs in one of two modes, as outlined in [Table 6-1](#).

Table 6-1 NIT AD-UID Mode Summary

AD-UID Mode	Details
Generate	<ul style="list-style-type: none">◆ Default mode◆ <code>/etc/opt/novell/nit/nitd.conf > ad-uid-generate-mode=1</code> (The option is enabled.)◆ NIT generates UIDs for all users and groups that need them, ignoring the <code>uidNumber</code> attribute in Active Directory.◆ NSS is accessible to all otherwise-qualified AD users and groups.
Fetch	<ul style="list-style-type: none">◆ <code>/etc/opt/novell/nit/nitd.conf > ad-uid-generate-mode=0</code> (The option is disabled.)◆ NIT retrieves UIDs for AD users and groups that have the <code>uidNumber</code> attribute in Active Directory◆ NSS is accessible only to AD users and groups that have the <code>uidNumber</code> attribute in Active Directory.

6.14.3 Actions that Require a Server Restart

The following changes to a server's NIT configuration require a server restart:

- ♦ Changing the AD-UID Generate mode (`ad-uid-generate-mode` in the `nitd.conf` file).
The two mutually exclusive options are "Generate" and "Fetch."
- ♦ Changing the UID range that NIT uses (`uid-start-range` or `uid-end-range` in the `nitd.conf` file).

For more information, see "NIT (Novell Identity Translator)" in the [OES 2015 SP1: NSS AD Administration Guide](#).

6.15 Novell-tomcat Is for OES Use Only

The `novell-tomcat` package is installed and configured for OES service use only. It is an integral, embedded part of Novell OES services, not a generic application platform.

The `novell-tomcat` package, and its associated configuration file and JRE (`novell-tomcat.conf` and IBM 1.6.0 Java), must not be manually modified, updated, or changed in any way. Otherwise, OES services and tools, such as iManager, do not work as expected.

If you want to deploy a Tomcat-dependant Web application on an OES server, use the open source Tomcat package that comes with SLES 11. Installing and configuring the open source Tomcat package will not affect the `novell-tomcat` package.

6.16 NSS

- ♦ [Section 6.16.1, "For GroupWise, Change the Default Name Space to UNIX," on page 75](#)
- ♦ [Section 6.16.2, "Junction Target Support," on page 75](#)

6.16.1 For GroupWise, Change the Default Name Space to UNIX

NSS stores LONG, UNIX, DOS, and AFP name spaces for all files. The default name space sets which name space will be exposed.

In OES 2015 or later the LONG name space is the default to help performance of NCP, CIFS, and Samba file services. If your primary use is for GroupWise, we recommend changing the default name space to UNIX.

6.16.2 Junction Target Support

If a junction's source and target are both on OES, then subdirectory targets are fully supported.

Junctions from OES to NetWare only support targets at the root of a volume.

NetWare junctions cannot target OES servers.

6.17 OpenLDAP on OES

You cannot run OpenLDAP on an OES server with eDirectory installed. eDirectory LDAP is required for OES services and uses the same ports as OpenLDAP.

6.18 Samba

For Samba implementation caveats, see “[Samba Caveats](#)” in the *OES 2015 SP1: Novell Samba Administration Guide*.

6.19 SLP Registrations Are Not Retrieved from a Novell SLP DA

By default, the OpenSLP DA cannot retrieve SLP registrations from the Novell SLP DA during startup. For information on resolving this issue, see [TID 7009783 \(http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7009783&sliceId=1&docTypeID=DT_TID_1_1&dialogID=281740290&stateId=0%20%20281736877\)](http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7009783&sliceId=1&docTypeID=DT_TID_1_1&dialogID=281740290&stateId=0%20%20281736877).

6.20 Synchronizing NMAS Login Methods Is Required to Avoid Login Failures

NMAS (NetIQ Modular Authentication Service) provides flexible login options, including support for smart cards, proximity cards, passwords, etc.

OES services, such as Novell AFP and Novell CIFS include NMAS login methods that are installed in eDirectory at the same time as the services. Macintosh and Windows users can then log into OES just as they would log into a native AFP or CIFS server.

After an NMAS login method is installed in eDirectory, it must be synchronized to all of the eDirectory replicas in the tree. Replica synchronization is, of course, a high system priority. However, it is not guaranteed to be immediate, and on networks with many servers and multiple-replica trees, normal delays in synchronization can result in authentication failures.

For example, when an AFP user requests a connection to an OES server running Novell AFP, NMAS can direct the login request to any eDirectory server that has a writable replica of a partition containing the User object. If the AFP login method is not yet synchronized to that particular eDirectory server, the authentication request fails.

To avoid login failures and user frustration, you should make sure that all of your eDirectory servers that hold replicas are synchronized as soon as possible after OES services are installed.

For more information on synchronization, see “[Synchronization](#)” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

6.21 Using NLVM with Linux Software RAIDs

Linux Software RAIDs are intended to be used with Linux tools and file systems. Consider the caveats in this section before implementing Linux Software RAIDs on your OES server.

- ♦ [Section 6.21.1, “Linux Software RAIDs,” on page 77](#)
- ♦ [Section 6.21.2, “Linux Software RAIDs Are Not Cluster Aware,” on page 77](#)
- ♦ [Section 6.21.3, “Linux Software RAIDs Are Not Recommended for the System Device,” on page 77](#)

6.21.1 Linux Software RAIDs

We recommend that you do not use Linux software RAIDs (such as MD RAIDs and Device Mapper RAIDs) for devices that you plan to use for storage objects that are managed by NSS management tools. The Novell Linux Volume Manager (NLVM) utility and the NSS Management Utility (NSSMU) list Linux software RAID devices that you have created by using Linux tools. Beginning with Linux Kernel 3.0 in OES 11 SP1, NLVM and NSSMU can see these devices, initialize them, and allow you to create storage objects on them. However, this capability has not yet been fully tested.

IMPORTANT: In OES 11 or later, a server hang or crash can occur if you attempt to use a Linux software RAID when you create storage objects that are managed by NSS management tools.

For NSS pools, you can use hardware RAID devices or NSS Software RAID devices to achieve disk fault tolerance.

For Linux POSIX volumes, LVM volume groups, and cLVM volume groups, you can use hardware RAID devices on your storage subsystem to achieve disk fault tolerance.

6.21.2 Linux Software RAIDs Are Not Cluster Aware

Do not use Linux Software RAIDs for devices that you plan to use for shared storage objects. Linux Software RAID devices do not support concurrent activation on multiple nodes; that is, they are not cluster aware. They cannot be used for shared-disk storage objects, such as the OCFS2 file system, cLVM volume groups, and Novell Cluster Services SBD (split-brain-detector) partitions.

For shared disks, you can use hardware RAID devices on your storage subsystem to achieve fault tolerance.

6.21.3 Linux Software RAIDs Are Not Recommended for the System Device

We recommend that you do not use Linux software RAIDs (such as MD RAIDs and Device Mapper RAIDs) on the system device if you plan to use free space on the device later for storage objects managed by NSS tools. During the SLES and OES installation, if you create a Linux software RAID device to use as the system device for the root (/) file system, the free space on the system device cannot be used later for NSS pools because the configuration of NSS storage objects on Linux software RAIDs has not yet been fully tested.

IMPORTANT: In OES 11, a server hang or crash can occur if you attempt to use a Linux software RAID when you create storage objects that are managed by NSS management tools.

For the Linux system device, you can use a hardware RAID device to achieve fault tolerance. This allows NSS tools to see and use any available free space on the system device for unshared NSS pools.

6.22 Virtualization

The following are caveats for setting up OES server in Xen VMs:

- ◆ [Section 6.22.1, “Always Close Virtual Machine Manager When Not in Use,” on page 78](#)
- ◆ [Section 6.22.2, “Always Use Timesync Rather Than NTP,” on page 78](#)

- ♦ [Section 6.22.3, “Backing Up a Xen Virtual Machine,” on page 78](#)
- ♦ [Section 6.22.4, “Time Synchronization and Virtualized OES,” on page 78](#)
- ♦ [Section 6.22.5, “NSS Considerations,” on page 78](#)

6.22.1 Always Close Virtual Machine Manager When Not in Use

You should always close Virtual Machine Manager (VMM) when you are not actively using it. Virtual Machines are not affected.

Leaving VMM open can affect the system resources available to the VMs.

6.22.2 Always Use Timesync Rather Than NTP

Time synchronization problems have been observed when virtualized NetWare servers are running the XNTPD NLM. Therefore, Novell strongly recommends using Timesync and also configuring the service to communicate through NTP.

6.22.3 Backing Up a Xen Virtual Machine

When backing up a Xen virtual machine running virtualized NetWare, we recommend using a remote backup source rather than a local tape device because of limitations in detecting a local tape device.

6.22.4 Time Synchronization and Virtualized OES

eDirectory relies on time being synchronized and connections with eDirectory are lost if the system time varies in the host operating system. Be sure you understand and follow the instructions in [Virtual Machine Clock Settings \(http://www.suse.com/documentation/sles11/book_xen/data/sec_xen_guests_suse_time.html\)](http://www.suse.com/documentation/sles11/book_xen/data/sec_xen_guests_suse_time.html) in the *Virtualization with Xen* (http://www.suse.com/documentation/sles11/book_xen/data/book_xen.html) guide.

6.22.5 NSS Considerations

Make sure you follow these guidelines for using NSS volumes in connection with OES servers running in Xen VMs:

- ♦ **OES:** Data shredding is not supported.

7 Upgrading to OES 2015 SP1

This section provides information and links for upgrading to Open Enterprise Server.

- ♦ [Section 7.1, “Caveats to Consider Before Upgrading,” on page 79](#)
- ♦ [Section 7.2, “OES 2015 SP1 Upgrade Paths,” on page 79](#)
- ♦ [Section 7.3, “NetWare 6.5 SP8 Upgrade Paths,” on page 80](#)

7.1 Caveats to Consider Before Upgrading

Be aware of the following caveats when upgrading an OES server:

- ♦ [Section 7.1.1, “About Previously Installed Packages \(RPMs\),” on page 79](#)
- ♦ [Section 7.1.2, “Only One eDirectory Instance Is Supported on OES Servers,” on page 79](#)

7.1.1 About Previously Installed Packages (RPMs)

Other Novell products, such as GroupWise, and third-party applications that you have installed are treated differently by default when you upgrade an OES server, depending on the version of the server you are upgrading.

To learn more and for instructions on manually changing these options, see [“Planning for the Upgrade to OES 2015 SP1”](#) in the *OES 2015 SP1: Installation Guide*.

7.1.2 Only One eDirectory Instance Is Supported on OES Servers

If your OES server has multiple instances of eDirectory running (multiple trees), any attempt to upgrade the server fails.

You must remove all instances, except the one that uses port 524, prior to an upgrade.

For more information, see [Section 6.6.5, “One Instance Only,” on page 68](#).

7.2 OES 2015 SP1 Upgrade Paths

The following are supported upgrade paths for OES 2015 SP1:

Table 7-1 Supported OES 2015 SP1 Upgrade Paths

Source	Destination
OES 2015	OES 2015 SP1
OES 11 SP2, OES 11 SP3	OES 2015 SP1

NOTE: Physical installations cannot be upgraded to virtual installations, and the reverse is also true. Only physical to physical and virtual to virtual upgrades are supported.

For complete upgrade instructions, see “[Upgrading to OES 2015 SP1](#)” in the *OES 2015 SP1: Installation Guide*.

In addition to upgrading the server itself, data and service migrations are also supported. For more information, see “[Planning for Migration](#)” in the *OES 2015 SP1: Migration Tool Administration Guide*.

7.3 NetWare 6.5 SP8 Upgrade Paths

For help upgrading from NetWare to OES 2015 SP1, see the *OES 2015 SP1: Upgrading to OES—Best Practices Guide*.

8

Migrating Existing Servers and Data

This section briefly outlines the following migration topics:

- ♦ [Section 8.1, “Supported OES 2015 SP1 Migration Paths,”](#) on page 81
- ♦ [Section 8.2, “Migration Tools and Purposes,”](#) on page 81

8.1 Supported OES 2015 SP1 Migration Paths

For a complete list of Open Enterprise Server migration scenarios and paths, see “[Migration Scenarios](#)” in the *OES 2015 SP1: Migration Tool Administration Guide*.

8.2 Migration Tools and Purposes

The OES 2015 SP1 Migration Tool lets you migrate and/or consolidate data and services from one or more NetWare and OES source servers to an OES 2015 SP1 target server. See “[Source Platform Support for OES 2015 SP1 Services](#)” in the *OES 2015 SP1: Migration Tool Administration Guide*.

You can also transfer a complete server identity, including its IP address, hostname, eDirectory identity, NCI keys, and certificates. For more information, see “[Transfer ID](#)” in the *OES 2015 SP1: Migration Tool Administration Guide*.

9 Virtualization in OES 2015 SP1

Open Enterprise Server 2015 SP1 runs as a VM guest on any virtual machine host server that is certified for running SUSE Linux Enterprise Server 11 SP4 (SLES 11 SP4) as a virtualized guest. Because Xen and KVM are distributed with SLES 11 SP4, they are mentioned more particularly in the OES documentation.

For a list of the VM host platforms that are certified for SLES 11 SP4, see [Section 2.2.4, “Supported Virtualization Hosts”](https://www.suse.com/documentation/sles11/book_sle_deployment/data/sec_x86_sysreqs.html) (https://www.suse.com/documentation/sles11/book_sle_deployment/data/sec_x86_sysreqs.html) in the *SLES 11 Deployment Guide* (https://www.suse.com/documentation/sles11/book_sle_deployment/data/book_sle_deployment.html).

NetWare guest servers are supported only on Xen host servers. NetWare is not supported as a guest on a KVM virtual machine host server.

For information about installing and running OES 2015 SP1 services on virtual machines, see the links on the [Virtualization page of the OES 11 Online Documentation](http://www.novell.com/documentation/oes11/index.html#cat_virtualization) (http://www.novell.com/documentation/oes11/index.html#cat_virtualization).

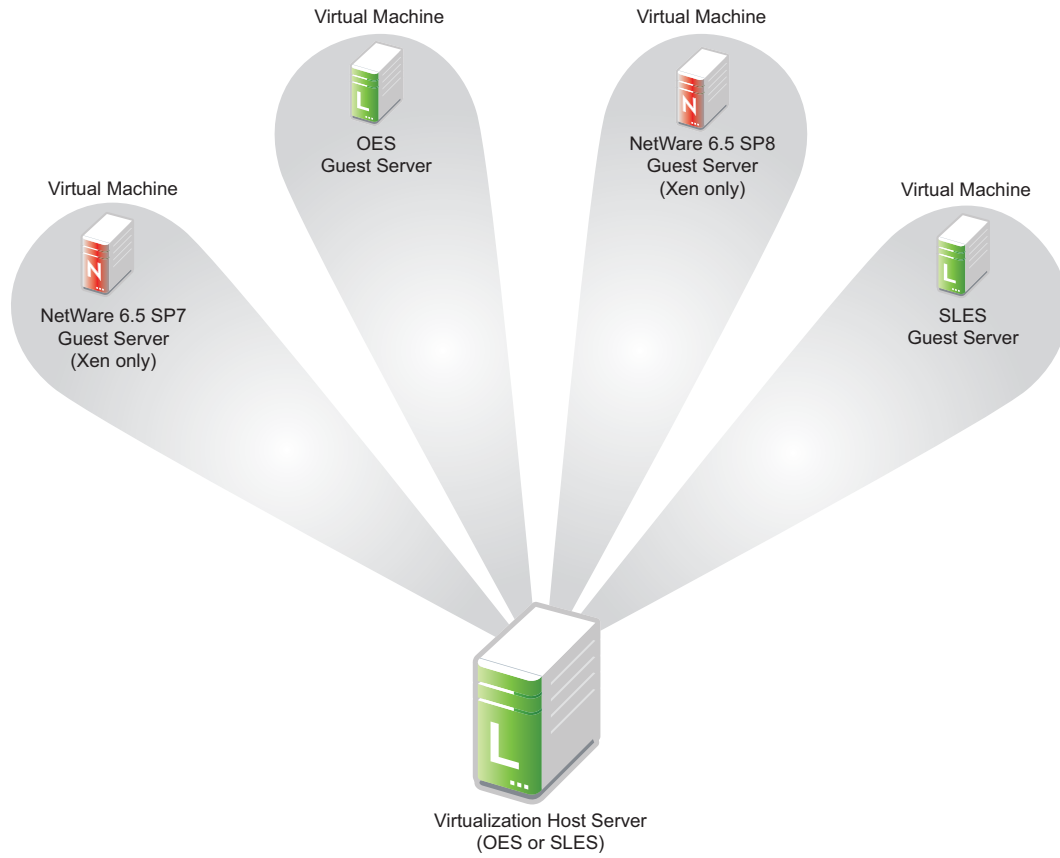
- ♦ [Section 9.1, “Graphical Overview of Virtualization in OES 2015 SP1,”](#) on page 83
- ♦ [Section 9.2, “Why Install OES Services on Your VM Host?,”](#) on page 84
- ♦ [Section 9.3, “Services Supported on VM Hosts and Guests,”](#) on page 85
- ♦ [Section 9.4, “Xen VMs Need Ext2 for the System /Boot Volume,”](#) on page 86

IMPORTANT: Support for Xen virtualization of NetWare 6.5 SP7 and later is an OES product feature and is available only to OES registered customers.

9.1 Graphical Overview of Virtualization in OES 2015 SP1

[Figure 9-1](#) illustrates how a single VM host server can support multiple VM guest servers that in turn provide OES services.

Figure 9-1 Virtualization in OES 2015 SP1



9.2 Why Install OES Services on Your VM Host?

Novell supports four OES services running on a Xen VM host server: Novell Linux User Management, Novell Storage Management Services, Novell Cluster Services, and iPrint.

Having these components installed on a Xen VM host server provides the following benefits:

- ♦ **Linux User Management (LUM):** Lets you SSH into the server for management purposes by using an eDirectory user account.

This functionality requires that you

- ♦ Enable SSH communications through any firewalls that are running on the server
- ♦ Configure LUM to allow SSH as a LUM-enabled service. For more information see [“Section 11.4.2, “Setting Up SSH Access for LUM-enabled eDirectory Users,” on page 94.”](#)
- ♦ **Storage Management Services (SMS):** Lets you back up VM host server file system data.
- ♦ **Novell Cluster Services (NCS):** Lets you cluster the VM host.
- ♦ **Micro Focus iPrint:** Lets you print from the host.

9.3 Services Supported on VM Hosts and Guests

As you plan your virtualization configurations, you will want to consider which services are supported where [Table 9-1](#) and which combinations of services are supported (see [Section 3.8.21](#), “[Unsupported Service Combinations](#),” on page 49).

Table 9-1 Services Supported on VM Hosts and Guests

OES 2015 SP1 Service	Linux VM Host	OES VM Guest	NetWare VM Guest
AFP (Novell AFP)		✓	✓
Backup/SMS	✓	✓	✓
CIFS (Novell CIFS)		✓	✓
Cluster Services	✓ (non-NSS and Xen templates only)	✓	✓
DHCP		✓	✓
DNS		✓	✓
Domain Services for Windows (DSfW)		✓	
eDirectory		✓	✓
FTP		✓	✓
Novell iFolder		✓ (3.9)	✓ (2.1x)
iManager		✓	✓
iPrint	✓	✓	✓
Linux User Management	✓	✓	
NCP Server/Dynamic Storage Technology		✓	
NetStorage		✓	✓
Novell Remote Manager (NRM)		✓	✓
Novell Storage Services (NSS)		✓	✓
Samba		✓	

IMPORTANT: Adding OES services to a Xen VM host requires that you boot the server with the regular kernel prior to adding the services. See the instructions in the Important note in [“Adding/Configuring OES Services on an Existing Server”](#) in the *OES 2015 SP1: Installation Guide*.

9.4 Xen VMs Need Ext2 for the System /Boot Volume

It is recommended that operating systems running in paravirtual mode set up their kernel on a separate partition that uses a non-journaling file system, such as ext2.

Before a paravirtualized operating system can boot, the management domain must construct a virtual machine and place the paravirtualized kernel in it. Then, the paravirtualized operating system boots. To retrieve the kernel during the bootstrapping process, the virtual machine's boot disk is mounted in read-only mode, the kernel is copied to the virtual machine's memory, and then the boot disk is unmounted.

When a virtual machine's operating system crashes, its disks are not shut down in an orderly manner. This should not pose a problem to a virtual machine running in full virtualization mode because the pending disk entries are checked and corrected the next time the operating system starts. If the disk is using a journaling file system, the journal is replayed to update and coordinate any pending disk entries.

This type of system crash poses a potential problem for paravirtualized operating systems. If a paravirtualized operating system using a journaled file system crashes, any pending disk entries cannot be updated and coordinated because the file system is initially mounted in read-only mode.

Therefore, it is recommended that you set virtual machine boot files, such as the kernel and ramdisk, on a separate partition that is formatted with a non-journaling file system, such as ext2.

10 Clustering and High Availability

Open Enterprise Server 2015 SP1 includes support for a two-node Novell Cluster Services cluster.

The full Novell Cluster Services product (available through a separate purchase) is a multinode clustering product that

- ♦ Can include up to 32 servers.
- ♦ Is supported for both NetWare and OES during the migration to OES.
For more information, see the [OES 2015 SP1: Novell Cluster Services NetWare to Linux Conversion Guide](#).
- ♦ Is eDirectory enabled for single-point ease of management.
- ♦ Supports failover, failback, and migration (load balancing) of individually managed cluster resources.
- ♦ Supports shared SCSI, iSCSI, and Fibre Channel storage area networks.

For more information, see the [OES 2015 SP1: Novell Cluster Services for Linux Administration Guide](#).

11 Managing OES 2015 SP1

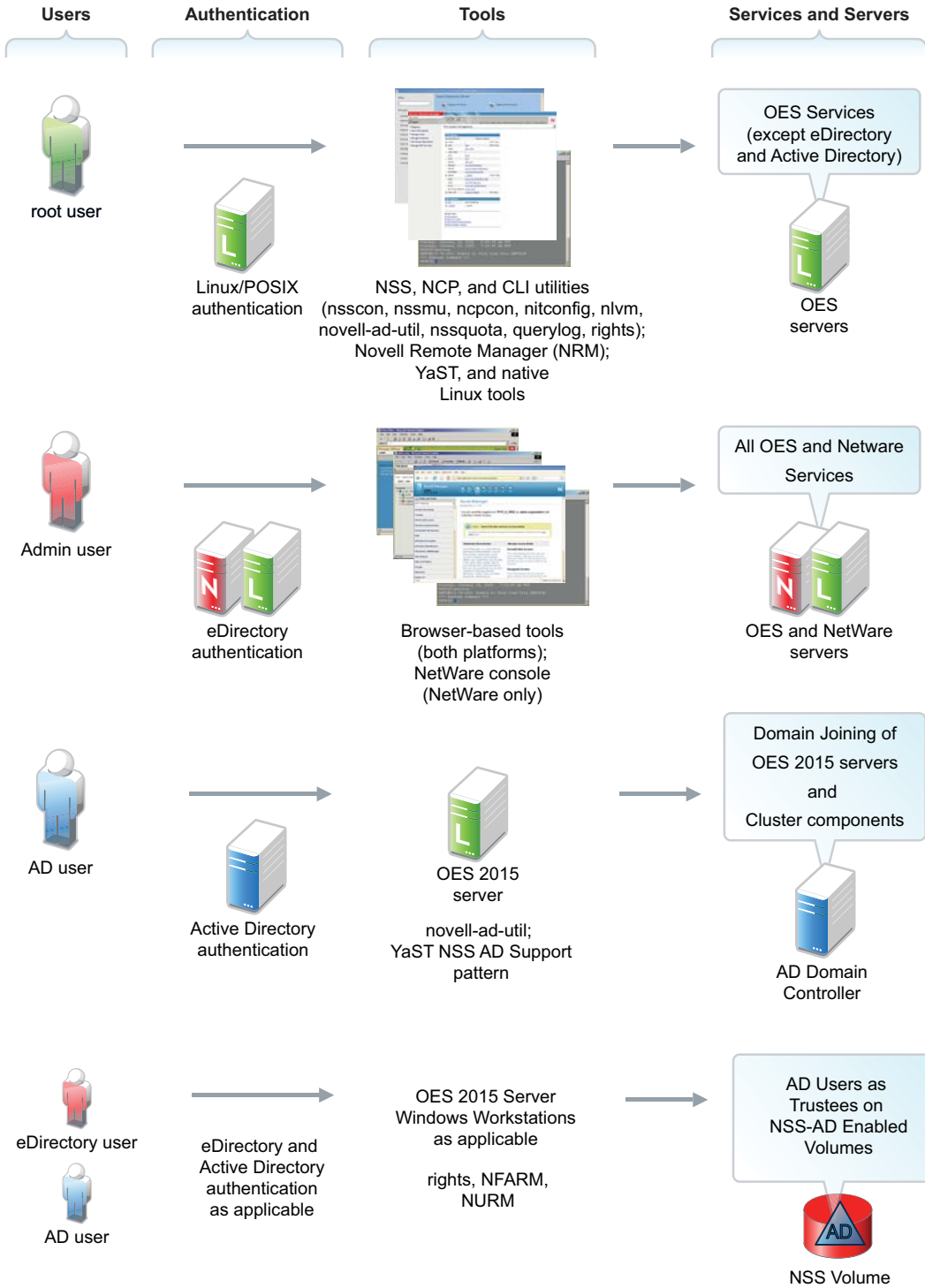
This section includes the following topics:

- ♦ [Section 11.1, “Overview of Management Interfaces and Services,”](#) on page 89
- ♦ [Section 11.2, “Using OES 2015 SP1 Welcome Pages,”](#) on page 91
- ♦ [Section 11.3, “iManager and Self-Signed Certificates,”](#) on page 92
- ♦ [Section 11.4, “SSH Services on OES 2015 SP1,”](#) on page 92

11.1 Overview of Management Interfaces and Services

As shown in [Figure 11-1](#), Open Enterprise Server provides a rich set of service-management and server-management tools, including browser-based and server-based interfaces that help you implement and maintain your network. Access to most of these management interfaces is controlled through eDirectory. However, a few interfaces, such as YaST on SUSE Linux Enterprise Server 11 servers, require local authentication.

Figure 11-1 Management Interfaces and Services



Note:
Use Active Directory supported tools to manage AD users, AD groups, and Windows computers

11.2 Using OES 2015 SP1 Welcome Pages

After you install an OES 2015 SP1 server, anyone with browser access to the server can access its Welcome Web site, which is a collection of dynamic Web pages that provides access to management tools and software.

This section explains OES Welcome Web Site features, and discusses:

- ♦ [Section 11.2.1, “The Welcome Site Requires JavaScript, Apache, and Tomcat,” on page 91](#)
- ♦ [Section 11.2.2, “Accessing the Welcome Web Site,” on page 91](#)
- ♦ [Section 11.2.3, “The Welcome Web Site Is Available to All Users,” on page 92](#)
- ♦ [Section 11.2.4, “Administrative Access from the Welcome Web Site,” on page 92](#)

11.2.1 The Welcome Site Requires JavaScript, Apache, and Tomcat

Browsers accessing the Welcome site must have JavaScript enabled to function correctly.

Additionally, it is possible to install OES 2015 SP1 without including the Apache Web Server or the Tomcat Servlet Container. For example, the Apache server and Tomcat container are included with many of the OES 2015 SP1 server patterns, but not all of them.

If you are unable to access the Welcome Web site, your server is probably missing one or both of these required components. To make the site available, you need to add the components to the OES 2015 SP1 server.

11.2.2 Accessing the Welcome Web Site

Anyone with browser access to an OES 2015 SP1 server can access the Welcome site by doing the following:

- 1 Open a [supported Web browser](#) that has a TCP connection to the network where the OES 2015 SP1 server is installed.
- 2 Enter the URL to the server, using HTTP.

For example:

```
http://server.example.com/welcome
```

or

```
http://192.168.1.206/welcome
```

IMPORTANT: By default, the Welcome site is accessible by entering only the DNS name or IP address without the path to /welcome as the URL. However, it displays only when there is no `index.html` file in `/srv/www/htdocs`. For example, installing the Web and LAMP Server pattern installs a page that says “It Works!” and the Welcome site is not displayed.

If the Welcome page disappears, include /welcome in the access URL.

For additional information, see [“Verifying That the Installation Was Successful”](#) in the *OES 2015 SP1: Installation Guide*.

11.2.3 The Welcome Web Site Is Available to All Users

Although the Welcome Web site is designed primarily for administrators, it can also be accessed and used by end users. Keep in mind, however, that the software in the [Client Software](#) link is static. For the latest client software, such as the iPrint client and Novell Client, refer users to the [Novell download site](#).

11.2.4 Administrative Access from the Welcome Web Site

Administrators can access any of the administrative tools installed on the server by clicking the Management Services link, selecting the tool they want to use, and entering the required authentication information.

If a tool doesn't appear, that means that it or the service that it manages is not installed on the server.

11.3 iManager and Self-Signed Certificates

As explained in the [NetIQ iManager Installation Guide](#), the iManager instructions for dealing with self-signed certificates don't apply to OES Linux.

OES installs Tomcat and Apache versions that are specific to OES (see [Section 6.15, "Novell-tomcat Is for OES Use Only," on page 75](#)). For instructions on replacing the self-signed Apache/Tomcat certificate on OES, see [Section 22.2, "Setting Up Certificate Management," on page 235](#).

11.4 SSH Services on OES 2015 SP1

This section documents the following topics:

- [Section 11.4.1, "Overview," on page 92](#)
- [Section 11.4.2, "Setting Up SSH Access for LUM-enabled eDirectory Users," on page 94](#)

11.4.1 Overview

SSH services on SLES 11 are provided by [OpenSSH \(http://www.openssh.org\)](http://www.openssh.org), a free version of SSH connectivity tools developed by the [OpenBSD Project \(http://www.openbsd.org\)](http://www.openbsd.org).

Linux administrators often use SSH to remotely access a server for management purposes, such as executing shell commands, transferring files, etc. Because many OES 2015 SP1 services can be managed at a command prompt via an SSH session, it is important to understand how SSH access is controlled in OES 2015 SP1.

This section discusses the following topics:

- ["When Is SSH Access Required?" on page 93](#)
- ["How SSH Access for eDirectory Users Works" on page 93](#)
- ["SSH Security Considerations" on page 94](#)

When Is SSH Access Required?

SSH access is required for the following:

- ♦ **SSH administration access for eDirectory users:** For eDirectory users to manage the server through an SSH connection, they must have SSH access as **LUM-enabled users** (eDirectory users configured for access to Linux services).

NOTE: The standard Linux `root` user is a local user, not an eDirectory user. The `root` user always has SSH access as long as the firewall allows it.

- ♦ **Access to NSS Volume Management in NetStorage:** When an OES 2015 SP1 server has NSS volumes, eDirectory contains an object named **nssvolumes** that provides management access to the volumes through the File Access (NetStorage) iManager plug-in. Using the plug-in to manage NSS volumes, assign trustee rights, salvage and purge files, etc. requires SSH access to the server.

Although eDirectory administrators can create Storage Location Objects to the NSS volumes without SSH access if they know the path to the volume on the POSIX file system and other volume information, having SSH access makes administering NSS volumes in NetStorage much easier.

- ♦ **Access to any NetStorage Storage Location Objects based on SSH:** The NetStorage server provides Web access to directories and files on other servers (or on itself).

Typically, either an NCP or a CIFS connection is used for connecting the NetStorage server with storage targets. However, an SSH connection can also be used, and if it is, the users accessing data through the connection must have SSH access to the data on the target servers.

How SSH Access for eDirectory Users Works

For eDirectory users, the following work together to control SSH access:

- ♦ **Firewall:** As mentioned, the default firewall configuration on an OES 2015 SP1 server doesn't allow SSH connections with the server. This restricts the `root` user as well. Therefore, the first requirement for SSH access is configuring the firewall to allow SSH services.
- ♦ **Linux User Management (LUM) must allow SSH as a PAM-enabled service:** In OES 2015 SP1, access to SSH and other Linux services is controlled through Linux User Management (LUM), and each service must be explicitly included in the LUM configuration as a PAM-enabled service on each server.
- ♦ **PAM-enabling:** After SSH is included as a PAM-enabled service on a server, at least one group and its users must be enabled for LUM. Only LUM-enabled eDirectory users can have SSH access.
- ♦ **All eDirectory Groups must allow access:** SSH access is inherited from the LUM-enabled groups that a user belongs to, and access is only granted when all of the groups to which a user belongs allow it.
- ♦ **The Samba connection:** Users who are enabled for Samba (CIFS) file services are added by default to an OES-created Samba group that:
 - ♦ Is LUM-enabled.
 - ♦ Doesn't specify SSH as an allowed service.

Therefore, because SSH access requires that all of a user's groups must all allow access, Samba users are denied SSH access unless

- ♦ The user is removed from the Samba group.

or

- ♦ The Samba group is modified to allow SSH access for all Samba users.

SSH Security Considerations

Remember that SSH access lets users browse and view most directories and files on a Linux server. Even though users might be prevented from modifying settings or effecting other changes, there are serious security and confidentiality issues to consider before granting SSH access to a group of users.

11.4.2 Setting Up SSH Access for LUM-enabled eDirectory Users

If you need to grant SSH access to an eDirectory user, complete the instructions in the following sections in order, as they apply to your situation.

- ♦ [“Allowing SSH Access Through the Firewall” on page 94](#)
- ♦ [“Adding SSH as an Allowed Service in LUM” on page 94](#)
- ♦ [“Enabling Users for LUM” on page 95](#)
- ♦ [“Restricting SSH Access to Only Certain LUM-Enabled Users” on page 95](#)
- ♦ [“Providing SSH Access for Samba Users” on page 96](#)

Allowing SSH Access Through the Firewall

NOTE: This section assumes you are allowing SSH access on an installed server.

SSH can also be enabled during an OES installation by clicking the **SSH Port Is Blocked** button on the Firewall screen.

- 1 On the OES 2015 SP1 server you are granting access to, open the YaST Control Center and click **Security and Users > Firewall**.
- 2 In the left navigation frame, click **Allowed Services**.
- 3 In the **Allowed Services** drop-down list, select **SSH**.
- 4 Click **Add > Next > Accept**.

The firewall is now configured to allow SSH connections with the server.

Adding SSH as an Allowed Service in LUM

- 1 If SSH is already an allowed (PAM-enabled) service for Linux User Management on the server, skip to [“Enabling Users for LUM” on page 95](#).

or

If SSH is not an allowed (PAM-enabled) service for Linux User Management on the server, continue with [Step 2](#).

- 2 On the OES 2015 SP1 server, open the YaST Control Center; then, in the **Open Enterprise Server** group, click **OES Install and Configuration**.
- 3 Click **Accept**.
- 4 When the Novell Open Enterprise Server Configuration screen has finished loading, click the **Disabled** link under **Linux User Management**.

The option changes to **Enabled** and the configuration settings appear.

- 5 Click **Linux User Management**.
- 6 Type the eDirectory Admin password in the appropriate field, then click **OK > Next**.
- 7 In the list of allowed services, click **sshd**.
- 8 Click **Next > Next > Finish**.

Each LUM-enabled group in eDirectory, except the system-created Samba group, now shows SSH as an allowed service. The Samba group shows the service as not allowed (or literally speaking, **sshd** is not checked).

Enabling Users for LUM

There are numerous ways to enable users for LUM.

For example, in iManager > **Linux User Management** there are options for enabling users (and choosing a Group in the process) or enabling groups (and enabling users in the process). Linux enabling is part of the process required for Samba access. And finally, there are also command line options.

For specific instructions, refer to “[Managing User and Group Objects in eDirectory](#)” in the *OES 2015 SP1: Linux User Management Administration Guide*.

After you configure the server’s firewall to allow SSH, add SSH as an allowed service, and LUM-enable the eDirectory users you want to have SSH access, if those same users are not also enabled for Samba on the server, they now have SSH access to the server.

On the other hand, if you have installed Samba on the server, or if you install Samba in the future, the users who are configured for Samba access will have SSH access disabled.

To restore access for users impacted by Samba, see “[Providing SSH Access for Samba Users](#)” on [page 96](#).

Of course, many network administrators limit SSH access to only those who have administrative responsibilities. They don’t want every LUM-enabled user to have SSH access to the server.

If you need to limit SSH access to only certain LUM-enabled users, continue with “[Restricting SSH Access to Only Certain LUM-Enabled Users](#)” on [page 95](#).

Restricting SSH Access to Only Certain LUM-Enabled Users

SSH Access is easily restricted for one or more users by making them members of a LUM-enabled group and then disabling SSH access for that group. All other groups assignments that enable SSH access are then overridden.

- 1 Open iManager in a browser using its access URL:
`http://IP_Address/iManager.html`
where *IP_Address* is the IP address of an OES 2015 SP1 server with iManager 2.7 installed.
- 2 In the **Roles and Tasks** list, click **Groups > Create Group**.
- 3 Type a group name, for example NoSSHGroup, and select a context, such as the container where your other Group and User objects are located. Then click **OK**.
- 4 In the **Roles and Tasks** list, click **Directory Administration > Modify Object**.
- 5 Browse to the group you just created and click **OK**.
- 6 Click the **Linux Profile** tab.

- 7 Select the **Enable Linux Profile** option.
- 8 In the Add UNIX Workstation dialog box, browse to and select the UNIX Workstation objects for the servers you are restricting SSH access to, then click **OK > OK**.
- 9 Click **Apply > OK**.
- 10 In the Roles and Tasks list, click **Modify Object**, browse to the group again, then click **OK**.
- 11 Click the **Other** sub-tab.
- 12 In the **Unvalued Attributes** list, select **uamPosixPAMServiceExcludeList**, then click the left-arrow to move the attribute to the **Valued Attributes** list.
- 13 In the Add Attribute dialog box, click the plus sign (+) next to the empty drop-down list.
- 14 In the **Add item** field, type `sshd`, then click **OK > OK**.
- 15 Click the **Members** tab.
- 16 Browse to and select the User objects that shouldn't have SSH access, then click **OK**.
- 17 Click **Apply > OK**.

Providing SSH Access for Samba Users

There are two options for providing SSH access to users who have been enabled for Samba access:

- ♦ You can remove the user from the `server_name-W-SambaUserGroup`.

IMPORTANT: This presupposes that the user is a member of a different LUM-enabled group that also provides access to the server. If the user was enabled for LUM only as part of a Samba configuration, then removing the user from the Samba group breaks access to Samba and the user does not have SSH access.

- ♦ You can change access for the entire Samba group by moving the `uamPosicPAMServiceExcludeList` attribute from the **Valued Attributes** list to the **Unvalued Attributes** list, using the instructions in [“Restricting SSH Access to Only Certain LUM-Enabled Users” on page 95](#) as a general guide.

12 Network Services

The term “network services” as used in this section, refers to the protocols that provide the following:

- ♦ Data packet transport on the network.
- ♦ Management of IP addresses and DNS names.
- ♦ Time synchronization to make sure that all network devices and eDirectory replicas and partitions have the same time.
- ♦ Discovery of network devices and services, such as eDirectory, printers, and so on as required by certain applications, clients, and other services.

This section discusses the following:

- ♦ [Section 12.1, “TCP/IP,” on page 97](#)
- ♦ [Section 12.2, “DNS and DHCP,” on page 98](#)
- ♦ [Section 12.3, “Time Services,” on page 100](#)
- ♦ [Section 12.4, “Discovery Services,” on page 111](#)
- ♦ [Section 12.5, “SLP,” on page 112](#)

For links to more information and tasks, see the “[network protocols \(http://www.novell.com/documentation/oes11/index.html#cat_network-protocols-services\)](http://www.novell.com/documentation/oes11/index.html#cat_network-protocols-services)” links in the OES 2015 SP1 online documentation.

12.1 TCP/IP

Network nodes must support a common protocol in order to exchange packets. Transport protocols establish point-to-point connections so that nodes can send messages to each other and have the packets arrive intact and in the correct order. The transport protocol also specifies how nodes are identified with unique network addresses and how packets are routed to the intended receiver.

Open Enterprise Server 2015 or later includes the standard Linux TCP/IP support on SUSE Linux Enterprise Server 11 SP4.

12.1.1 Coexistence and Migration Issues

Internetwork Packet Exchange (IPX) was the foundational protocol for NetWare from the 1980s until the release of NetWare 5.0, when support for pure TCP/IP became standard.

To aid with migrations from NetWare to OES, coexistence between IPX and TCP/IP networks is still supported on NetWare, but IPX is not supported on Linux.

12.2 DNS and DHCP

Domain Name Service (DNS) is the standard naming service in TCP/IP-based networks. It converts IP addresses, such as 192.168.1.1, to human-readable domain names, such as myserver.example.com, and it reverses the conversion process as required.

The Dynamic Host Configuration Protocol (DHCP) assigns IP addresses and configuration parameters to hosts and network devices.

OES 2015 SP1 includes a ported version of the NetWare DNS service, and an eDirectory integration with ISC DHCP as explained in the sections that follow.

- ◆ [Section 12.2.1, “DNS Differences Between NetWare and OES 2015 SP1,” on page 98](#)
- ◆ [Section 12.2.2, “DHCP Differences Between NetWare and OES 2015 SP1,” on page 99](#)

12.2.1 DNS Differences Between NetWare and OES 2015 SP1

As you plan to upgrade from NetWare to OES 2015 SP1, consider the following differences between DNS on NetWare and OES 2015 SP1:

Table 12-1 DNS: NetWare 6.5 SP8 vs. OES 2015 SP1

Feature or Command	NetWare 6.5 SP8	OES 2015 SP1
Auditing	Yes	No
Console commands:		
◆ Check Status	◆ <code>named status</code>	◆ <code>rcnovell-named status</code>
◆ Force Zone-in	◆ <code>-zi zone_name</code>	N/A
◆ Purge All Cache	◆ <code>-pa</code>	N/A
◆ Screen Logging	◆ <code>-s</code>	N/A
◆ Start the server	◆ <code>named</code>	◆ <code>rcnovell-named start</code> or ◆ <code>/etc/init.d/novell-named start</code>
◆ Stop the server	◆ <code>named stop</code>	◆ <code>rcnovell-named stop</code>
◆ Unsupported <code>named</code> command parameters	◆ N/A	◆ <code>[-dc categories]</code> ◆ <code>[-mstats]</code> ◆ <code>[-nno_of_cpus]</code> ◆ <code>[-qstats]</code>
◆ Zone Information	◆ <code>-info file_name</code>	N/A
DNSMaint	Yes	Yes - <code>dns-maint</code>
Fault Tolerance	Yes	Yes
Filenames and paths:		

Feature or Command	NetWare 6.5 SP8	OES 2015 SP1
♦ Server binary	♦ <code>sys:/system/named.nlm</code>	♦ <code>/opt/novell/named/bin/novell-named</code>
♦ .db, .jnl file	♦ <code>sys:/etc/dns</code>	♦ <code>/etc/opt/novell/named/named.conf</code>
♦ Stat file, info file		♦ <code>/var/opt/novell/log/named/named.run</code>
Journal log size	Specify at the command prompt by using the <code>jsize</code> argument.	Specify using Java Console, DNS Server Object>Advanced tab > max-journal-size field.
Management	iManager Command Line Interface	Java Console Command Line Interface Unlike the Netware implementation, command line parameters cannot be passed when loading and unloading.
SNMP Support	Yes	No

12.2.2 DHCP Differences Between NetWare and OES 2015 SP1

As you plan to upgrade from NetWare to OES 2015 SP1, consider the following differences between DHCP on NetWare and OES 2015 SP1:

Table 12-2 DHCP: NetWare 6.5 SP8 vs. OES 2015 SP1

Feature or Command	NetWare 6.5 SP8	OES 2015 SP1
Auditing	Yes	No
Filenames and paths:		
♦ Conf file	♦ N/A	♦ <code>/etc/dhcpd.conf</code>
♦ Leases	♦ Stored in eDirectory	♦ <code>/var/lib/dhcp/db/dhcpd.leases</code>
♦ Log file	♦ <code>sys:/etc/dhcp/dhcpd.log</code>	♦ <code>/var/log/dhcpd.log</code>
♦ Startup log	♦ N/A	♦ <code>/var/log/dhcp-ldap-startup.log</code> This is a dump of DHCP configurations read from eDirectory when the DHCP server starts.
Management	iManager 2.7 (Wizard-based)	Java Console Unlike the NetWare implementation, command line parameters cannot be passed when loading and unloading.
Migration	N/A	There is seamless migration support from NetWare.

Feature or Command	NetWare 6.5 SP8	OES 2015 SP1
Schema changes	N/A	There are separate locator and group objects for centralized management and easy rights management.
SNMP Support	Yes	No
Subnet naming	Yes	No

12.3 Time Services

The information in this section can help you understand your time services options as you move from NetWare to OES:

- ◆ [Section 12.3.1, “Overview of Time Synchronization,” on page 100](#)
- ◆ [Section 12.3.2, “Planning for Time Synchronization,” on page 104](#)
- ◆ [Section 12.3.3, “Coexistence and Migration of Time Synchronization Services,” on page 107](#)
- ◆ [Section 12.3.4, “Implementing Time Synchronization,” on page 108](#)
- ◆ [Section 12.3.5, “Configuring and Administering Time Synchronization,” on page 110](#)
- ◆ [Section 12.3.6, “Daylight Saving Time,” on page 111](#)

12.3.1 Overview of Time Synchronization

All servers in an eDirectory tree must have their times synchronized to ensure that updates and changes to eDirectory objects occur in the proper order.

eDirectory gets its time from the server operating system of the OES server where it is installed. It is, therefore, critical that every server in the tree has the same time.

- ◆ [“Understanding Time Synchronization Modules” on page 100](#)
- ◆ [“OES Servers as Time Providers” on page 102](#)
- ◆ [“OES Servers as Time Consumers” on page 103](#)

Understanding Time Synchronization Modules

During the upgrade to OES 2015 SP1, your eDirectory tree might contain servers running different versions of OES, NetWare 6.5 SP8, and/or previous versions of NetWare. Therefore, you must understand the differences in the time synchronization modules that each operating system uses and how these modules can interact with each other.

- ◆ [“OES vs. NetWare 6.5” on page 101](#)
- ◆ [“OES Servers Use the Network Time Protocol \(NTP\) to Communicate” on page 101](#)
- ◆ [“Compatibility with Earlier Versions of NetWare” on page 101](#)

OES vs. NetWare 6.5

As illustrated in [Figure 12-1](#), NetWare 6.5 can use either the Network Time Protocol (NTP) or Timesync modules for time synchronization. Both modules can communicate with OES by using NTP on port 123. However, when installing virtualized NetWare, Timesync should always be used (see [Section 6.22.2, “Always Use Timesync Rather Than NTP,” on page 78](#)).

OES must use the NTP daemon (xntpd).

Figure 12-1 Time Synchronization for Linux and NetWare



OES Servers Use the Network Time Protocol (NTP) to Communicate

Because OES and NetWare servers must communicate with each other for time synchronization, and because OES uses only NTP for time synchronization, it follows that both OES and NetWare must communicate time synchronization information by using NTP time packets.

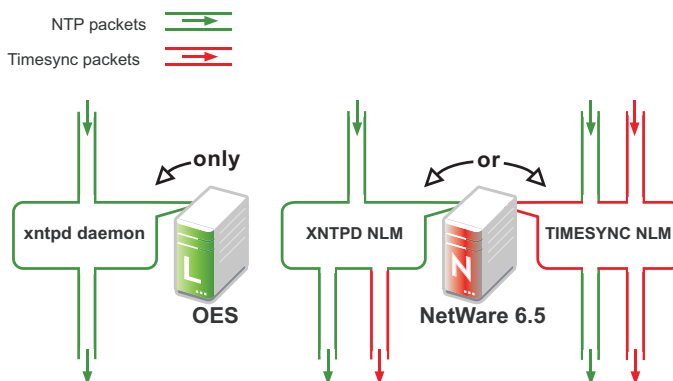
However, this doesn't limit your options on NetWare.

[Figure 12-2](#) illustrates that OES and NetWare 6.5 servers can freely interchange time synchronization information because NetWare 6.5 includes the following:

- A TIMESYNC NLM that both consumes and provides NTP time packets in addition to Timesync packets.
- An XNTPD NLM that can provide Timesync packets in addition to offering standard NTP functionality.

NOTE: Although NetWare includes two time synchronization modules, only one can be loaded at a time.

Figure 12-2 NTP Packet Compatibilities with All OES Time Synchronization Modules



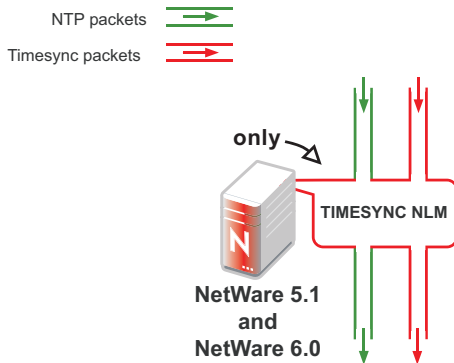
Compatibility with Earlier Versions of NetWare

Earlier versions of NetWare (version 4.2 through version 6.0) do not include an NTP time module. Their time synchronization options are, therefore, more limited.

NetWare 5.1 and 6.0 Servers

Figure 12-3 illustrates that although NetWare 5.1 and 6.0 do not include an NTP time module, they can consume and deliver NTP time packets.

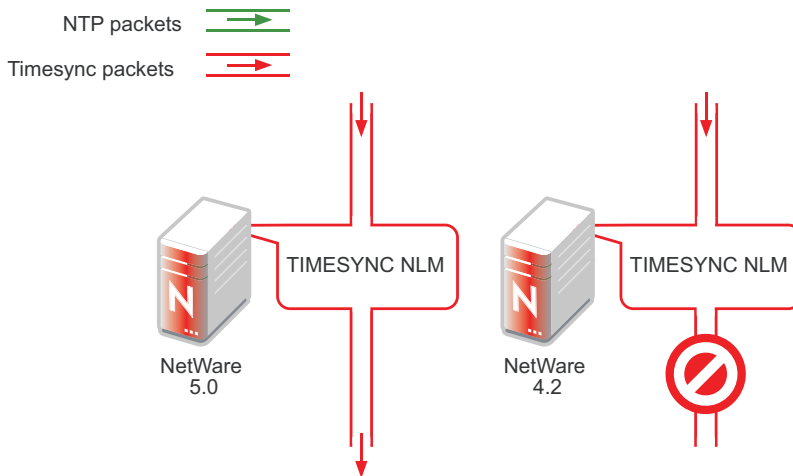
Figure 12-3 NTP Compatibility of NetWare 5.1 and 6.0



NetWare 5.0 and 4.2 Servers

Figure 12-4 illustrates that NetWare 4.2 and 5.0 servers can only consume and provide Timesync packets.

Figure 12-4 Synchronizing Time on NetWare 5.0 and 4.2 Servers



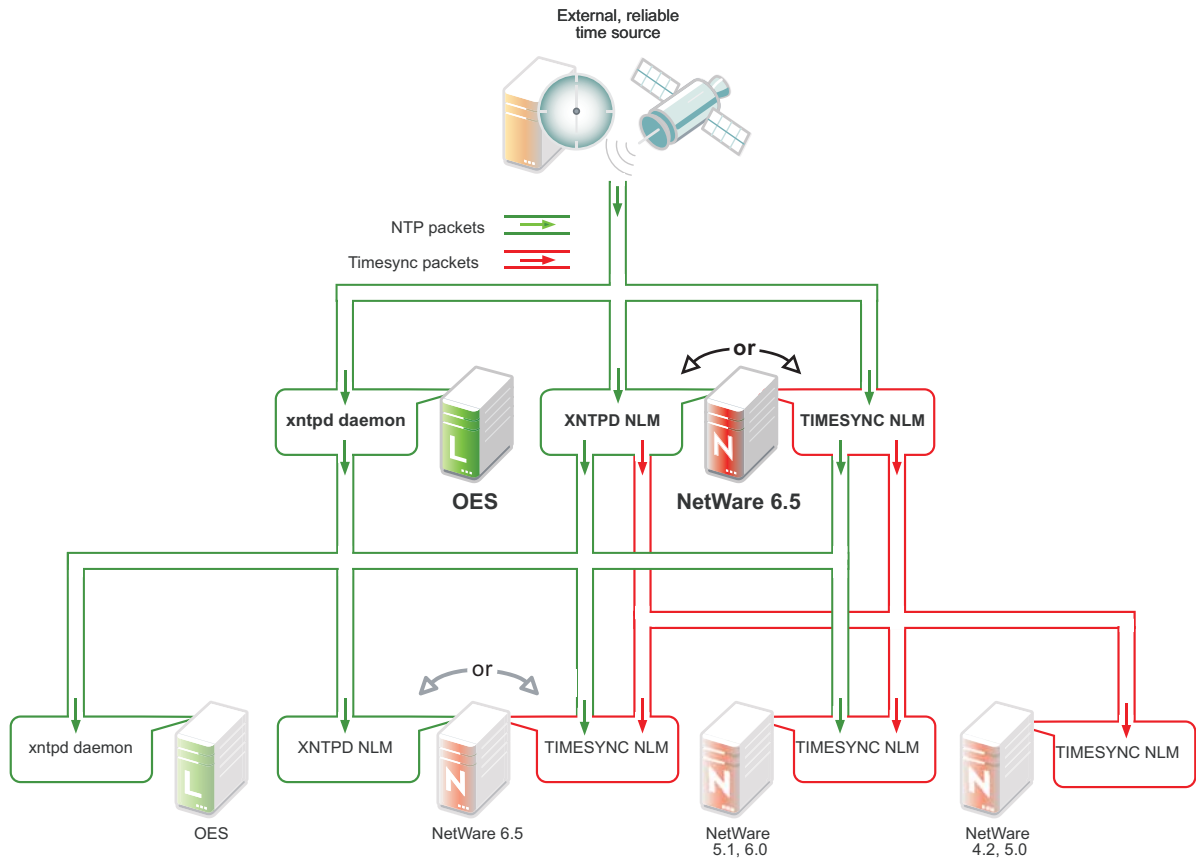
Therefore, if you have NetWare 4.2 or 5.0 servers in your eDirectory tree, and you want to install an OES server, you must have at least one NetWare 5.1 or later server to provide a “bridge” between NTP and Timesync time packets. Figure 12-5 on page 103 illustrates that these earlier server versions can synchronize through a NetWare 6.5 server.

IMPORTANT: As shown in Figure 12-4, we recommend that NetWare 4.2 servers not be used as a time source.

OES Servers as Time Providers

Figure 12-5 shows how OES servers can function as time providers to other OES servers and to NetWare servers, including NetWare 4.2 and later.

Figure 12-5 OES Servers as Time Providers

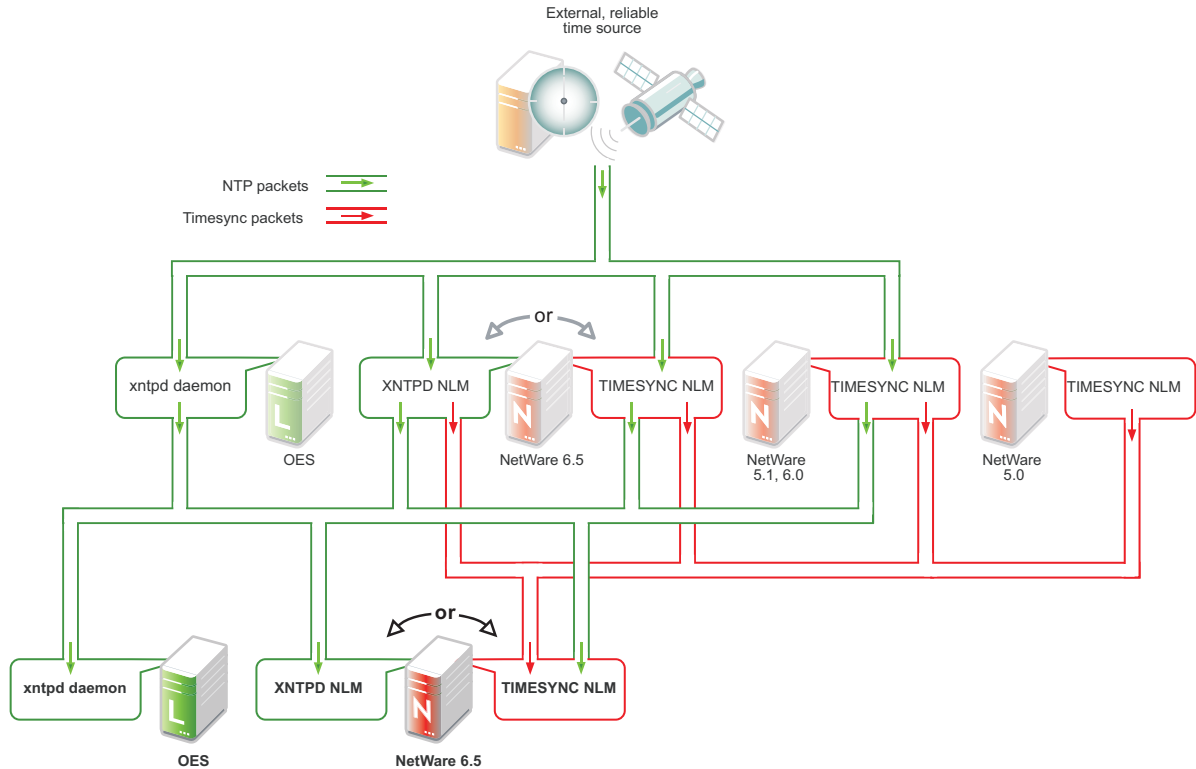


OES Servers as Time Consumers

Figure 12-6 shows the time sources that OES servers can use for synchronizing server time.

IMPORTANT: Notice that NetWare 4.2 is not shown as a valid time source.

Figure 12-6 OES servers as Time Consumers



12.3.2 Planning for Time Synchronization

Use the information in this section to understand the basics of time synchronization planning.

- ♦ “NetWork Size Determines the Level of Planning Required” on page 104
- ♦ “Choose Timesync for Virtualized NetWare Only” on page 105
- ♦ “Planning a Time Synchronization Hierarchy before Installing OES” on page 105

For more detailed planning information, refer to the following resources:

- ♦ “How Timesync Works” in the *NW 6.5 SP8: Network Time Synchronization Administration Guide*
- ♦ “Network Time Protocol” in the *NW 6.5 SP8: NTP Administration Guide*
- ♦ NTP information on the Web (<http://www.cis.udel.edu/~mills/ntp.html>)

NetWork Size Determines the Level of Planning Required

The level of time synchronization planning required for your network is largely dictated by how many servers you have and where they are located, as explained in the following sections.

- ♦ “Time Synchronization for Trees with Fewer Than Thirty Servers” on page 105
- ♦ “Time Synchronization for Trees with More Than Thirty Servers” on page 105
- ♦ “Time Synchronization across Geographical Boundaries” on page 105

Time Synchronization for Trees with Fewer Than Thirty Servers

If your tree will have fewer than thirty servers, the default installation settings for time synchronization should be sufficient for all of the servers except the first server installed in the tree.

You should configure the first server in the tree to obtain time from one or more time sources that are external to the tree. (See [Step 1](#) in “[Planning a Time Synchronization Hierarchy before Installing OES](#)” on page 105.)

All other servers should point to the first server in the tree for their time synchronization needs.

Time Synchronization for Trees with More Than Thirty Servers

If your tree will have more than thirty servers, you need to plan and configure your servers with time synchronization roles that match your network architecture and time synchronization strategy.

Example roles might include the following:

- ◆ Servers that receive time from external time sources and send packets to other servers further down in the hierarchy
- ◆ Servers that communicate with other servers in peer-to-peer relationships to ensure that they are synchronized

Basic planning steps are summarized in “[Planning a Time Synchronization Hierarchy before Installing OES](#)” on page 105.

Refer to the following sources for additional help in planning time server roles:

- ◆ “[Configuring Timesync on Servers](#)” in the *NW 6.5 SP8: Network Time Synchronization Administration Guide*
- ◆ “[Modes of Time Synchronization](#)” in the *NW 6.5 SP8: NTP Administration Guide*
- ◆ NTP information on the [Web](http://www.cis.udel.edu/~mills/ntp.html) (<http://www.cis.udel.edu/~mills/ntp.html>)

Time Synchronization across Geographical Boundaries

If the servers in the tree will reside at multiple geographic sites, you need to plan how to synchronize time for the entire network while minimizing network traffic. For more information, see “[Wide Area Configuration](#)” in the *NW 6.5 SP8: NTP Administration Guide*.

Choose Timesync for Virtualized NetWare Only

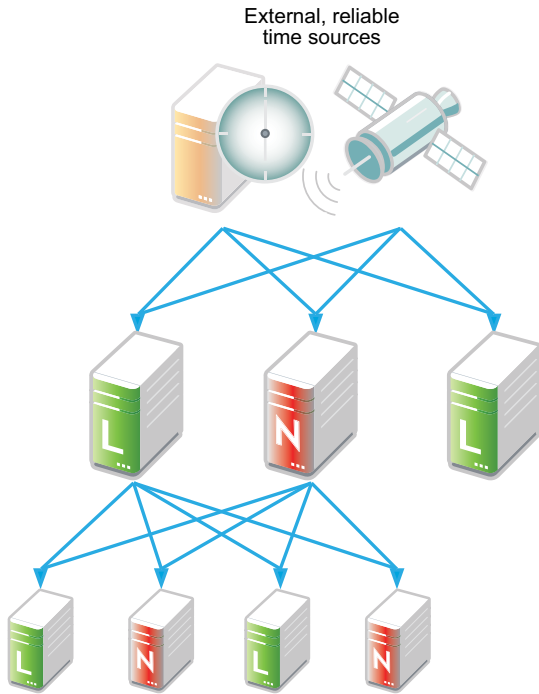
When you install a virtualized NetWare 6.5 server, you should always use Timesync and configure it to communicate using NTP. For more information, see “[You Must Use Timesync for Time Synchronization](#)” in the *OES 2015 SP1: Installation Guide*.

The dialog box that lets you choose between Timesync and NTP is available as an advanced option in the Time Zone panel during the NetWare installation. Choosing between Timesync and NTP is documented in “[Setting the Server Time Zone and Time Synchronization Method](#)” in the *NW65 SP8: Installation Guide*.

Planning a Time Synchronization Hierarchy before Installing OES

The obvious goal for time synchronization is that all the network servers (and workstations, if desired) have the same time. This is best accomplished by planning a time synchronization hierarchy before installing the first OES server, then configuring each server at install time so that you form a hierarchy similar to the one outlined in [Figure 12-7](#).

Figure 12-7 A Basic Time Synchronization Hierarchy



As you plan your hierarchy, do the following:

- 1 Identify at least two authoritative external NTP time sources for the top positions in your hierarchy.
 - ♦ If your network already has an NTP server hierarchy in place, identify the IP address of an appropriate time server. This might be internal to your network, but it should be external to the eDirectory tree and it should ultimately obtain time from a public NTP server.
 - ♦ If your network doesn't currently employ time synchronization, refer to the list of public NTP servers published on the [ntp.org Web site \(http://support.ntp.org/bin/view/Servers/WebHome\)](http://support.ntp.org/bin/view/Servers/WebHome) and identify a time server you can use.
- 2 Plan which servers will receive time from the external sources and plan to install these servers first.
- 3 Map the position for each Linux server in your tree, including its time sources and the servers it will provide time for.
- 4 Map the position for each NetWare server in your tree:
 - 4a Include the server's time sources and the servers it will provide time for.
 - 4b If your network currently has only NetWare 4.2 or 5.0 servers, be sure to plan for their time synchronization needs by including at least one newer NetWare server in the tree and configuring the older servers to use the newer server as their time source. (See "NetWare 5.0 and 4.2 Servers" on page 102.)
- 5 Be sure that each server in the hierarchy is configured to receive time from at least two sources.
- 6 (Conditional) If your network spans geographic locations, plan the connections for time-related traffic on the network and especially across WANs.

For more information, see "Wide Area Configuration" in the *NW 6.5 SP8: NTP Administration Guide*.

For more planning information, see the following documentation:

- ♦ [NW 6.5 SP8: Network Time Synchronization Administration Guide](#)
- ♦ [NW 6.5 SP8: NTP Administration Guide](#)
- ♦ NTP information found on the OES 2015 SP1 server in /usr/share/doc/packages/xntp and on the Web (<http://www.cis.udel.edu/~mills/ntp.html>)

12.3.3 Coexistence and Migration of Time Synchronization Services

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

This section discusses the issues involved in the coexistence and migration of time synchronization in OES in the following sections:

- ♦ [“Coexistence” on page 107](#)
- ♦ [“Upgrading from NetWare to OES 2015 SP1” on page 108](#)

Coexistence

This section provides information regarding the coexistence of the OES time synchronization modules with existing NetWare or Linux networks, and with previous versions of the TIMESYNC NLM. This information can help you confidently install new OES servers into your current network.

- ♦ [“Compatibility” on page 107](#)
- ♦ [“Coexistence Issues” on page 108](#)

Compatibility

The following table summarizes the compatibility of OES time synchronization modules with other time synchronization modules and eDirectory. These compatibilities are illustrated in [Figure 12-5 on page 103](#) and [Figure 12-6 on page 104](#).

Table 12-3 Time Synchronization Compatibility

Module	Compatibility
TIMESYNC NLM (NetWare)	<p>Can consume time from</p> <ul style="list-style-type: none">♦ All previous versions of Timesync. However, the NetWare 4.2 TIMESYNC NLM should not be used as a time source.♦ Any TIMESYNC or NTP daemon. <p>Can provide time to</p> <ul style="list-style-type: none">♦ All previous versions of Timesync.♦ Any TIMESYNC or NTP daemon.

Module	Compatibility
XNTPD NLM (NetWare)	<p>Can consume time from</p> <ul style="list-style-type: none"> ◆ Any NTP daemon. <p>Can provide time to</p> <ul style="list-style-type: none"> ◆ All previous versions of Timesync. ◆ Any NTP daemon.
xntpd daemon (SLES 11)	<p>Can consume time from</p> <ul style="list-style-type: none"> ◆ Any NTP daemon. <p>Can provide time to</p> <ul style="list-style-type: none"> ◆ Any NTP daemon.
eDirectory	eDirectory gets its time synchronization information from the host OS (Linux or NetWare), not from the time synchronization modules.

Coexistence Issues

If you have NetWare servers earlier than version 5.1, you need to install at least one later version NetWare server to bridge between the TIMESYNC NLM on the earlier server and the OES servers you have on your network. This is because the earlier versions of Timesync can't consume or provide NTP time packets and the xntpd daemon on Linux can't provide or consume Timesync packets.

Fortunately, the TIMESYNC NLM in NetWare 5.1 and later can both consume and provide Timesync packets. And the XNTPD NLM can provide Timesync packets when required.

This is explained in [“Compatibility with Earlier Versions of NetWare” on page 101](#).

Upgrading from NetWare to OES 2015 SP1

The OES 2015 SP1 Migration Tool can migrate time synchronization services from NetWare to Linux. For more information, see [“Migrating NTP to OES 2015 SP1”](#) in the *OES 2015 SP1: Migration Tool Administration Guide*.

12.3.4 Implementing Time Synchronization

As you plan to implement your time synchronization hierarchy, you should know how the NetWare and OES 2015 SP1 product installations configure time synchronization on the network. Both installs look at whether you are creating a new tree or installing into an existing tree.

- ◆ [“New Tree” on page 109](#)
- ◆ [“Existing Tree” on page 109](#)

New Tree

By default, both the OES 2015 SP1 and the NetWare 6.5 SP8 installs configure the first server in the tree to use its internal (BIOS) clock as the authoritative time source for the tree.

Because BIOS clocks can fail over time, you should always specify an external, reliable NTP time source for the first server in a tree. For help finding a reliable NTP time source, see the [NTP Server Lists \(http://support.ntp.org/bin/view/Servers/WebHome\)](http://support.ntp.org/bin/view/Servers/WebHome) on the Web.

- ♦ “OES 2015 SP1” on page 109
- ♦ “NetWare 6.5 SP8” on page 109

OES 2015 SP1

When you configure your eDirectory installation, the OES 2015 SP1 install prompts you for the IP address or DNS name of an NTP v3-compatible time server.

If you are installing the first server in a new eDirectory tree, you have two choices:

- ♦ You can enter the IP address or DNS name of an authoritative NTP time source (recommended).
- ♦ You can leave the field displaying Local Time, so the server is configured to use its BIOS clock as the authoritative time source.

IMPORTANT: We do not recommend this second option because BIOS clocks can fail over time, causing serious problems for eDirectory.

NetWare 6.5 SP8

By default, the NetWare install automatically configures the TIMESYNC NLM to use the server's BIOS clock. As indicated earlier, this default behavior is not recommended for production networks. You should, therefore, manually configure time synchronization (either Timesync or NTP) while installing each NetWare server.

Manual time synchronization configuration is accessed at install time from the Time Zone dialog box by clicking the **Advanced** button as outlined in “[Choose Timesync for Virtualized NetWare Only](#)” on page 105 and as fully explained in “[Setting the Server Time Zone and Time Synchronization Method](#)” in the *NW65 SP8: Installation Guide*.

Existing Tree

When a server joins an existing eDirectory tree, both OES installations do approximately the same thing.

- ♦ “OES 2015 SP1” on page 110
- ♦ “NetWare 6.5 SP8” on page 110

OES 2015 SP1

If you are installing into an existing tree, the OES 2015 SP1 install proposes to use the IP address of the eDirectory server (either NetWare or Linux) as the NTP time source. This default should be sufficient unless one of the following is true:

- ♦ The server referenced is a NetWare 5.0 or earlier server, in which case you need to identify and specify the address of another server in the tree that is running either a later version of NetWare or any version of OES.
- ♦ You will have more than 30 servers in your tree, in which case you need to configure the server to fit in to your planned time synchronization hierarchy. For more information, see [“Planning a Time Synchronization Hierarchy before Installing OES” on page 105](#).

The OES 2015 SP1 install activates the `xntp` daemon and configures it to synchronize server time with the specified NTP time source. After the install finishes, you can configure the daemon to work with additional time sources to ensure fault tolerance. For more information, see [“Changing Time Synchronization Settings on a SLES 11 Server” on page 110](#).

NetWare 6.5 SP8

If you are installing into an existing tree, the NetWare 6.5 SP8 install first checks to see whether you manually configured either NTP or Timesync time synchronization sources while setting the server Time Zone (see [“Setting the Server Time Zone and Time Synchronization Method”](#) in the *NW65 SP8: Installation Guide*).

If you will have more than 30 servers in your tree, you should have developed a time synchronization plan (see [“Planning a Time Synchronization Hierarchy before Installing OES” on page 105](#)) and used the Time Zone panel to configure your server according to the plan.

If you haven't manually configured time synchronization sources for the server (for example, if your tree has fewer than 30 servers), the install automatically configures the Timesync NLM to point to the IP address of the server with a master replica of the tree's [ROOT] partition.

12.3.5 Configuring and Administering Time Synchronization

As your network changes, you will probably need to adjust the time synchronization settings on your servers.

- ♦ [“Changing Time Synchronization Settings on a SLES 11 Server” on page 110](#)
- ♦ [“Changing Time Synchronization Settings on a NetWare Server” on page 111](#)

Changing Time Synchronization Settings on a SLES 11 Server

This method works both in the GUI and at the command prompt and is the most reliable method for ensuring a successful NTP implementation.

- 1 Launch YaST on your SLES 11 server by either navigating to the application on the desktop or typing `yast` at the command prompt.
- 2 Click **Network Services > NTP Configuration**.
- 3 In the **Advanced NTP Configuration** dialog box, modify the NTP time settings as your needs require.

Changing Time Synchronization Settings on a NetWare Server

Time synchronization settings and their modification possibilities are documented in the following administration guides:

- ♦ Timesync: [NW 6.5 SP8: Network Time Synchronization Administration Guide](#)
- ♦ NTP: [NW 6.5 SP8: NTP Administration Guide](#)

12.3.6 Daylight Saving Time

For information about daylight saving time (DST), go to the [Novell Support Knowledgebase \(http://www.novell.com/support/kb/\)](http://www.novell.com/support/kb/) and search for Daylight Saving Time.

12.4 Discovery Services

Various discovery mechanisms are usually available on an OES network.

- ♦ DNS/DHCP
- ♦ Directory services
- ♦ Local host configuration files
- ♦ Service Location Protocol (SLP services)

NOTE: NetWare 3 and 4 used the IPX-based Service Advertising Protocol (SAP) as the discovery mechanism. All the servers advertised their services automatically. If a server went offline, the SAP information on the network was dynamically refreshed.

Starting with NetWare 5 and pure TCP/IP, 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.

For more information, see [Section 12.5, “SLP,” on page 112](#).

- ♦ Universal Description, Discovery, and Integration (UDDI) server

Some systems are designed to leverage only a single discovery technology. Others choose among the various providers. And some use different technologies in combination with each other.

12.4.1 Novell SLP and OpenSLP

NetWare 3 and 4 used the IPX-based Service Advertising Protocol (SAP) as the discovery mechanism. All the servers advertised their services automatically. If a server went offline, the SAP information on the network was dynamically refreshed.

Starting with NetWare 5 and pure TCP/IP, 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.

For more information, see [Section 12.5, “SLP,” on page 112](#).

12.5 SLP

The OpenSLP services on OES 2015 SP1 are compatible and comparable with NetWare SLP services.

This section discusses the following topics:

- ◆ [Section 12.5.1, “Overview,” on page 112](#)
- ◆ [Section 12.5.2, “Comparing Novell SLP and OpenSLP,” on page 114](#)
- ◆ [Section 12.5.3, “Setting Up OpenSLP on OES 2015 SP1 Networks,” on page 115](#)
- ◆ [Section 12.5.4, “Using Novell SLP on OES 2015 SP1 Networks,” on page 120](#)
- ◆ [Section 12.5.5, “TIDs and Other Help,” on page 124](#)

12.5.1 Overview

The Service Location Protocol (SLP) was developed so that clients and other software modules can dynamically discover and use services on the network without knowing the IP address or the hostname of the server offering the service.

- ◆ [“Why SLP Is Needed” on page 112](#)
- ◆ [“About the Three SLP Agents and Their Roles” on page 112](#)
- ◆ [“Overcoming the Subnet Limitation” on page 113](#)
- ◆ [“An eDirectory Example” on page 113](#)
- ◆ [“What Happens When a DA Goes Down?” on page 113](#)

Why SLP Is Needed

NetWare: Although many other applications and server types rely on SLP for service discovery, NetWare services are actually integrated with eDirectory, and if eDirectory is configured correctly, the services work without SLP. However, SLP is automatically provided on NetWare for other services that might be installed.

OES: On the other hand, for OES services to work, the server must either:

- ◆ Have an eDirectory replica installed.

This is not automatic after the third server installed in a tree, nor is having more than three to five replicas on servers in the tree recommended.

- ◆ Have eDirectory registered with the OpenSLP service running on the server.

This requires SLP configuration either during the OES 2015 SP1 installation or manually.

About the Three SLP Agents and Their Roles

Three software “agents” provide the infrastructure for SLP-based service discovery:

- ◆ **Service Agents (SAs):** Are a required component of any SLP infrastructure. They act on behalf of a network service that is running on a server by advertising that the service is available.
- ◆ **User Agents (UAs):** Are also required. They act on behalf of clients or other software modules that need network services by searching for the needed services.

- ♦ **Directory Agents (DAs):** Are technically optional, but they are used in most SLP infrastructures. They collect service information from Service Agents so that User Agents can more easily locate the services. DAs are like a phone book directory listing of services on the network.

DAs are not needed when all of the SAs and UAs are on the same subnet. This is because the UAs and SAs can find each other within the subnet using multicast packets, provided that there are no firewalls that are set to block multicast traffic.

Overcoming the Subnet Limitation

Novell recommends against routing multicast packets across subnet boundaries, and most network configurations conform with that recommendation. Therefore, when SAs and UAs are on different subnets, they need an alternative to multicasting for advertizing and locating services on the other subnets.

Network administrators use DAs to solve this problem by setting up organizational or geographical DAs and then configuring the SAs and UAs within the organization or geographical area to use them. Many administrators further subdivide the DA workload by defining multiple SLP scopes based on different kinds of network services, and then configuring the SAs and UAs to communicate with the DAs servicing the scope that pertains to them.

An eDirectory Example

When you configure eDirectory during an OES server installation, you have the option of specifying one or more SLP DAs for the server to communicate with. Each time eDirectory starts and every hour thereafter, the server's SA will send a unicast packet to the server's assigned DAs, advertising that its eDirectory services are available.

IMPORTANT: Prior to eDirectory 8.8.2, the eDirectory SA advertised service availability every 10 minutes by default. Starting with eDirectory 8.8.2, the refresh interval changed to one hour. This has caused some confusion for network administrators who couldn't figure out why it took so long for eDirectory to register as a service

For information on how to set the refresh interval to a smaller value, see [TID 7001449 \(http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7001449&sliceId=2&docTypeID=DT_TID_1_1&dialogID=104660609&stateId=0%20%20209665064\)](http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7001449&sliceId=2&docTypeID=DT_TID_1_1&dialogID=104660609&stateId=0%20%20209665064) in the Novell Support Knowledgebase.

What Happens When a DA Goes Down?

As you can imagine, a directory agent in a large organization can accumulate many service listings after it has been running for a while. Unfortunately, because DAs are inherently cache-only repositories, if they go down for some reason, when they come back up their list of services is initially blank.

Novell SLP solved this problem on NetWare 5.x and later through eDirectory Modified Event notifications. These notifications keep all of the NetWare DA's that are servicing the same scope in sync with each other. After going down and coming back up, a NetWare DA can quickly recover its directory listings.

OpenSLP DA's, on the other hand, have historically been completely independent from each other. Because they are not eDirectory-aware, they have had no means of recovering the directory listings they had prior to going down.

This changed, beginning in OES 2 SP3.

OpenSLP DAs can now

- ◆ Retrieve and/or push service information to and/or from other DAs. For more information, see [“Synchronizing Data Between OpenSLP DAs and/or Novell SLP DAs” on page 117.](#)
- ◆ Back up their service registrations so that when the DA service is started up it can read the backup file and pre-populate its cache. For more information, see [“Backing Up Registrations and Managing Persistence” on page 118.](#)

These changes provide, in effect, the same type of DA to DA communication for OES that has traditionally been available only on NetWare.

12.5.2 Comparing Novell SLP and OpenSLP

Table 12-4 SLP Solutions

Platform	NetWare	OES 2015 SP1
SLP Solution	Novell SLP	OpenSLP
About the Solution	<p>The Novell version of SLP adapted portions of the SLP standard to provide a more robust service advertising environment.</p> <p>Novell SLP remains the default discovery mechanism for NetWare 6.5 SP8 servers. 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.</p>	<p>OpenSLP is an implementation of various IETF specifications, including RFC 2614 (SLP version 2.0). It is the default SLP service installed on SLES 11.</p> <p>In OES 2015 SP1, OpenSLP is available for those applications that require it. The default discovery mechanism is actually DNS, but SLP must be present for any applications that require it, especially in those cases where the OES 2015 SP1 server is the fourth or later server added to a tree and doesn't have an eDirectory replica automatically installed.</p>

Platform	NetWare	OES 2015 SP1
Differences	<p>Novell SLP directory agents (DAs) store service registrations for their SLP scope in eDirectory.</p> <p>As a new service registration is stored in eDirectory, other DAs assigned to the same scope are notified so that they can refresh their caches with the latest service information.</p> <p>Also, when a Novell SLP DA starts up, it immediately populates its cache with the latest service information stored in eDirectory.</p> <p>NOTE: Novell SLP DAs do not directly share information with each other as many administrators have assumed. But they do maintain well synchronized caches through eDirectory as described above.</p>	<p>OpenSLP directory agents (DAs) are able to share service registrations as described in “Synchronizing Data Between OpenSLP DAs and/or Novell SLP DAs” on page 117.</p> <p>OpenSLP is also capable of ensuring data persistence when DAs go down, as explained in “Backing Up Registrations and Managing Persistence” on page 118.</p>
Compatibility	Novell SLP user agents (UAs) or service agents (SAs) can access both Novell SLP DAs and OpenSLP DAs.	OpenSLP-based user agents or service agents can access both Novell SLP DAs and OpenSLP DAs.
Documentation	Setting Up SLP on NetWare (https://www.netiq.com/documentation/edir88/edir88/?page=/documentation/edir88/edir88/data/ba6406j.html) .	“Configuring OpenSLP for eDirectory” in the <i>NetIQ eDirectory 8.8 SP8 Administration Guide</i> .

12.5.3 Setting Up OpenSLP on OES 2015 SP1 Networks

SLP services are always installed as part of both NetWare and SLES 11 SP4 (the underlying OES 2015 SP1 platform). On NetWare and on OES, SLP services run automatically in multicast mode. Setting up directory agents and multiple scopes, etc. requires a manual configuration of SLP, either during the installation or by modifying the `slpd.conf` file afterward.

- ♦ [“When Is OpenSLP Required?”](#) on page 116
- ♦ [“Setting Up an OpenSLP DA Server”](#) on page 116
- ♦ [“Synchronizing Data Between OpenSLP DAs and/or Novell SLP DAs”](#) on page 117
- ♦ [“Backing Up Registrations and Managing Persistence”](#) on page 118
- ♦ [“Configuring OES 2015 SP1 Servers to Access the OpenSLP DA”](#) on page 118
- ♦ [“Configuring NetWare Servers to Use the OpenSLP Service”](#) on page 119

When Is OpenSLP Required?

The OES install automatically starts OpenSLP on your OES 2015 SP1 server in case any of the following applies:

- ♦ You install more than three servers into a new tree
- ♦ You create a new eDirectory partition on an OES 2015 SP1 server.
- ♦ You either don't have an existing Novell SLP service, or you don't want to continue using Novell SLP.

IMPORTANT: If you need to set up OpenSLP in more than multicast mode for the reasons above, it is most convenient if you do it before you install the fourth server in your tree or partition. That way you can point to the SLP service during the installation. Setting up SLP services on every OES 2015 SP1 server is recommended.

Setting Up an OpenSLP DA Server

The default SLP configuration in the YaST-based install doesn't include having a Directory Agent. This approach is far less robust, requires multicasting, and involves disabling the firewall.

If you need OpenSLP and you don't already have an OpenSLP Directory Agent (DA) set up on your network, for simplicity's sake we recommend that you set up the first OES 2015 SP1 server in your tree as an OpenSLP DA. The simplest way to do this is during server installation by selecting the **Configure as Directory Agent** option in the YaST-based installation.

After creating the DA, you can then configure all subsequently installed servers to either point to that DA or to other DAs you create later.

To set up an OpenSLP DA on an existing OES 2015 SP1 server, do the following.

- 1 On the OES 2015 SP1 server that will become the DA, open the `/etc/slp.conf` file in a text editor.
- 2 In `slp.conf`, remove the semicolon [;] from the beginning of the following line:

```
inet.slp.isDA = true
```

so that it reads

```
net.slp.isDA = true
```

- 3 Find the following line:

```
inet.slp.useScopes = myScope1, myScope2, myScope3
```

IMPORTANT: The example in the configuration file is misleading because the spaces after each comma are not ignored as one might expect them to be.

Therefore, the scope names created or configured by the statement after the first comma actually have leading spaces in them. For example, the first scope name is "myScope1" but the scope names that follow it all have leading spaces, " myScope2", " myScope3" and so on. This is a problem, especially if one of the later names becomes the first name in a subsequent SLP configuration and the leading space is ignored.

If you use the scopes given in the example, remove the spaces between the entries.

- 4 Modify the line by removing the semicolon and typing the name of the scope you want this DA to use to provide service information on the network. For example, you might change the line as follows:

```
net.slp.useScopes = Directory
```

IMPORTANT: Although SLP provides a default scope if no scope is specified, it is always good practice to define one or more scopes by configuring the `net.slp.useScopes` parameter in `slp.conf`.

Scopes group and organize the services on your network into logical categories. For example, the services that the Accounting group needs might be grouped into an Accounting scope.

More information about scope planning is available on the [OpenSLP Web site \(http://www.openslp.org/\)](http://www.openslp.org/).

When no scope is specified, all services are registered in a scope named Default.

- 5 Configure the firewall on the DA server to allow SLP daemon traffic:
 - 5a In the YaST Control Center, click **Security and Users > Firewall**.
 - 5b In the left navigation frame, click **Allowed Services**.
 - 5c Click the **Services to Allow** drop-down list and select **SLP Daemon**.
 - 5d Click **Add > Next**.
 - 5e Click **Accept**.
- 6 At the command prompt, enter the following command to restart the SLP daemon:

```
rcslpd restart
```
- 7 (Conditional) If you are doing this after installing OES 2015 SP1 and eDirectory, you must also restart eDirectory by entering the following command:

```
rcnstd restart
```
- 8 Continue with the following sections that apply to your situation:
 - ◆ [Synchronizing Data Between OpenSLP DAs and/or Novell SLP DAs \(page 117\)](#)
 - ◆ [Backing Up Registrations and Managing Persistence \(page 118\)](#)
 - ◆ [Configuring OES 2015 SP1 Servers to Access the OpenSLP DA \(page 118\)](#)
 - ◆ [Configuring NetWare Servers to Use the OpenSLP Service \(page 119\)](#)

Synchronizing Data Between OpenSLP DAs and/or Novell SLP DAs

If you didn't set up DA synchronization during server installation, you can set it up later by using the following parameters in the `slp.conf` file:

```
net.slp.dasyncreg = true/false  
  
slp.DAaddresses = IP_address_1,IP_address_2
```

If the `net.slp.dasyncreg` parameter value is set to `true`, then synchronization is achieved by the DA pushing or pulling SLP registrations from the DAs listed for the `slp.DAaddresses` parameter, as follows:

1. When the DA starts up, it pulls the registration information from all of the server DAs listed in the `slp.DAaddresses` parameter, including any Novell SLP DAs listed.
2. When the DA receives a service registration, it forwards the information to the OpenSLP DAs that are listed.

IMPORTANT: Service registrations cannot be pushed to Novell SLP DA's.

Backing Up Registrations and Managing Persistence

If you didn't set up registration back-up during server installation, you can set it up later by using the following parameters in the `slp.conf` file:

```
net.slp.isDABackup = true/false

net.slp.DABackupInterval = time_in_seconds
```

If the `net.slp.isDABackup` parameter is set to `true`, service registrations are backed up in the `/etc/slp.reg.d/slpd/DABackup` file at the interval specified for the `net.slp.DABackupInterval` parameter. By default, the interval is 900 seconds (15 minutes).

Configuring OES 2015 SP1 Servers to Access the OpenSLP DA

If you created the OpenSLP DA on an OES 2015 SP1 server installed in your tree, then SLP is properly configured on that server and these instructions do not apply to it.

For all other OES 2015 SP1 servers installed in your eDirectory tree, you should complete one of the following procedures as it applies to your situation:

- ♦ [“Configuring for DA Access During the OES 2015 SP1 Installation” on page 118](#)
- ♦ [“Configuring for DA Access Before or After Installing OES 2015 SP1” on page 118](#)

Configuring for DA Access During the OES 2015 SP1 Installation

As you install OES 2015 SP1 by using the instructions in the [“NetIQ eDirectory Services”](#) section of the [OES 2015 SP1: Installation Guide](#), do the following:

- 1 When you reach the [“eDirectory Configuration - NTP and SLP”](#) section of the installation, select **Configure SLP to Use an Existing Directory Agent**.
The first option, **Use Multicast**, requires that you disable the firewall on the server. Disabling the firewall is always discouraged.
- 2 In the **Service Location Protocol Scopes** field, specify the scope you defined in [Step 4 on page 116](#). You can also list additional scopes, separated by commas (no spaces).
For example, you might type `Directory` in the field if that is the scope name you assigned to the DA you created.
- 3 In the **Configured SLP Directory Agent** field, type the IP address of the DA server you defined in [“Setting Up an OpenSLP DA Server” on page 116](#). You can also list additional DA addresses, separated by commas.
- 4 Return to the [“NetIQ Modular Authentication Services”](#) instructions in the [OES 2015 SP1: Installation Guide](#).

Configuring for DA Access Before or After Installing OES 2015 SP1

Whether you configure DA access before installing OES 2015 SP1 on a SLES 11 SP4 server or after a simultaneous install of SLES 11 SP4 and OES 2015 SP1, the manual DA configuration process is the same.

- 1 Open `/etc/slp.conf` in a text editor.
- 2 Find the following line:

```
net.slp.useScopes = myScope1, myScope2, myScope3
```

IMPORTANT: The example in the configuration file is misleading because the spaces after each comma are not ignored as one might expect them to be.

Therefore, the scope names created or configured by the statement after the first comma actually have leading spaces in them. For example, the first scope name is “myScope1” but the scope names that follow it all have leading spaces, “ myScope2”, “ myScope3” and so on. This is a problem, especially if one of the later names becomes the first name in a subsequent SLP configuration and the leading space is ignored.

If you use the scopes given in the example for some reason, remove the spaces between the entries.

- 3 Modify the line by removing the semicolon and typing the name or names of the scopes you want this server to have access to. Be sure to include the scope you defined in [Step 4 on page 116](#).

For example, you might change the line as follows:

```
net.slp.useScopes = Directory
```

- 4 Find the following line:

```
;net.slp.DAAddresses = myDa1,myDa2,myDa3
```

- 5 Modify the line by removing the semicolon and typing the actual IP address of the OpenSLP DA you defined in [“Setting Up an OpenSLP DA Server” on page 116](#).

```
net.slp.DAAddresses = IP_Address
```

- 6 Save the file and close it.

- 7 At the Linux command prompt, enter the following to restart the SLP daemon and reset its configuration:

```
rcslpd restart
```

Configuring NetWare Servers to Use the OpenSLP Service

IMPORTANT: NetWare uses Novell SLP by default and will configure a server for that service if possible.

Complete one of the following as it applies to your situation:

- ♦ [“Configuring for DA Access During the NetWare Server Installation” on page 119](#)
- ♦ [“Configuring for DA Access After Installing the NetWare Server” on page 120](#)

Configuring for DA Access During the NetWare Server Installation

- 1 In the dialog box where you set up IP addresses for network boards, click **Advanced**.
- 2 Click the **SLP** tab.
- 3 Specify the IP address of the OES 2015 SP1 DA servers—up to three.
- 4 Type the list of scopes covered by the configured DAs that you want the NetWare server to have access to.

IMPORTANT: We recommend you do not configure the server to use multicast because that necessitates disabling firewalls, which is never recommended.

- 5 Click **OK**.

Configuring for DA Access After Installing the NetWare Server

- 1 Using a text editor, edit the `SYS:ETC/slp.cfg` file on the NetWare server and add the following line for each DA server you want the NetWare server to have access to:

```
DA IPV4, IP_Address1
DA IPV4, IP_Address2
```

where `IP_AddressX` is the IP address of an OES 2015 SP1 DA server.

- 2 Save the file and close it.
- 3 At the NetWare console prompt, specify the scopes you want the NetWare server to have access to, write the SLP cache to the registry, and restart the SLP service:

```
set slp scope list = scope1,scope2,...
flush cdb
set slp reset = on
```

- 4 Verify that SLP is functioning correctly by entering the following command:

```
display slp services
```

12.5.4 Using Novell SLP on OES 2015 SP1 Networks

If you have a NetWare tree, you automatically have Novell SLP on your network and you can continue to use it as the SLP service during the upgrade to OES 2015 SP1 until you are ready to switch to OpenSLP.

This section discusses the following:

- ♦ [“NetWare Is Configured with Novell SLP By Default” on page 120](#)
- ♦ [“Configuring OES 2015 SP1 Servers to Access the Novell SLP DA” on page 120](#)
- ♦ [“Checking the Status of Novell SLP Services” on page 123](#)

NetWare Is Configured with Novell SLP By Default

When you install NetWare, if you don't specify an alternate SLP configuration, the server is automatically configured to use Novell SLP in a way that is sufficient for most networks.

Configuring OES 2015 SP1 Servers to Access the Novell SLP DA

For each of the OES 2015 servers installed in your eDirectory tree, you should complete one of the following procedures as it applies to your situation:

- ♦ [“Configuring for DA Access During the OES 2015 SP1 Installation” on page 120](#)
- ♦ [“Configuring for DA Access Before or After Installing the OES 2015 SP1 Server” on page 121](#)

Configuring for DA Access During the OES 2015 SP1 Installation

As you install OES 2015 SP1, in the [“NetIQ eDirectory Services”](#) section of the *OES 2015 SP1: Installation Guide*, do the following:

- 1 When you reach the SLP section of the installation, select **Configure SLP to Use an Existing Directory Agent**.

The first option, **Use Multicast**, requires that you disable the firewall on the server. Disabling the firewall is always discouraged.

- 2 In the **Service Location Protocol Scopes** field, specify one or more appropriate scopes that are defined on your network.

If you aren't sure about the exact scope names, you can view the SLP configuration of a NetWare server on the same network segment. Log into Novell Remote Manager on the server and click **Manage Applications > SLP**.

You can list multiple scopes, separated by commas (no spaces).

For example, you might type `Directory` in the field.

- 3 In the **Configured SLP Directory Agent** field, type the IP address of an appropriate DA server.

You can use Novell Remote Manager on a NetWare server if you aren't sure which address to use.

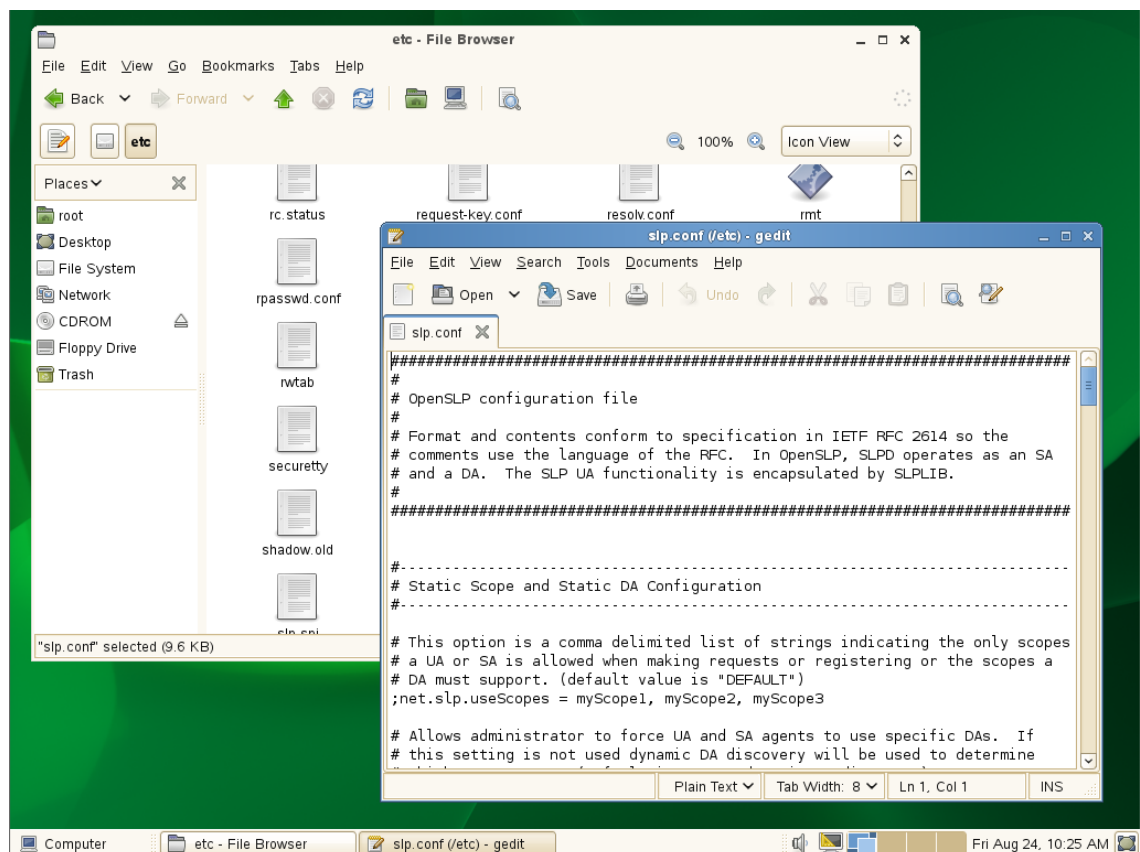
You can also list additional DA addresses, separated by commas.

- 4 Return to the "**NetIQ eDirectory Services**" instructions in the [OES 2015 SP1: Installation Guide](#).

Configuring for DA Access Before or After Installing the OES 2015 SP1 Server

Whether you configure DA access before installing OES 2015 SP1 on a SLES 11 SP4 server or after a simultaneous install of SLES 11 SP4 and OES 2015 SP1, the manual DA configuration process is the same.

- 1 Open `/etc/slp.conf` in a text editor.



- 2 Find the following line:

```
;net.slp.useScopes = myScope1, myScope2, myScope3
```

IMPORTANT: The example in the configuration file is misleading because the spaces after each comma are not ignored as one might expect them to be.

Therefore, the scope names created or configured by the statement after the first comma actually have leading spaces in them. For example, the first scope name is “myScope1” but the scope names that follow it all have leading spaces, “ myScope2”, “ myScope3” and so on. This is a problem, especially if one of the later names becomes the first name in a subsequent SLP configuration and the leading space is ignored.

If you use the scope names given in the example, remove the spaces between the entries.

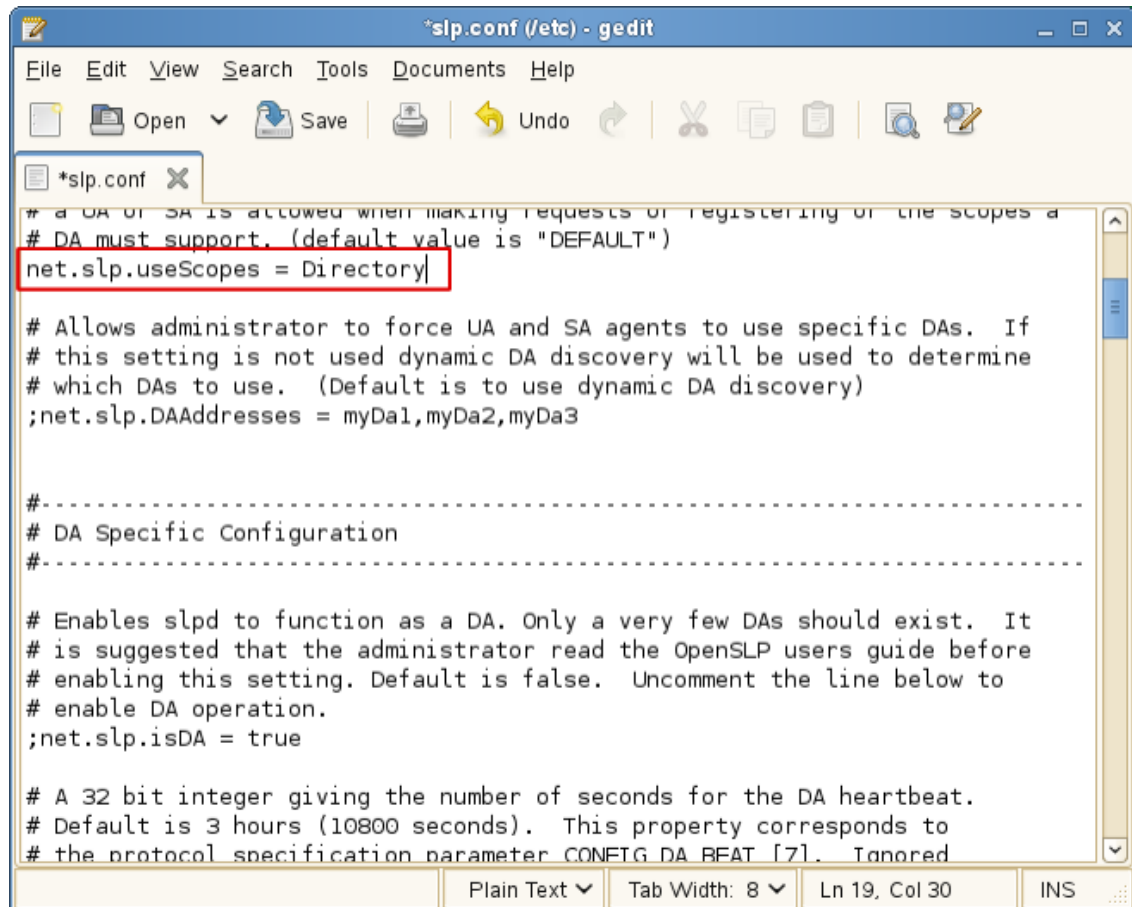
- 3 Modify the line by removing the semicolon and typing the name or names of the scopes you want this server to have access to.

If you aren't sure about the exact scope names, you can view the SLP configuration of a NetWare server on the same network segment. Log into Novell Remote Manager on the server and click **Manage Applications > SLP**.

You can list multiple scopes, separated by commas (no spaces).

For example, you might change the line as follows:

```
net.slp.useScopes = Directory
```



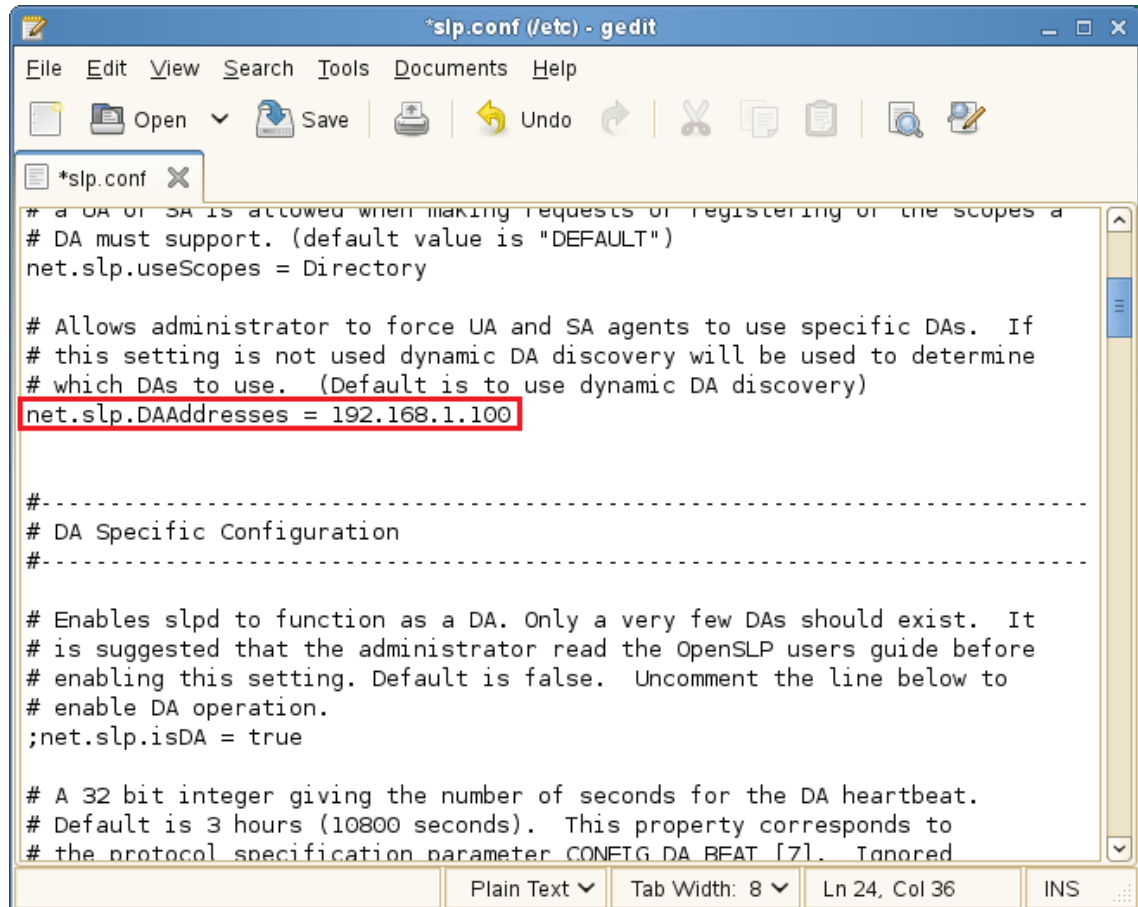
```
*slp.conf (/etc) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
# a DA or SA is allowed when making requests or registering of the scopes a
# DA must support. (default value is "DEFAULT")
net.slp.useScopes = Directory
# Allows administrator to force UA and SA agents to use specific DAs. If
# this setting is not used dynamic DA discovery will be used to determine
# which DAs to use. (Default is to use dynamic DA discovery)
;net.slp.DAAddresses = myDa1,myDa2,myDa3
#-----
# DA Specific Configuration
#-----
# Enables slpd to function as a DA. Only a very few DAs should exist. It
# is suggested that the administrator read the OpenSLP users guide before
# enabling this setting. Default is false. Uncomment the line below to
# enable DA operation.
;net.slp.isDA = true
# A 32 bit integer giving the number of seconds for the DA heartbeat.
# Default is 3 hours (10800 seconds). This property corresponds to
# the protocol specification parameter CONFIG DA BEAT [7]. Ignored
Plain Text Tab Width: 8 Ln 19, Col 30 INS
```

- 4 Find the following line:

```
;net.slp.DAAddresses = myDa1,myDa2,myDa3
```

- 5 Modify the line by removing the semicolon and typing the actual IP address of the Novell SLP DA (using Novell Remote Manager if necessary).

```
net.slp.DAAddresses = IP_Address
```



```
*slp.conf (/etc) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
*slp.conf x
# a DA or SA is allowed when making requests or registering of the scopes a
# DA must support. (default value is "DEFAULT")
net.slp.useScopes = Directory

# Allows administrator to force UA and SA agents to use specific DAs. If
# this setting is not used dynamic DA discovery will be used to determine
# which DAs to use. (Default is to use dynamic DA discovery)
net.slp.DAAddresses = 192.168.1.100

#-----
# DA Specific Configuration
#-----

# Enables slpd to function as a DA. Only a very few DAs should exist. It
# is suggested that the administrator read the OpenSLP users guide before
# enabling this setting. Default is false. Uncomment the line below to
# enable DA operation.
;net.slp.isDA = true

# A 32 bit integer giving the number of seconds for the DA heartbeat.
# Default is 3 hours (10800 seconds). This property corresponds to
# the protocol specification parameter CONFIG DA BEAT [7]. Ignored
```

6 Save the file and close it.

7 At a terminal prompt, enter the following to restart the SLP daemon and reset its configuration:

```
rcslpd restart
```

8 Enter the following commands to verify that the DA and scopes you configured are recognized.

```
slptool findsrvs service:
```

The DA server should be listed.

```
slptool findscopes
```

The scopes should be listed.

9 If you did this after installing OES 2015 SP1, enter the following to verify that the tree is found:

```
slptool findsrvs service:ndap.novell
```

Checking the Status of Novell SLP Services

There are several ways to check the status of Novell SLP services.

- If you know the IP addresses of the DAs, check the `SYS:\etc\slp.cfg` file on non-DA servers to see if the DA IP addresses are listed.
- If you know the scope names, check for the proper scope name configuration by using the `SET SLP SCOPE LIST` command.

- ♦ Use the `DISPLAY SLP SERVICES` command to list all of the services that are registered in all of the scopes that the server is configured to use.
- ♦ Use iManager to open the scope container object to see all of the registered services.
- ♦ If you are registering different services in different scopes, look in the `SYS:\etc\slp.cfg` file for `REGISTER TYPE` lines.
- ♦ At the DOS prompt on a Windows workstation with Client32 installed, use the `SLPINFO /ALL` command.

12.5.5 TIDs and Other Help

The SLP configuration file (`etc/slp.conf`) is self-documented regarding each of the configuration parameters. Novell support has also provided the following TIDS:

- ♦ [OpenSLP vs. Novell SLP \(http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7004574&sliceId=1&docTypeID=DT_TID_1_1&dialogID=246569372&stateId=0%200%20246565813\)](http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7004574&sliceId=1&docTypeID=DT_TID_1_1&dialogID=246569372&stateId=0%200%20246565813) answers questions about the differences between the two SLP solutions.
- ♦ [eDir not registering bindery or NDAP services with OpenSLP \(http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7001449&sliceId=1&docTypeID=DT_TID_1_1&dialogID=246569372&stateId=0%200%20246565813\)](http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7001449&sliceId=1&docTypeID=DT_TID_1_1&dialogID=246569372&stateId=0%200%20246565813) answers questions about how the SLP solutions register ndap and bindery services.
- ♦ [NetWare SLP fails to populate service registrations to an openSLP DA on OES \(http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7009783&sliceId=1&docTypeID=DT_TID_1_1&dialogID=281740290&stateId=0%200%20281736877\)](http://www.novell.com/support/php/search.do?cmd=displayKC&docType=kc&externalId=7009783&sliceId=1&docTypeID=DT_TID_1_1&dialogID=281740290&stateId=0%200%20281736877) explains how to solve the communication problem.
- ♦ [OpenSLP Documentation on the Web \(http://www.openslp.org/documentation.html\)](http://www.openslp.org/documentation.html) provides complete documentation of the OpenSLP services that OES leverages.

13 Storage and File Systems

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.

Use this section to understand the file storage solutions available in Open Enterprise Server 2015 or later and then to plan a storage solution that meets your file system management needs.

The “[storage and file systems \(http://www.novell.com/documentation/oes2015/index.html#cat_storage-file-systems-databases\)](http://www.novell.com/documentation/oes2015/index.html#cat_storage-file-systems-databases)” links in the OES 2015 SP1 online documentation provides overview, planning, implementation, and configuration links.

This section provides the following information about the process of planning and implementing storage services in OES:

- ◆ [Section 13.1, “Overview of OES 2015 SP1 Storage,” on page 125](#)
- ◆ [Section 13.2, “Planning OES File Storage,” on page 131](#)
- ◆ [Section 13.3, “Coexistence and Migration of Storage Services,” on page 137](#)
- ◆ [Section 13.4, “Configuring and Maintaining Storage,” on page 140](#)

Other storage-related topics in this guide are:

- ◆ [Chapter 16, “Access Control and Authentication,” on page 167](#)
- ◆ [Section 16.2, “Authentication Services,” on page 179](#)
- ◆ [Appendix 17, “Backup Services,” on page 183](#)
- ◆ [Chapter 18, “File Services,” on page 185](#)

13.1 Overview of OES 2015 SP1 Storage

This section presents the following overview information for the file systems included in OES:

- ◆ [Section 13.1.1, “Databases,” on page 125](#)
- ◆ [Section 13.1.2, “iSCSI,” on page 126](#)
- ◆ [Section 13.1.3, “File System Support in OES,” on page 126](#)
- ◆ [Section 13.1.4, “Storage Basics by Platform,” on page 128](#)
- ◆ [Section 13.1.5, “Storage Options,” on page 129](#)
- ◆ [Section 13.1.6, “NetWare Core Protocol Support \(Novell Client Support\) on Linux,” on page 130](#)

13.1.1 Databases

See the [MySQL documentation \(http://dev.mysql.com/doc\)](http://dev.mysql.com/doc) on the Web.

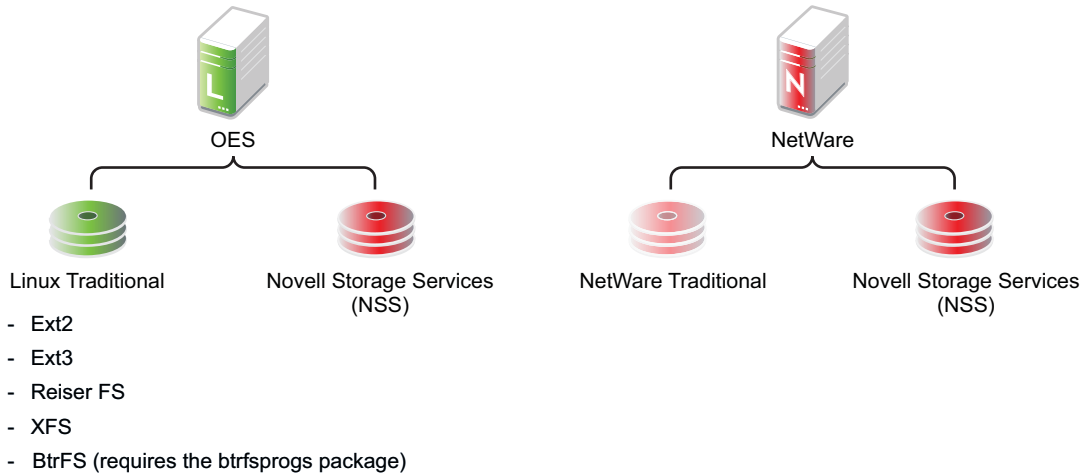
13.1.2 iSCSI

See the topics in “iSCSI for Linux (http://www.suse.com/documentation/sles11/stor_admin/data/cha_inst_system_iscsi.html)” in the SLES online documentation.

13.1.3 File System Support in OES

As shown in [Figure 13-1](#), both OES and NetWare support Novell Storage Services as well as their traditional file systems.

Figure 13-1 File System Choices on OES and NetWare Servers



[Table 13-1](#) summarizes OES file system types and provides links to more information.

Table 13-1 File Systems Available on OES and NetWare Servers

File System Type	OES	NetWare	Summary	Link for More Information
Linux POSIX File Systems	Y	N	<p>SLES 11 SP4 includes a number of different file systems, the most common of which are Ext3, Reiser, XFS, and Btrfs (requires the btrfsprogs package).</p> <p>OES 2015 SP1 services are supported on Ext3, Reiser, XFS, and Btrfs.</p>	<p>For an overview of the supported file systems in OES 2015 SP1, see “File Systems Overview” in the <i>OES 2015 SP1: File Systems Management Guide</i>.</p> <p>For an overview of Linux POSIX file systems, see Overview of File Systems in Linux in the <i>SLES 11 SP4: Storage Administration Guide</i>.</p>
NetWare Traditional File System	N	Y	<p>This is a legacy file system on NetWare servers that supports the Novell file service trustee access control model.</p>	<p>For more information, see the <i>NW6.5 SP8: Traditional File System Administration Guide</i>.</p>

File System Type	OES	NetWare	Summary	Link for More Information
Novell Storage Services (NSS)	Y	Y	<p>NSS lets you manage your shared file storage for any size organization.</p> <p>On Netware, NSS features include visibility, a trustee access control model, multiple simultaneous name space support, native Unicode, user and directory quotas, rich file attributes, multiple data stream support, event file lists, and a file salvage subsystem.</p> <p>Most of these features are also supported on NSS on Linux.</p> <p>In addition, starting in OES 2015 SP1, NSS supports two pool types: NSS32, the traditional NSS type that supports up to 8 Terabytes of data, and NSS64, the new NSS type that supports up to 8 Exabytes.</p> <p>For a feature comparison, see “Comparison of NSS on NetWare and NSS on Linux” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>.</p>	<p>For an overview of NSS, see “Overview of NSS” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>.</p>

Novell Storage Services (NSS)

The following sections summarize key points regarding NSS:

- ♦ “[Understanding NSS Nomenclature](#)” on page 127
- ♦ “[Comparing NSS with Other File Systems](#)” on page 127
- ♦ “[NSS and Storage Devices](#)” on page 128

Understanding NSS Nomenclature

NSS uses a specific nomenclature to describe key media objects. These terms appear in both the NSS documentation and in NSS error messages.

For more information, see “[NSS Nomenclature](#)” in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

Comparing NSS with Other File Systems

Because OES 2015 SP1 supports a variety of file systems, you might want to compare their features and benefits as outlined in the following sections of the *OES 2015 SP1: NSS File System Administration Guide for Linux*:

- ♦ **NSS Linux vs. NSS NetWare:** “[Comparison of NSS on NetWare and NSS on Linux](#)”

- ♦ **NSS Linux vs. NCP Volumes on Linux POSIX:** [“Comparison of NSS on Linux and NCP Volumes on Linux POSIX File Systems”](#)

NSS and Storage Devices

NSS supports both physical devices (such as hard disks) and virtual devices (such as software RAIDs and iSCSI devices).

For more information on the various devices that NSS supports, see [“Managing Devices”](#) in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

13.1.4 Storage Basics by Platform

The following sections summarize storage basics for Linux and NetWare.

- ♦ [“Linux and File Systems”](#) on page 128
- ♦ [“NSS on OES Storage Devices”](#) on page 128
- ♦ [“NetWare Directories”](#) on page 128
- ♦ [“NetWare Storage Devices”](#) on page 128

Linux and File Systems

For a high-level overview of the file system on Linux, including the root (/) directory, mount points, standard folders, and case sensitivity, see [“Understanding Directory Structures in Linux POSIX File Systems”](#) in the *OES 2015 SP1: File Systems Management Guide*.

NSS on OES Storage Devices

See [“Guidelines for NSS Storage”](#) in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

NetWare Directories

NetWare uses volumes and directories (or folders) to organize data. NetWare file systems support directory paths, fake root directories, Directory Map objects, and drive mappings.

For more information, see [“Understanding Directory Structures for the NSS File System”](#) in the *OES 2015 SP1: File Systems Management Guide*.

NetWare Storage Devices

NetWare lets you use many different kinds of storage devices, including server disks, single storage devices, arrays of storage devices, and virtual storage devices.

To understand how NetWare connects with and uses storage devices, see [“Overview of Server Disks and Storage Devices for NetWare”](#) in the *NW6.5 SP8: Server Disks and Storage Devices*.

13.1.5 Storage Options

The following sections summarize OES storage options.

- ♦ [“Dynamic Storage Technology” on page 129](#)
- ♦ [“Direct-Attached Storage Options \(NSS and Traditional\)” on page 129](#)
- ♦ [“Advanced Storage Options” on page 129](#)

Dynamic Storage Technology

Dynamic Storage Technology for OES lets you present the files and subdirectories on two separate NSS volumes as though they were on a single, unified NSS volume called a shadow volume.

NCP client users and Novell CIFS users automatically see a merged view of the files and subdirectories on the shadow volume when they access a share on the primary volume. All the actions they take--renaming, deleting, moving, etc.--are synchronized by Dynamic Storage Technology across the two volumes. If you use supported native Linux file access protocols, such as Novell Samba, SSH, or Novell FTP (PureFTP-d), to access the DST volume, you can enable ShadowFS to provide a merged view location for LUM-enabled users of those protocols. Novell CIFS and Novell Samba cannot be used on the same server.

Backup tools can access the volumes directly and separately, instead of via the merged view shown to NCP and CIFS users. You can apply one backup policy to the primary volume and a different backup policy to the secondary volume.

You can use Dynamic Storage Technology to substantially reduce storage costs by placing your less frequently accessed files on less expensive storage media.

In addition, Dynamic Storage Technology doesn't suffer the performance penalty that HSM solutions do.

For more information about Dynamic Storage Technology, see the [OES 2015 SP1: Dynamic Storage Technology Administration Guide](#).

Direct-Attached Storage Options (NSS and Traditional)

As shown in [Figure 13-1 on page 126](#), you can install traditional volumes and Novell Storage System (NSS) volumes on both OES platforms. These devices can be installed within the server or attached directly to the server through an external SCSI bus.

For more information, see [“Direct Attached Storage Solutions”](#) in the [OES 2015 SP1: Storage and File Services Overview](#).

Advanced Storage Options

NSS volumes support the following advanced storage solutions, as documented in the [OES 2015 SP1: Storage and File Services Overview](#).

- ♦ [Network Attached Storage Solutions](#)

A dedicated data server or appliance that provides centralized storage access for users and application servers through the existing network infrastructure and by using traditional LAN protocols such as Ethernet and TCP/IP. When Gigabit Ethernet is used, access speeds are similar to direct attached storage device speeds.

The disadvantage is that data requests and data compete for network bandwidth.

- ◆ [Storage Area Network Solutions](#)

A separate, dedicated data network consisting of servers and storage media that are connected through high-speed interconnects, such as Fibre Channel.

- ◆ [iSCSI SAN](#)

You can create a SAN using Linux iSCSI.

- ◆ [Fault-Tolerant and High-Availability Architectures](#)

Use one or more of the following technologies:

- ◆ [Multiple Path I/O](#): Multipath I/O software resolves multiple paths to a device into a single device and manages the traffic flow across the paths transparently for file systems on the devices. NSS on Linux does not provide an LVM-based software solution for managing multiple paths like the Media Manager multipath solution on NetWare. Instead, you can use Linux multipath I/O tools to configure and manage multiple paths for devices where you want to create NSS software RAIDS, pools, and volumes.

- ◆ [Software RAIDS](#): NSS supports software RAIDS to improve storage availability and performance by enhancing data fault tolerance and I/O performance.

For more information, see “[Managing NSS Software RAID Devices](#)” in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

- ◆ [Server Clusters](#): With Novell Cluster Services, you can configure up to 32 servers into a high-availability cluster where resources and services are dynamically allocated to any server in the cluster and automatically switched to another server if the hosting server fails.

By manually switching services, IT organizations can maintain and upgrade servers during production hours and eliminate scheduled downtime.

For more information, see the *OES 2015 SP1: Novell Cluster Services for Linux Administration Guide*. To convert a NetWare cluster to an OES cluster, see the *OES 2015 SP1: Novell Cluster Services NetWare to Linux Conversion Guide*.

13.1.6 NetWare Core Protocol Support (Novell Client Support) on Linux

Many organizations rely on Novell Client software and the NetWare Core Protocol (NCP) for highly secure file storage services.

Novell Storage Services (NSS) volumes are NCP volumes by nature, and you can also define Linux POSIX volumes as NCP volumes. The main difference in access control between NSS volumes and Linux POSIX volumes that are defined as NCP volumes is that NSS extended file and directory attributes are not available on Linux POSIX volumes.

The NCP server for OES lets you attach to Linux POSIX volumes that are defined as NCP volumes using Novell Client software.

NCP support in OES 2015 and later includes support for 64-bit operations and has expanded the theoretical limit of NCP volumes to multiple zettabytes. Of course this is limited by server hardware, the underlying file system, and other factors.

For more information, see [Section 18.6, “NCP Implementation and Maintenance,” on page 210](#).

13.2 Planning OES File Storage

The following sections can help you plan for storage on your OES network:

- ♦ [Section 13.2.1, “Directory Structures,” on page 131](#)
- ♦ [Section 13.2.2, “File Service Support Considerations,” on page 131](#)
- ♦ [Section 13.2.3, “General Requirements for Data Storage,” on page 131](#)
- ♦ [Section 13.2.4, “OES 2015 SP1 Storage Planning Considerations,” on page 132](#)
- ♦ [Section 13.2.5, “NSS Planning Considerations,” on page 137](#)

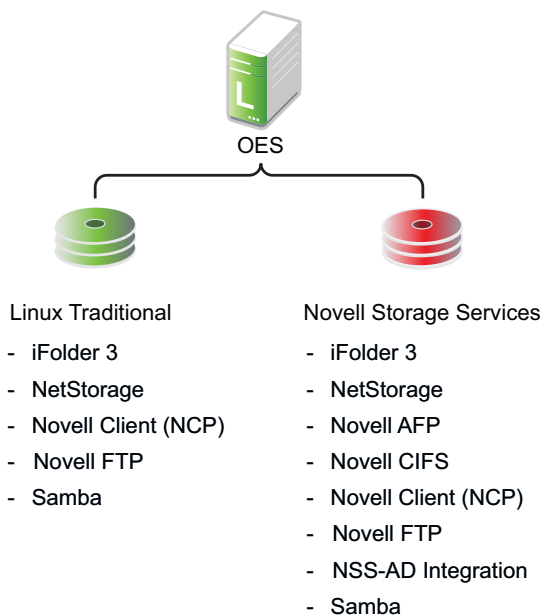
13.2.1 Directory Structures

To plan the directory structures you need on OES 2015 SP1, see “[Understanding Directory Structures in Linux POSIX File Systems](#)” in the *OES 2015 SP1: File Systems Management Guide*.

13.2.2 File Service Support Considerations

[Figure 13-2](#) shows which file services can access which volume types.

Figure 13-2 File Services Supported on Volume Types



13.2.3 General Requirements for Data Storage

Finding the right storage solution requires you to identify your data storage requirements. You might want to compare your list of requirements against those described in “[Storage Solutions](#)” in the *OES 2015 SP1: Storage and File Services Overview*.

13.2.4 OES 2015 SP1 Storage Planning Considerations

Not all data is the same. Not all workloads are the same. Not all file systems are the same. Matching your data and workloads to the available file systems and their capabilities lets you build efficient, scalable, and cost-effective solutions. This section discusses issues to consider when planning your file systems on OES 2015 SP1 servers, and includes the following topics:

- ◆ [“The Workgroup Environment” on page 132](#)
- ◆ [“File System Support” on page 132](#)
- ◆ [“File Access Protocol Support” on page 135](#)
- ◆ [“OES 2015 SP1 Workloads” on page 136](#)

The Workgroup Environment

When selecting a file system, it is important to understand the environment in which it operates. For OES 2015 SP1, the primary target environment is the workgroup, which requires the following:

- ◆ A shared file system for Linux, Macintosh, and Windows desktops. Think of this as a NAS (network-attached storage) for desktops.
- ◆ A rich, flexible permissions model to maintain security while providing for the management of many different users with different permissions throughout the file system. The permissions must be granular, allow for delegation of permission management, and ease the administrative burden in an environment where change is constant.
- ◆ A robust enterprise-wide identity management system tied into authentication and file system permissions is a must.
- ◆ The capabilities for correcting end user mistakes that are made daily (accidental overwrites, deletes, etc.).
- ◆ Integration with collaboration tools.
- ◆ Data encryption on an individual user or group basis for compliance and security.
- ◆ Departmental Web servers and databases.
- ◆ SAN support to provide flexible storage management.
- ◆ Backup support for both desktop and server data, with rich tools for monitoring the health of the backup system and quickly locating and repairing problems with data protection.
- ◆ Regulatory compliance. Regulatory requirements are now pushing new models of protecting and storing employee-generated data that is in LAN systems. It is important to apply correct regulatory requirements only on those users to which they must be applied, and then to produce audits showing compliance.
- ◆ Highly available collaboration (e-mail) services, with rich tools to monitor, audit, and trend resource usage.

File System Support

OES 2015 SP1 offers support for five six systems: Novell Storage Services (NSS), Btrfs, Ext 2, Ext3, Reiser, and XFS. Following is an explanation of each file system and the pros and cons of using them in the workloads supported by OES 2015 SP1.

- ◆ [“Novell Storage Services \(NSS\)” on page 133](#)
- ◆ [“Btrfs” on page 133](#)
- ◆ [“Ext2” on page 134](#)

- ♦ “Ext3” on page 134
- ♦ “Reiser” on page 134
- ♦ “XFS” on page 135

Novell Storage Services (NSS)

- ♦ Supported only through NSS management tools; not supported through native Linux Management tools.
- ♦ Best for shared LAN file serving; excellent scalability in the number of files
- ♦ Journalled
- ♦ Novell Trustee Model and NSS directory and file attributes (such as Rename Inhibit) provide access control that is much richer than POSIX and Linux access control lists (ACLs)

The Novell Storage Services file system is used in NetWare 5.0 and above, is included in the Novell Open Enterprise Server.

The NSS file system is unique in many ways, especially in its ability to manage and support shared file services from simultaneous different file access protocols. It is designed to manage access control (using a unique model, called the Novell Trustee Model, that scales to hundreds of thousands of different users accessing the same storage securely) in enterprise file sharing environments.

NSS and its predecessor NWFS are the only file systems that can restrict the visibility of the directory tree based on the user ID accessing the file system. NSS and NWFS have built-in ACL (access control list) rights inheritance. NSS includes mature and robust features tailored for the file-sharing environment of the largest enterprises. The file system also scales to millions of files in a single directory. NSS also supports multiple data streams and rich metadata; its features are a superset of existing file systems on the market for data stream, metadata, name space, and attribute support.

Beginning with OES 2015 SP1, both eDirectory and Active Directory are supported as identity sources, and OES enables the NSS file system to accept Active Directory identities as trustees. Active Directory users can authenticate to Active Directory and natively access the NSS resources using the CIFS protocol.

Btrfs

- ♦ Writable snapshots that allow you to easily roll back your system if needed after applying updates, or to back up files.
- ♦ Multiple device support that allows you to grow or shrink the file system.
- ♦ Compression to efficiently use storage space.
- ♦ Different RAID levels for metadata and user data.
- ♦ Different checksums for metadata and user data to improve error detection.
- ♦ Integration with Linux Logical Volume Manager (LVM) storage objects.
- ♦ Integration with the YaST Partitioner on SUSE Linux.

BtrFS creates a default subvolume in its assigned pool of space. It allows you to create additional subvolumes that act as individual file systems within the same pool of space. The number of subvolumes is limited only by the space allocated to the pool.

If BtrFS is used for the root (/) file system, you can cover any subdirectory as a subvolume as you might normally do. You should also consider covering the following subdirectories in separate subvolumes because they contain files that you might prefer not to snapshot for the reasons given:

Path	Reason to Cover as a Subvolume
/opt	Contains third-party add-on application software packages.
/srv	Contains <code>http</code> and <code>ftp</code> files.
/tmp	Contains temporary files.
/var/log	Contains log files.
/var/opt	Contains run-time variable data for /opt.
/var/run	Contains run-time variable data.
/var/spool	Contains data that is awaiting processing by a program, user, or administrator, such as news, mail, and printer queues.
/var/tmp	Contains temporary files or directories that are preserved between system reboots.

Ext2

- ◆ Legacy file system
- ◆ Not journaled
- ◆ POSIX access control

Ext2 does not maintain a journal, so it is generally not desirable to use it for any server that needs high availability, with one important exception. If a paravirtualized server is running as a Xen VM guest, you should format the `/boot` partition with Ext2 as explained in [Section 9.4, “Xen VMs Need Ext2 for the System /Boot Volume,” on page 86](#).

Ext3

- ◆ Most popular Linux file system; limited scalability in size and number of files
- ◆ Journaled
- ◆ POSIX extended access control

The Ext3 file system is a journaled file system that has the widest use in Linux today. It is the default file system for SUSE Linux 11 distributions. It is quite robust and quick, although it does not scale well to large volumes or a great number of files.

A scalability feature has been added called H-trees, which significantly improved Ext3’s scalability. However, it is still not as scalable as some of the other file systems. With H-trees, it scales similarly to NTFS. Without H-trees, Ext3 does not handle more than about 5,000 files in a directory.

Reiser

- ◆ Best performance and scalability when the number of files is great and/or files are small
- ◆ Journaled
- ◆ POSIX extended access control

Reiser was designed to remove the scalability and performance limitations that exist in Ext2 and Ext3 file systems.

Reiser scales and performs extremely well on Linux, outscaling Ext3 with H-trees. In addition, Reiser was designed to use disk space very efficiently.

XFS

- ♦ Best for extremely large file systems, large files, and lots of files
- ♦ Journaled (an asymmetric parallel cluster file system version is also available)
- ♦ POSIX extended access controls

The XFS file system is open source and is included in major Linux distributions. It originated from SGI (Irix) and was designed specifically for large files and large volume scalability.

Video and multimedia files are best handled by this file system. Scaling to petabyte volumes, it also handles very large amounts of data. It is one of the few file systems on Linux that supports HSM data migration.

File Access Protocol Support

OES 2015 SP1 offers support for a variety of file access protocols.

- ♦ **AFP:** The Apple Filing Protocol (AFP) is a network protocol that offers file services for Mac OS X and the original Mac OS.
- ♦ **CIFS (Novell CIFS and Novell Samba):** The Common Internet File Services (CIFS) protocol is the protocol for Windows networking and file services.

Novell CIFS is a ported version of the CIFS file service traditionally available only on NetWare. It supports Novell Trustee model access for NSS volumes and Dynamic Storage Technology shadow volumes

Novell Samba is a Novell's customized version of an open source software version of CIFS developed after extensive use and analysis of the wire protocol of Microsoft Windows machines.

Beginning with OES 2015 SP1, both eDirectory and Active Directory users can natively access NSS resources using the CIFS protocol.

- ♦ **FTP:** The File Transfer Protocol (FTP) is one of the most common and widely used simple protocols in the Internet. Virtually all platforms and devices support FTP at some level, but it is a very simple protocol, only allowing for uploading and downloading of files. OES provides FTP functionality similar to that available on NetWare. For more information, see [Section 18.5, "Novell FTP \(Pure-FTPd\) and OES 2015 SP1," on page 203](#).
- ♦ **HTTP:** The Hypertext Transfer Protocol (HTTP) is the dominant protocol on the World Wide Web today, and is the one "spoken" by Web browser clients and Web servers. It is like FTP in being designed strictly for transfers of HTML (Hypertext Markup Language) and additional markup languages that have been invented, such as XML (Extensible Markup Language).

The NetStorage file service provides secure Internet-based access to files and folders on OES and NetWare servers through a browser or Microsoft Web Folders (Microsoft's implementation of WebDAV).

- ♦ **NCP:** The NetWare Core Protocol (NCP) is the client server protocol that was developed by Novell for supporting DOS, Windows, OS/2, Macintosh, UNIX (UnixWare), and Linux for shared file services.

The NCP Server included in OES features emulation of the Novell Trustee Model and inheritance plus visibility when it runs on traditional POSIX file systems such as Ext3, Reiser, and XFS. When it runs on NSS, these capabilities are synchronized with the NSS File system and its extended directory and file attributes, such as Rename Inhibit.

OES 2015 SP1 Workloads

Each file system has its strengths and weaknesses depending on the workload the file system supports. This section gives some guidelines for picking and building the right file system for a given workload. In determining which file system to use for a particular workload, consider your environment and the following explanation of each workload to determine which file system best meets your workload environment.

Table 13-2 File System Support per Workload

Workload Type	NSS File System	Btrfs	Ext3 File System	Reiser File System	XFS File System
AFP (Novell AFP)	Supported	Not Supported	Not Supported	Not Supported	Not Supported
CIFS (Novell CIFS)	Supported	Not Supported	Not Supported	Not Supported	Not Supported
Cluster Services	Recommended	Supported	Recommended	Recommended	Recommended
Collaboration (GroupWise)	Supported	Supported	Recommended	Supported	Supported
Dynamic Storage Technology	Supported	Not Supported	Not Supported	Not Supported	Not Supported
File serving – Application server	Supported	Supported	Supported	Recommended	Recommended
iFolder	Recommended	Supported	Supported	Recommended	Recommended
NCP (Novell Client)	Recommended	Supported	Supported	Supported	Supported
NetStorage	Recommended	Supported	Recommended	Recommended	Recommended
NSS-AD Integration	Supported	Not Supported	Not Supported	Not Supported	Not Supported
Printing (iPrint)	Recommended	Supported	Recommended	Recommended	Recommended
PureFTP	Recommended	Supported	Recommended	Recommended	Recommended

The following sections provide a brief summary of considerations for the workload types listed in [Table 13-2](#).

- ◆ [“Collaboration \(GroupWise\)” on page 136](#)
- ◆ [“Dynamic Storage Technology” on page 137](#)
- ◆ [“File Serving” on page 137](#)
- ◆ [“iFolder” on page 137](#)
- ◆ [“Novell Cluster Services” on page 137](#)
- ◆ [“Printing \(iPrint\)” on page 137](#)

Collaboration (GroupWise)

GroupWise deals with many little files. Because only the application process is accessing the file system, the added overhead of the rich ACL and file attributes found in NSS is redundant. The necessary characteristics are a file system whose performance remains relatively constant regardless of the number of files that are in the volume, and that performs well with small files. GroupWise recommends the Ext3 file system. NSS and Reiser are also supported.

Dynamic Storage Technology

Dynamic Storage Technology does not depend on a particular file system in principle; however, it is currently supported only on NSS volumes.

File Serving

Generally there are two types of NAS use cases: Serving files to application servers in a tiered service oriented architecture (SOA), and serving files to end user desktops and workstations. The former has minimal access control requirements. The latter has quite heavy access control requirements.

Typically for serving files to application servers (traditional NAS), you would choose a file system that is scalable and fast. Reiser and XFS would be good choices in this environment. For file serving to end user workstations, the access control and security management capabilities of the NSS file systems with AFP, CIFS, and NCP file access protocols are important.

The NSS model does better than the other file systems for very large numbers of users. It allows for security between users and also allows for very fine granular sharing between given users and groups. NSS includes a visibility feature implemented in the file system that prevents unauthorized users from even seeing subdirectory structures they don't have rights to access.

iFolder

Novell iFolder does not depend on a particular file system. Based on the client workload, the file system should be chosen at the server side. Because it mostly serves user data, a file system that can scale with a large number of files is the best suited in most deployments, making Reiser and NSS the best bets. Novell iFolder maintains its own ACL, so having an NSS file system that supports a rich ACL might be redundant.

Novell Cluster Services

Novell Cluster Services does not depend on a particular file system. For shared storage, the file systems software must be available from node to node. For example, if you are using NSS on one node, you need to use NSS on the failover node as well.

Printing (iPrint)

iPrint is file system agnostic. There is no noticeable difference in performance or reliability on any of the file systems.

13.2.5 NSS Planning Considerations

To plan for NSS volumes—including prerequisites and security considerations—see [“Planning NSS Storage Solutions”](#) in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

13.3 Coexistence and Migration of Storage Services

The following sections summarize the coexistence and migration issues related to storage services.

- ◆ [Section 13.3.1, “Databases,” on page 138](#)
- ◆ [Section 13.3.2, “NetWare 6.5 SP8,” on page 138](#)
- ◆ [Section 13.3.3, “OES 2015 SP1 File System Options,” on page 139](#)

13.3.1 Databases

The SUSE Linux Enterprise Server 11 (SLES 11) SP4 platform on which OES 2015 SP1 services are installed, includes two open source databases:

- ♦ “MySQL” on page 138
- ♦ “PostgreSQL” on page 138

NOTE: Full Novell support of these databases requires a product-specific Novell support contract. Documentation and support are available through open source communities as outlined below.

MySQL

The SLES 11 platform includes the open source MySQL database server and client. When combined with a Web application and a Web server, MySQL is a very reliable and scalable database for use in hosting e-commerce and business-to-business Web applications. See the [documentation on the Web \(http://dev.mysql.com/doc/\)](http://dev.mysql.com/doc/).

For overview of MySQL and for information about configuring it with Novell Cluster Services, see “[Configuring MySQL with Novell Cluster Services](#)” in the *OES 2015 SP1: Web Services and Applications Guide*.

PostgreSQL

The more powerful PostgreSQL database server also comes with SLES 11. See the [PostgreSQL documentation on the Web \(http://www.postgresql.org/docs/8.3/interactive/index.html\)](http://www.postgresql.org/docs/8.3/interactive/index.html).

13.3.2 NetWare 6.5 SP8

NetWare 6.5 SP8 supports both the NetWare Traditional file system and Novell Storage Services (NSS).

- ♦ “NetWare Traditional File System” on page 138
- ♦ “NSS Volumes” on page 138

NetWare Traditional File System

Although NetWare 6.5 SP8 supports Traditional volumes, you must upgrade them to NSS before upgrading from NetWare to OES.

NSS Volumes

To support data migration, NSS volumes are cross-compatible between NetWare and OES servers. During a cluster conversion from NetWare 6.5 SP8 to OES, clustered NSS pools that were originally created on a NetWare server can fail over between kernels, allowing for full data and file system feature preservation when migrating data to OES. For information, see the *OES 2015 SP1: Novell Cluster Services NetWare to Linux Conversion Guide*.

For additional information about coexistence and migration of NSS volumes, as well as access control issues for NSS on OES, see “[Migrating NSS Devices to OES 2015 SP1](#)” in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

13.3.3 OES 2015 SP1 File System Options

OES 2015 SP1 provides support for Novell Storage Services (NSS) as well as Linux POSIX file systems.

- ♦ [“NSS Volumes” on page 139](#)
- ♦ [“Linux POSIX File Systems” on page 139](#)

NSS Volumes

To support migration from NetWare to OES, NSS volumes are cross-compatible between NetWare and Linux.

On OES, you can use NSS volumes only as data volumes.

You configure NSS pools and volumes in iManager or NSSMU after the server installation completes successfully. You can also use the Novell Linux Volume Manager (NLVM) command line interface.

Starting with NetWare 6.5 SP4 (and OES 1), a new metadata structure provided enhanced support for hard links. After you upgrade your operating system to OES, you must upgrade the media format in order to use the new metadata structure; some restrictions apply. For more information, see [“Upgrading the NSS Media Format”](#) in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

For additional information about coexistence and migration of NSS volumes, as well as access control issues for NSS on Linux, see [“Cross-Platform Issues for NSS”](#) in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

Beginning with OES 2015 SP1, both eDirectory and Active Directory are supported as identity sources, and OES enables the NSS file system to accept eDirectory and Active Directory identities as trustees. For more information, see [“Upgrading the NSS Media Format”](#) in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

Linux POSIX File Systems

IMPORTANT: Users can access data storage on OES 2015 SP1 servers through a number of methods. For more information, see [“Overview of File Services” on page 185](#).

OES 2015 SP1 includes tools and services that help bridge the gap between traditional Novell file services and Linux POSIX file services.

- ♦ [“Management Tools” on page 139](#)
- ♦ [“NCP Server” on page 140](#)
- ♦ [“Novell Cluster Services” on page 140](#)

Management Tools

Using NSSMU and the Novell Linux Volume Manager (NLVM) command line interface, you can create native Linux POSIX volumes and standalone or clustered Linux Logical Volume Manager 2 (LVM2) volume groups and logical volumes.

NCP Server

OES 2015 SP1 includes NCP Server for Linux. After you create native Linux POSIX volumes, you can use NCP Server to create NCP shares on them. You can then manage the shares as NCP volumes.

This lets Novell Client users map drives to Linux POSIX file system data, with access controls being enforced by NCP. For more information on using NCP Server for Linux in OES, see the [OES 2015 SP1: NCP Server for Linux Administration Guide](#).

Novell Cluster Services

For information about clustering LVM2 volume groups with Novell Cluster Services, see “[Configuring and Managing Cluster Resources for Shared LVM Volume Groups](#)” in the [OES 2015 SP1: Novell Cluster Services for Linux Administration Guide](#).

13.4 Configuring and Maintaining Storage

- ◆ [Section 13.4.1, “Managing Directories and Files,” on page 140](#)
- ◆ [Section 13.4.2, “Managing NSS,” on page 140](#)
- ◆ [Section 13.4.3, “Optimizing Storage Performance,” on page 142](#)

13.4.1 Managing Directories and Files

To learn about managing directories and files on an OES 2015 SP1 server, see “[Understanding Directory Structures in Linux POSIX File Systems](#)” in the [OES 2015 SP1: File Systems Management Guide](#) and “[Understanding Directory Structures for the NSS File System](#)” in the [OES 2015 SP1: File Systems Management Guide](#).

13.4.2 Managing NSS

Use the links in [Table 13-3](#) to find information on the many management tasks associated with NSS volumes.

Table 13-3 NSS Management

Category/Feature	Description	Link
Compression	Conserve disk space and increase the amount of data a volume can store.	“Managing Compression on NSS Volumes” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Console Commands	Manage NSS volumes in an OES terminal console via the NSS Console (<code>nsscon</code>) utility. You can also issue Novell Linux Volume Manager (NLVM) command line commands at the console prompt and in scripts.	“NSS Commands” and “NSS Utilities” in the OES 2015 SP1: NSS File System Administration Guide for Linux

Category/Feature	Description	Link
Distributed File Services (DFS)	Use DFS junctions to transparently redirect data requests, split volumes while maintaining transparent access, and quickly move volume data to another volume.	OES 2015 SP1: Novell Distributed File Services Administration Guide for Linux
Encryption	Create and manage encrypted NSS volumes that make data inaccessible to software that circumvents normal access control.	“Managing Encrypted NSS Volumes” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Hard Links	Create multiple names for a single file in the same or multiple directories in an NSS volume.	“Managing Hard Links” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Monitoring	Monitor NSS file systems.	“Monitoring the Status of the NSS File System and Services” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Multipath Support on Linux	Use Linux Device Mapper Multipath I/O tools to manage the dynamic, multiple, redundant connection paths between a Linux server and its external storage devices.	“Managing Multipath I/O to Devices” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Novell Linux Volume Manager	NLVM provides a command line interface that lets you manage the NSS file system at a terminal console or by using a script. It also provides APIs that are used by the NSSMU and iManager storage management tools.	OES 2015 SP1: NLVM Reference
Partitions	Manage partitions on NSS volumes.	“Managing Partitions” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Pools	Create and manage NSS pools.	“Managing NSS Pools” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Pool Move	You can move the contents of a pool from one location to another on the same system. The destination location can be made up of one or multiple devices. If the new location is larger than the original location, the pool is automatically expanded after the move is complete.	“Move” in the OES 2015 SP1: NLVM Reference “Moving a Pool” in the OES 2015 SP1: NSS File System Administration Guide for Linux
Quotas	Set space restrictions for users and directories to control storage usage.	“Managing Space Quotas for Volumes, Directories, and Users” in the OES 2015 SP1: NSS File System Administration Guide for Linux
RAID	Create and manage software RAIDs.	“Managing NSS Software RAID Devices” in the OES 2015 SP1: NSS File System Administration Guide for Linux

Category/Feature	Description	Link
Salvage subsystem	Use the salvage subsystem to make deleted files and directories available for undelete or purge actions.	“Salvaging and Purging Deleted Volumes, Directories, and Files” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>
Snapshots	Take pool snapshots.	“Managing NSS Pool Snapshots” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>
Tools	Learn about the various tools available to manage NSS volumes, the tool capabilities, and how to use them.	“Management Tools for NSS” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>
Troubleshooting	Troubleshoot NSS on OES and NetWare 6.5 SP8.	“Troubleshooting the NSS File System” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>
File System Trustees and Attributes	Control user access to data by setting trustees, trustee rights, and inherited rights filters for files. Control file behavior by setting file and folder attributes.	“Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>
Volumes	Create and manage NSS volumes in NSS pools.	“Managing NSS Volumes” in the <i>OES 2015 SP1: NSS File System Administration Guide for Linux</i>

13.4.3 Optimizing Storage Performance

See [“Tuning NSS Performance”](#) in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

14 eDirectory, LDAP, NSS AD, and Domain Services for Windows

This section discusses the following topics:

- ◆ [Section 14.1, “Overview of Directory Services,” on page 143](#)
- ◆ [Section 14.2, “eDirectory,” on page 144](#)
- ◆ [Section 14.3, “LDAP \(eDirectory\),” on page 145](#)
- ◆ [Section 14.4, “NSS AD Support,” on page 146](#)
- ◆ [Section 14.5, “Why Both NSS AD and DSfW?,” on page 146](#)
- ◆ [Section 14.6, “Domain Services for Windows,” on page 147](#)

14.1 Overview of Directory Services

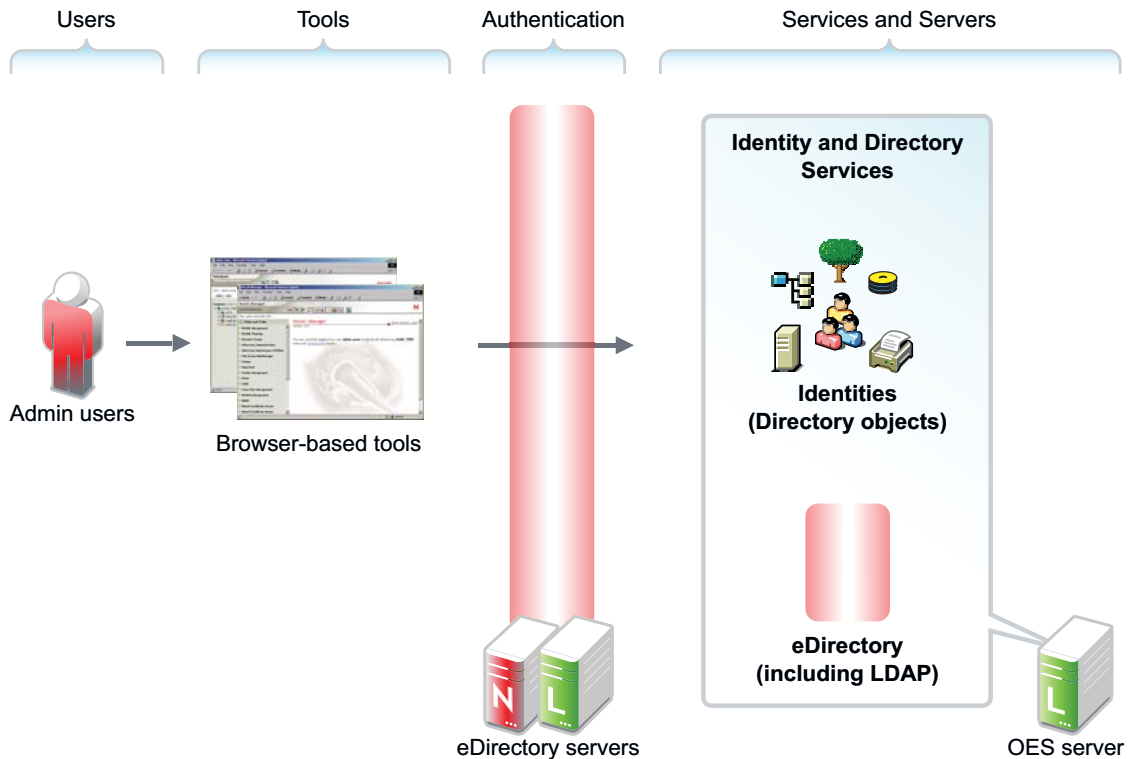
Storing and managing network identities in directory services is a fundamental expectation for networking.

In the simplest terms, NetIQ eDirectory is a tree structure containing a list of objects (or identities) that represent network resources, such as the following:

- ◆ Network users
- ◆ Servers
- ◆ Printers
- ◆ Applications

eDirectory is designed to provide easy, powerful, and flexible management of network resources (including eDirectory itself) in ways that no other directory service can match. You can administer eDirectory through the same browser-based tools on both OES and NetWare.

Figure 14-1 eDirectory Overview



14.2 eDirectory

NetIQ eDirectory is the central, key component of Novell Open Enterprise Server (OES) and provides the following:

- ◆ Centralized identity management
- ◆ The underlying infrastructure for managing your network servers and the services they provide
- ◆ Access security both within the firewall and from the Web

This section discusses the following tasks:

- ◆ [Section 14.2.1, “Installing and Managing eDirectory on OES,” on page 144](#)
- ◆ [Section 14.2.2, “Planning Your eDirectory Tree,” on page 145](#)
- ◆ [Section 14.2.3, “eDirectory Coexistence and Migration,” on page 145](#)

14.2.1 Installing and Managing eDirectory on OES

The tools you can use to install and manage eDirectory on OES are outlined in the following sections.

- ◆ [“OES Installation Programs” on page 144](#)
- ◆ [“iManager” on page 145](#)

OES Installation Programs

OES requires that eDirectory be installed by using the YaST-based OES install.

IMPORTANT: Other utilities, such as ndsconfig and ndsmanage, are not supported for installing or removing eDirectory on OES servers, unless explicitly called for in OES-specific instructions.

iManager

iManager is the OES eDirectory management tool and is used for all eDirectory management and most OES component management tasks, including the following:

- ♦ Creating eDirectory objects, including User and Group objects
- ♦ Managing eDirectory objects
- ♦ Configuring and managing OES service component controls in eDirectory
- ♦ Accessing other OES component management tools

For information on using iManager, see the [NetIQ® iManager Administration Guide](#).

14.2.2 Planning Your eDirectory Tree

If you don't have eDirectory installed on your network, it is critical that you and your organization take time to plan and design your eDirectory tree prior to installing OES.

For detailed information on getting started using eDirectory, see “[Designing Your NetIQ eDirectory Network](#)” in the [NetIQ eDirectory 8.8 SP8 Installation Guide](#).

To learn what's new in eDirectory 8.8, see the [NetIQ eDirectory 8.8 SP8 What's New Guide](#).

14.2.3 eDirectory Coexistence and Migration

Novell Directory Services (NDS) was introduced with NetWare 4.0. The successor to NDS, NetIQ eDirectory, is also available for Microsoft Windows, Red Hat, and SUSE versions of Linux, as well as various flavors of UNIX (Solaris, AIX, and HP-UX).

As eDirectory has evolved, backward compatibility issues have arisen. For example, moving from NetWare 4.x to 5.x involved not only upgrading NDS, but also moving from IPX to TCP/IP. This transition brought significant changes to the core schema and security-related components. Novell has consistently provided the migration tools and support required to migrate to new eDirectory versions.

OES 2015 SP1 includes eDirectory 8.8. For those upgrading an existing NetWare 6.5 SP6 server, eDirectory 8.7.3 is still available. New NetWare installations require eDirectory version 8.8.

For complete coexistence and migration information and instructions, see “[Migrating to eDirectory 8.8 SP8](#)” in the [NetIQ eDirectory 8.8 SP8 Installation Guide](#).

14.3 LDAP (eDirectory)

This section contains information about LDAP support in OES.

- ♦ [Section 14.3.1, “Overview of eDirectory LDAP Services,” on page 146](#)
- ♦ [Section 14.3.2, “Planning eDirectory LDAP Services,” on page 146](#)
- ♦ [Section 14.3.3, “Migration of eDirectory LDAP Services,” on page 146](#)
- ♦ [Section 14.3.4, “eDirectory LDAP Implementation Suggestions,” on page 146](#)

14.3.1 Overview of eDirectory LDAP Services

Lightweight Directory Access Protocol (LDAP) Services for NetIQ eDirectory is a server application that lets LDAP clients access information stored in eDirectory.

Most OES services leverage the LDAP server for eDirectory for authentication, as illustrated in the service overviews in this guide.

14.3.2 Planning eDirectory LDAP Services

LDAP for eDirectory provides LDAP authentication for the objects stored in eDirectory. As you plan your eDirectory tree, be sure you understand the information in “[Understanding LDAP Services for NetIQ eDirectory](#)” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

14.3.3 Migration of eDirectory LDAP Services

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 more information, see “[NetIQ eDirectory Management Utilities](#)” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

14.3.4 eDirectory LDAP Implementation Suggestions

OES service LDAP support requires no additional setup or configuration beyond the OES install.

For help with setting up and using LDAP for eDirectory for other purposes, you can refer to “[Configuring LDAP Services for NetIQ eDirectory](#)” in the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

14.4 NSS AD Support

Beginning with OES 2015 SP1, you can provide native CIFS access to NSS volumes by deploying the NSS AD Integration service.

For more information, see the *OES 2015 SP1: NSS AD Administration Guide*.

14.5 Why Both NSS AD and DSfW?

NSS AD Integration and Domain Services for Windows (DSfW) are very different services, from a directory standpoint.

Also, DSfW is broader in scope than NSS AD.

- ♦ **NSS AD:** Provides AD users with native CIFS access to NSS-based storage.
Other file services such as AFP and NetStorage are not currently supported and are unaffected.
- ♦ **DSfW:** Provides eDirectory users with native access to Windows servers and services, including NTFS-based storage.

14.6 Domain Services for Windows

Novell Domain Services for Windows (DSfW) allows eDirectory users on Windows workstations to access storage on both OES servers and Windows servers through native Windows and Active Directory authentication and file service protocols.

DSfW enables companies with Active Directory and NetIQ eDirectory deployments to achieve better coexistence between the two platforms.

- ♦ Users can work in a pure Windows desktop environment and still take advantage of some OES back-end services and technology, without the need for a Novell Client™ or even a matching local user account on the Windows workstation.
- ♦ Network administrators can use Microsoft Management Console (MMC) to administer users and groups within the DSfW domain, including their access rights to Samba-enabled storage on OES servers.

This section discusses the following:

- ♦ [Section 14.6.1, “Graphical Overview of DSfW,” on page 147](#)
- ♦ [Section 14.6.2, “Planning Your DSfW Implementation,” on page 149](#)
- ♦ [Section 14.6.3, “Implementing DSfW on Your Network,” on page 150](#)

14.6.1 Graphical Overview of DSfW

- ♦ [“User Management” on page 148](#)
- ♦ [“Storage Management” on page 149](#)

User Management

Figure 14-2 DSfW User Management Overview

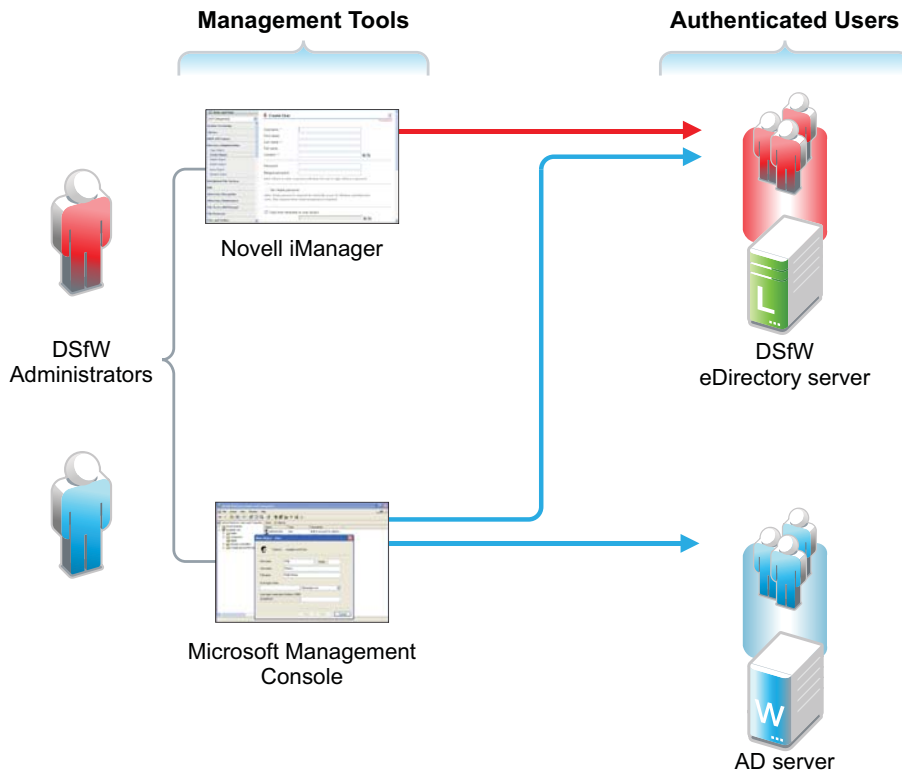


Table 14-1 DSfW User Management

Management Tools	Users
iManager manages DSfW users like other eDirectory users.	DSfW users must have the Default Domain Password policy assigned and a valid Universal Password.
MMC manages both AD users and DSfW users as though they were AD users.	DSfW users are automatically enabled for Samba and LUM.

Storage Management

Figure 14-3 DSfW Storage Management Overview

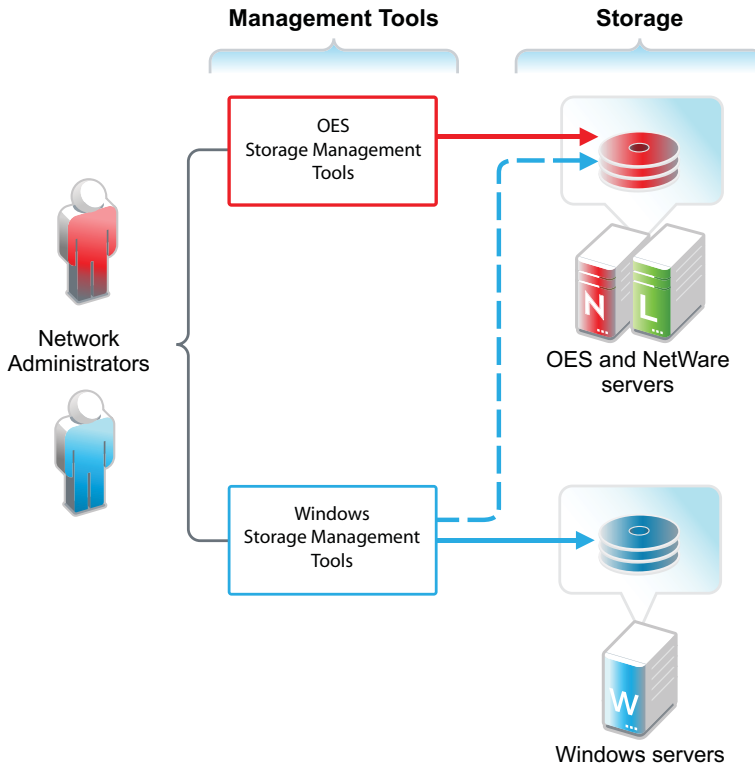


Table 14-2 DSfW Storage Management

Management Tools	Storage
<p>Network administrators use native OES and Windows storage management tools to create and manage storage devices on OES and Windows servers, respectively.</p> <p>Windows management tools can also manage share access rights and POSIX file system rights on DSfW storage devices after the shares are created. They cannot create the shares or perform other device management tasks.</p>	<p>Storage devices on OES servers can be either NSS or traditional Linux volumes. Samba management standards apply to both volume types.</p>

14.6.2 Planning Your DSfW Implementation

For planning information, see the [OES 2015 SP1: Domain Services for Windows Administration Guide](#).

14.6.3 Implementing DSfW on Your Network

This section highlights some of the potential caveats to consider when installing DSfW. For complete information, see the [OES 2015 SP1: Domain Services for Windows Administration Guide](#), especially the “[Troubleshooting DSfW](#)” section.

- ♦ [“Implement Universal Password Before DSfW in a Name-Mapped Scenario”](#) on page 150
- ♦ [“DSfW Must Be Installed at the Root of an eDirectory Partition”](#) on page 150
- ♦ [“Hierarchical Placement of Users in the eDirectory Tree”](#) on page 150
- ♦ [“OES 2015 SP1 Service Limitations”](#) on page 150
- ♦ [“Install DSfW on a New OES 2015 SP1 Server When Possible”](#) on page 150
- ♦ [“DNS Configuration”](#) on page 151

Implement Universal Password Before DSfW in a Name-Mapped Scenario

If you install DSfW into an existing tree and your users don't currently have a Universal Password policy assigned, they won't be able to log in without the Novell Client until the Universal Password has been set.

Therefore, you should consider implementing Universal Password and giving users an opportunity to log into the network before installing DSfW. Logging in after a password policy is in place creates a Universal Password for users so that their transition to DSfW is seamless.

DSfW Must Be Installed at the Root of an eDirectory Partition

You must install DSfW in the root container or an eDirectory partition, either one that currently exists or one that you create for DSfW.

Hierarchical Placement of Users in the eDirectory Tree

DSfW users must reside in the same eDirectory partition where DSfW is installed, either in the same container or in a container below it in the hierarchy. Therefore, DSfW should be installed high enough in the eDirectory tree that it encompasses all of the users that you want to enable for DSfW access.

OES 2015 SP1 Service Limitations

Only designated OES 2015 SP1 services can be installed on a DSfW server. For more information, see [“Unsupported Service Combinations”](#) in the [OES 2015 SP1: Domain Services for Windows Administration Guide](#).

Install DSfW on a New OES 2015 SP1 Server When Possible

Because of the service limitations mentioned in [OES 2015 SP1 Service Limitations](#), Novell strongly recommends that you install DSfW on a new server.

DNS Configuration

As you set up DNS, observe the following guidelines:

- ♦ **First DSfW Server (FRD):** This should point to itself as the primary DNS server, and to the network DNS server as the secondary DNS server (if applicable).
- ♦ **Subsequent DSfW Servers:** These must point to the FRD as their primary DNS server and optionally to the network DNS server as their secondary DNS server.
- ♦ **DSfW Workstations:** These must be able to resolve the FRD of the DSfW forest. For example, you might configure workstations to point to the FRD as their primary DNS server and to the network DNS server secondarily. Or if the network DNS server is configured to forward requests to the DSfW server, then workstations could point to it as their primary DNS server.

15 Users and Groups

Networks exist to serve users and groups of users. Open Enterprise Server 2015 or later provides strong user and group management through eDirectory and its associated technologies.

- ♦ [Section 15.1, “Creating Users and Groups,” on page 153](#)
- ♦ [Section 15.2, “Linux User Management: Access to Linux for eDirectory Users,” on page 153](#)
- ♦ [Section 15.3, “Identity Management Services,” on page 162](#)
- ♦ [Section 15.4, “Using the Identity Manager 4.5 Bundle Edition,” on page 163](#)

15.1 Creating Users and Groups

All OES services require that you create User objects to represent the users on your system. The Linux User Management (LUM) and Samba components on OES also require that you create a LUM-enabled Group object that you can assign the users to.

In addition to these basic objects, it is usually helpful to organize your tree structure by using Organizational Unit objects to represent the structure of your organization and to serve as container objects to help manage the users, groups, servers, printers, and other organization resources you can manage through eDirectory.

For more information about Samba, see [Creating eDirectory Users for Samba](#) in the *OES 2015 SP1: Novell Samba Administration Guide*.

For detailed information on understanding, creating, and managing the various objects your organization might require, see the *NetIQ eDirectory 8.8 SP8 Administration Guide*.

15.2 Linux User Management: Access to Linux for eDirectory Users

NOTE: OES 2015 SP1 includes a new service named the Novell Identity Translator (NIT) that is associated with Linux User Management.

NIT represents a new approach to the service that LUM provides and works seamlessly with LUM to provide access to Novell CIFS in OES 2015 SP1.

For more information about NIT, see [Section 1.18, “Novell Identity Translator \(NIT\),” on page 19](#).

Users and groups on NetWare servers are created in and managed through eDirectory; users and groups on Linux servers are usually created locally and managed according to the POSIX (Portable Operating System Interface) standard.

Because Open Enterprise Server provides services running on both Linux and NetWare, Novell has developed a technology that lets eDirectory users also function as “local” POSIX users on Linux servers. This technology is called Linux User Management or LUM.

The following sections outline the basic principles involved in Novell LUM and cover the following topics:

- ◆ [Section 15.2.1, “Overview,” on page 154](#)
- ◆ [Section 15.2.2, “LUM Changes,” on page 159](#)
- ◆ [Section 15.2.3, “Planning,” on page 159](#)
- ◆ [Section 15.2.4, “LUM Implementation Suggestions,” on page 160](#)

15.2.1 Overview

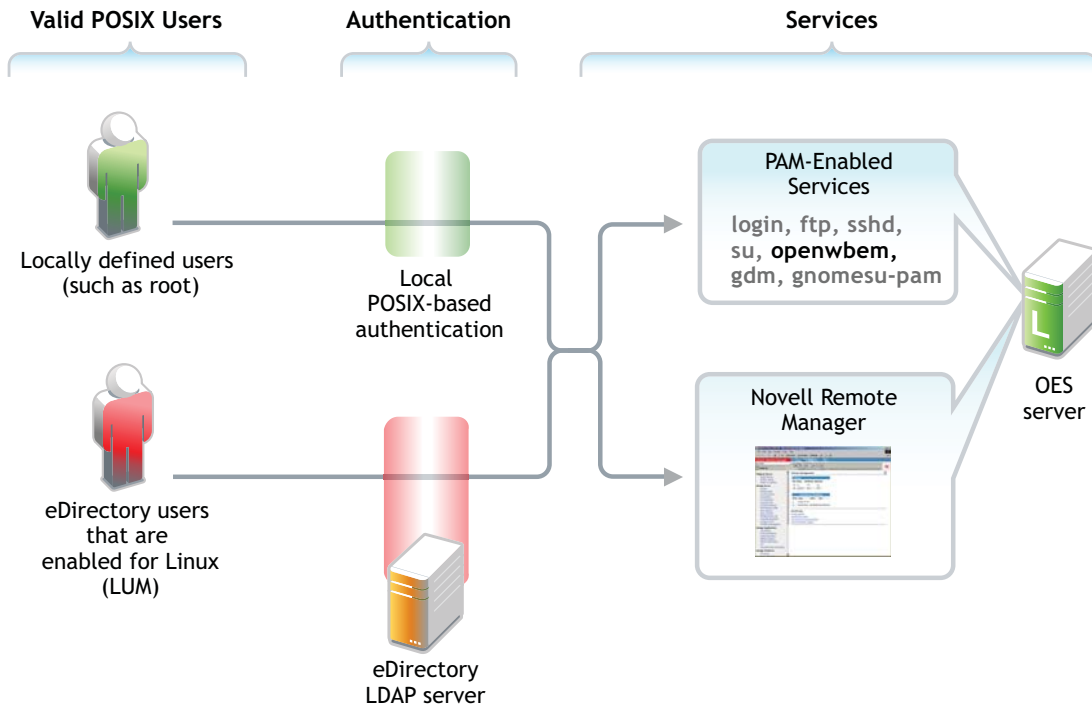
The topics in this section are designed to help you understand when LUM-enabled access is required so that your network services are accessible and work as expected. For more information about Linux User Management, see “[Overview](#)” in the *OES 2015 SP1: Linux User Management Administration Guide*.

- ◆ [“A Graphical Preview of Linux User Management” on page 154](#)
- ◆ [“Linux Requires POSIX Users” on page 155](#)
- ◆ [“Linux Users Can Be Local or Remote” on page 155](#)
- ◆ [“The root User Is Never LUM-Enabled” on page 156](#)
- ◆ [“About Service Access on OES” on page 156](#)
- ◆ [“OES Services That Require LUM-Enabled Access” on page 156](#)
- ◆ [“OES Services That Do Not Require LUM-Enabled Access But Have Some LUM Requirements” on page 158](#)
- ◆ [“OES Services That Do Not Require LUM-enabled Access” on page 158](#)
- ◆ [“LUM-Enabling Does Not Provide Global Access to ALL OES Servers” on page 159](#)
- ◆ [“LUM-Enabling Required for Full Administrative Access” on page 159](#)

A Graphical Preview of Linux User Management

[Figure 15-1](#) illustrates how Linux User Management controls access to the OES server.

Figure 15-1 LUM Provides POSIX Access for eDirectory Users



The following table explains the information presented in Figure 15-1.

Table 15-1 Linux User Management

Valid POSIX Users	Authentication	eDirectory Authenticated Services
Some services on OES servers must be accessed by POSIX users.	When the system receives an action request, it can authenticate both local POSIX users and users who have been enabled for Linux access.	Users can potentially access PAM-enabled services, Samba shares, and Novell Remote Manager as either local or eDirectory users.
eDirectory users can function as POSIX users if they are enabled for Linux access (LUM).		By default, only the <code>sfc</code> command (required for server management) is enabled for eDirectory access.

Linux Requires POSIX Users

Linux requires that all users be defined by standard POSIX attributes, such as username, user ID (UID), primary group ID (GID), password, and other similar attributes.

Linux Users Can Be Local or Remote

Users that access a Linux server can be created in two ways:

- Locally (on the server):** Local users are managed at a command prompt (using commands such as `useradd`) or in YaST. (See the `useradd(8)` man page and the YaST online help for more information.) These local users are stored in the `/etc/passwd` file. (See the `passwd(5)` man page for more information.)

IMPORTANT: As a general rule on OES servers, the only local user account that should exist is `root`. All other user accounts should be created in eDirectory and then be enabled for Linux access (LUM). You should never create duplicate local and eDirectory user accounts.

For more information, see [Section 6.2, “Avoiding POSIX and eDirectory Duplications,”](#) on page 64.

- ♦ **Remotely (off the server):** Remote users can be managed by other systems, such as LDAP-compliant directory services. Remote user access is enabled through the Pluggable Authentication Module (PAM) architecture on Linux.

The Linux POSIX-compliant interfaces can authenticate both kinds of users, independent of where they are stored and how they are managed.

The root User Is Never LUM-Enabled

The OES user management tools prevent you from creating an eDirectory user named `root`, thus replacing the `root` user on an OES server. If `root` were to be a LUM user and eDirectory became unavailable for some reason, there would be no root access to the system.

Even if eDirectory is not available, you can still log into the server through Novell Remote Manager and perform other system management tasks as the `root` user.

About Service Access on OES

Novell Linux User Management (LUM) lets you use eDirectory to centrally manage remote users for access to one or more OES servers.

In other words, LUM lets eDirectory users function as local (POSIX) users on an OES server. Access is enabled by leveraging the Linux Pluggable Authentication Module (PAM) architecture. PAM makes it possible for eDirectory users to authenticate with the OES server through LDAP.

In OES, the terms *LUM-enabling* and *Linux-enabling* are both used to describe the process that adds standard Linux (POSIX) attributes and values to eDirectory users and groups, thus enabling them to function as POSIX users and groups on the server.

You can use iManager to enable eDirectory users for Linux. For instructions, see [“About Enabling eDirectory Users for Linux Access”](#) on page 160.

OES Services That Require LUM-Enabled Access

Some services on an OES server require that eDirectory users be LUM-enabled to use them:

- ♦ **Novell Samba (CIFS) Shares on the Server:** Windows workgroup users who need access to Samba shares defined on the server must be LUM-enabled eDirectory users who are configured to access the server. This is because Samba requires POSIX identification for access.

By extension, NetStorage users who need access to Samba (CIFS) Storage Location objects that point to the server must also be LUM-enabled eDirectory users with access to the server.

NOTE: Although Samba users must be enabled for LUM, Samba is not a PAM-enabled service. Logging in to an OES server through Samba does not create a home directory on the server.

- ♦ **Core Linux Utilities Enabled for LUM:** These are the core utilities and other shell commands that you can specify during the OES install to be enabled for authentication through eDirectory LDAP. In Linux, these are known as PAM-enabled utilities or services.

IMPORTANT: Before you accept the default PAM-enabled service settings, be sure you understand the security implications explained in [Section 21.2.2, “User Restrictions: Some OES Limitations,”](#) on page 229.

The core utilities available for PAM-enablement are summarized in [Table 15-2](#).

Table 15-2 PAM-enabled Services Controlled by LUM

Command	Where Executed	Task
ftp	Another host	Transfer files to and from the OES server which, in this case, is a remote host.
gdm	◆ Local host ◆ Remote host	Run and manage the X servers using XDMCP.
gnomesu-pam	Local host	Required for GNOME applications that need superuser access.
login	◆ OES server ◆ SSH session with OES server	Log in to the OES server, either directly or in an SSH session with the server.
sfc	Local host	Required for iPrint, NSS, SMS, Novell Remote Manager, and iManager.
sshd	Another host	Establish a secure encrypted connection with the OES server which, in this case, is a remote host.
su	◆ OES server ◆ SSH session with OES server	Temporarily become another user. This is most often used to temporarily become the <code>root</code> user, who is not a LUM user and is, therefore, not affected by LUM.

NOTE: Logging in to the OES server through a PAM-enabled service for the first time causes the creation of a home directory in `/home` on the server.

- ◆ **Novell Remote Manager on Linux:** You can access Novell Remote Manager as the following:
 - ◆ The `root` user with rights to see everything on the Linux server.
 - ◆ A local Linux user with access governed by POSIX access rights. (Having local users in addition to `root` is not recommended on OES servers.)
 - ◆ A LUM-enabled eDirectory user, such as the Admin user created during the install.
- ◆ **Novell Storage Management Services (SMS) on Linux:** You can access SMS utilities as
 - ◆ The `root` user, who has rights to see everything on the Linux server, including NSS volumes.
 - ◆ A local Linux user with access governed by POSIX access rights. (Having local users in addition to `root` is not recommended on OES servers.)
 - ◆ A LUM-enabled eDirectory user, such as the Admin user created during the install.

OES Services That Do Not Require LUM-Enabled Access But Have Some LUM Requirements

Some services do not require eDirectory users to be LUM-enabled for service access:

- ♦ **NetStorage:** NetStorage users don't generally need to be LUM-enabled. However, salvaging and purging files through NetStorage on an NSS volume can only be done by users who are enabled for Linux.

IMPORTANT: Files that are uploaded by non-LUM users via NetStorage are owned, from a POSIX perspective, by the `root` user. The assumption is that such users are accessing their data on NSS or NCP volumes by using an NCP storage location object. In both cases, the Novell Trustee Model applies and POSIX ownership is irrelevant.

If non-LUM NetStorage users are later enabled for Samba access (which means they are then LUM-enabled), and they begin using Samba as a file service, their NetStorage uploaded files are not accessible through Samba until you make them the file owners from a POSIX perspective. Although the Novell implementation of Samba leverages eDirectory for authentication, Samba file and directory access is always controlled by POSIX. The Novell Trustee Model doesn't apply to Samba.

Both Novell trustee assignments and POSIX file ownership are tracked correctly after users are LUM-enabled.

Although NetStorage doesn't require LUM-enabled access, the service itself runs as a POSIX-compliant system (proxy) User (initially a local user on the OES server) who functions on behalf of the end users that are accessing the service.

If NetStorage must access NSS volumes, this local system user must be moved to eDirectory and LUM-enabled because only eDirectory users can access NSS volumes. The OES 2015 SP1 installation program configures this correctly by default.

For more information, see [Appendix H, "System User and Group Management in OES 2015 SP1," on page 257.](#)

- ♦ **NSS:** eDirectory users that access NSS volumes directly through NCP (the Novell Client) are not required to be LUM-enabled.

However, because Novell Samba accesses NSS through the virtual file system layer that makes NSS appear to be a POSIX-compliant file system, Samba users must be LUM-enabled to access an NSS volume.

OES Services That Do Not Require LUM-enabled Access

The following end user services do not require LUM-enabled access:

- ♦ iFolder 3.9.2
- ♦ iPrint
- ♦ NCP Client to an NCP Volume
- ♦ NCP Client to an NSS Volume
- ♦ Novell AFP
- ♦ Novell CIFS

LUM-Enabling Does Not Provide Global Access to ALL OES Servers

As you plan to LUM-enable users for access to the services that require it, keep in mind that each OES server being accessed must be associated with a LUM-enabled group that the accessing users belong to.

In other words, it is not sufficient to LUM-enable users for access to a single OES server if they need access to multiple servers. An association between the LUM-enabled groups that the users belong to and the eDirectory UNIX Workstation object associated with each server must be formed by using iManager. This can be accomplished for multiple servers by using the process described in [“Enabling eDirectory Groups and Users for Linux Access”](#) on page 160.

For more information on LUM, see the [OES 2015 SP1: Linux User Management Administration Guide](#).

LUM-Enabling Required for Full Administrative Access

The current LUM architecture requires that administrators, administrator equivalents, partition administrators, and RBS-enabled managers be LUM-enabled to have full management capabilities.

15.2.2 LUM Changes

In response to customer requests for improved LDAP performance, persistent searching for new Linux-enabled users and groups has been disabled in OES 2 SP3 and later.

For more information, see [Section 6.10, “LUM Cache Refresh No Longer Persistent,”](#) on page 71 and [“What’s New or Changed in Linux User Management”](#) in the [OES 2015 SP1: Linux User Management Administration Guide](#).

15.2.3 Planning

The following sections summarize LUM planning considerations.

- ♦ [“eDirectory Admin User Is Automatically Enabled for Linux Access”](#) on page 159
- ♦ [“Planning Which Users to Enable for Access”](#) on page 159
- ♦ [“Be Aware of System-Created Users and Groups”](#) on page 160

eDirectory Admin User Is Automatically Enabled for Linux Access

When you install Linux User Management on an OES server, the Admin User object that installs LUM is automatically enabled for eDirectory LDAP authentication to the server.

Planning Which Users to Enable for Access

You need to identify the eDirectory users (and groups) who need access to services on OES servers that require LUM-enabled users.

This can be easily determined by doing the following:

1. Review the information in [“OES Services That Require LUM-Enabled Access”](#) on page 156.
2. Identify the servers that will run the services mentioned.
3. Note the users and groups that need access and then configure their objects and the target servers/services for that access.

Be Aware of System-Created Users and Groups

You should also be aware of the system-created users and groups that are LUM-enabled when NSS is installed. For more information, see [Appendix H, “System User and Group Management in OES 2015 SP1,”](#) on page 257.

15.2.4 LUM Implementation Suggestions

The following sections summarize LUM implementation considerations.

- ♦ [“About Enabling eDirectory Users for Linux Access”](#) on page 160
- ♦ [““UNIX Workstation” and “Linux Workstation” Are the Same Thing”](#) on page 160
- ♦ [“Enabling eDirectory Groups and Users for Linux Access”](#) on page 160

About Enabling eDirectory Users for Linux Access

You can enable eDirectory users for Linux User Management by using either iManager 2.7 or the `nambulkadd` command.

- ♦ **iManager:** You can enable existing eDirectory users for Linux access by using the Linux User Management tasks in iManager.

You can enable multiple users in the same operation as long as they can be assigned to the same primary LUM-enabled group. The enabling process also lets you associate the group with one or more OES servers or Linux workstations.

Samba users are also enabled for Linux access as part of the Samba-enabling process.

- ♦ **nambulkadd:** If you have eDirectory users and groups that need to be enabled for Linux access, you can use the `nambulkadd` command to modify multiple objects simultaneously. For more information, see the [OES 2015 SP1: Linux User Management Administration Guide](#).

“UNIX Workstation” and “Linux Workstation” Are the Same Thing

When you use iManager to manage OES access, you might notice some inconsistencies in naming.

When OES servers are created, a “UNIX Workstation - *server_name*” object is created in eDirectory, where *server_name* is the DNS name of the OES server. In some places the iManager help refers to these server objects as “Linux Workstation” objects.

Both “UNIX Workstation” and “Linux Workstation” refer to the same eDirectory objects.

Enabling eDirectory Groups and Users for Linux Access

IMPORTANT: Users gain server access through their LUM-enabled group assignment rather than through a direct assignment to the UNIX Workstation objects themselves.

You can enable users for access to multiple OES servers by associating the LUM-enabled groups to which the users belong with the UNIX Workstation objects you want users to have access to.

There are four methods for enabling eDirectory groups and users for Linux access:

- ♦ [“Using iManager to Enable Groups and any Users Assigned to Them”](#) on page 161
- ♦ [“Using iManager to Bulk-Enable Users in a LUM Group”](#) on page 161

- ♦ [“Using iManager to Bulk-Enable Users in a Container” on page 161](#)
- ♦ [“Using LUM Utilities at the Command Prompt” on page 162](#)

Using iManager to Enable Groups and any Users Assigned to Them

The following steps assume that the eDirectory Group objects already exist and that any User objects you want to enable for Linux at the same time also exist and have been assigned to the groups.

- 1 Log in to iManager as the eDirectory Admin user or equivalent.
- 2 Click **Linux User Management > Enable Groups for Linux**.
- 3 Browse to and select one or more Group objects, then click **OK**.
- 4 If you want all users assigned to the groups to be enabled for Linux, make sure the **Linux-Enable All Users in These Groups** option is selected.
- 5 Click **Next**.
- 6 If the groups contain users, click **Next** to confirm that you want them enabled.
- 7 Browse to and select a UNIX Workstation (OES server) object, then click **OK**.
- 8 Browse to and select the Unix Config Object for the workstation, then click **OK**.
- 9 Click **Next**, click **Finish**, then click **OK**.

Using iManager to Bulk-Enable Users in a LUM Group

The following steps assume that the eDirectory LUM-enabled Group objects already exist and that they have assigned non-LUM-enabled User objects that you want to enable for Linux access.

- 1 Log in to iManager as the eDirectory Admin user or equivalent.
- 2 Click **Linux User Management > Bulk-Enable Users in a LUM Group**.
- 3 Browse to and select one or more LUM-enabled Group objects, then click **OK**.
- 4 Browse to and select the Unix Config Object, then click **OK**.
- 5 Click **Next**.
- 6 Click **Finish** to confirm that you want the listed users enabled for Linux.
- 7 Click **OK**.

Using iManager to Bulk-Enable Users in a Container

The following steps assume that eDirectory non-LUM-enabled User objects exist inside an eDirectory container (OU object) and that you want to enable these User objects for Linux access.

- 1 Log in to iManager as the eDirectory Admin user or equivalent.
- 2 Click **Linux User Management > Bulk-Enable Users in a Container**.
- 3 Browse to and select the Container (OU) object, then click **OK**.
- 4 Browse to and select the Unix Config Object, then click **OK**.
- 5 Browse to and select the LUM-enabled group that you want the users associated with for Linux access.
- 6 Click **Next**.
- 7 Observe that all user objects in the container are listed for assignment to the group you have selected as the primary group. If you don't want already enabled user objects that are currently assigned to a different primary group to have that assignment changed, you must deselect them at this point.

- 8 Click **Finish** to confirm that you want the selected users enabled for Linux (if not already) and assigned to the select group.
- 9 Click **OK**.

Using LUM Utilities at the Command Prompt

Novell Linux User Management includes utilities for creating new LUM-enabled groups, and for enabling existing eDirectory groups for Linux access.

- ♦ The `nambulkadd` utility lets you use a text editor to create a list of groups you want enabled for Linux access. For more information, see “`nambulkadd`” in the [OES 2015 SP1: Linux User Management Administration Guide](#).

IMPORTANT: Be sure to include a blank line at the end of each text file. Otherwise, the last line of the file won't be processed properly.

- ♦ The `namgroupadd` utility lets you create a new LUM-enabled group or enable an existing eDirectory group for Linux access. For more information, see “`namgroupadd`” in the [OES 2015 SP1: Linux User Management Administration Guide](#).

15.3 Identity Management Services

Providing network users with a network identity is a fundamental expectation for networking, but it can also become confusing when users need to track multiple identities to use network services. When you add the traditional POSIX users found on Linux systems to the mix, the picture becomes even more complex.

The identity management services provided by Novell Open Enterprise Server (OES) leverage NetIQ eDirectory to simplify and customize identity management to fit your needs:

- ♦ If you currently store and manage all your users and groups in eDirectory, you can continue to do so.
- ♦ If you use Novell Client software to provide network file and print services, you can provide seamless file and print access to OES servers by using the NCP server for Linux and iPrint services. For more information, see [Section 18.6, “NCP Implementation and Maintenance,” on page 210](#) and [Chapter 19, “Print Services,” on page 217](#).
- ♦ If you want eDirectory users to have access to OES services that require POSIX authentication, you can enable the users for Linux access. For more information, see [Section 15.2, “Linux User Management: Access to Linux for eDirectory Users,” on page 153](#).
- ♦ If you need to store and manage users in multiple directories, you can greatly strengthen your organization's security and dramatically decrease your identity management costs by deploying NetIQ Identity Manager. For more information, see [Section 15.4, “Using the Identity Manager 4.5 Bundle Edition,” on page 163](#).

15.4 Using the Identity Manager 4.5 Bundle Edition

NetIQ Identity Manager is a data-sharing solution that leverages the Identity Vault to synchronize, transform, and distribute information across applications, databases, and directories.

The Identity Manager Bundle Edition provides licensed synchronization of information (including passwords) held in Active Directory Domains and eDirectory systems. When data from one system changes, Identity Manager detects and propagates these changes to other connected systems based on the business policies you define.

This section discusses the following:

- ◆ [Section 15.4.1, “What Am I Entitled to Use?,” on page 163](#)
- ◆ [Section 15.4.2, “System Requirements,” on page 163](#)
- ◆ [Section 15.4.3, “Installation Considerations,” on page 164](#)
- ◆ [Section 15.4.4, “Getting Started,” on page 164](#)
- ◆ [Section 15.4.5, “Activating the Bundle Edition,” on page 164](#)

15.4.1 What Am I Entitled to Use?

The Bundle Edition allows you to use the Identity Manager engine and the following Identity Manager drivers:

- ◆ Legacy Identity Manager Driver for eDirectory (eDir2eDir)

IMPORTANT: The Bi-directional eDirectory driver is not included in the Bundle Edition entitlement.

- ◆ Identity Manager Driver for Active Directory

Other Identity Manager Integration Modules (drivers) are included in the software distribution. You can install and use these additional Integration Modules for 90 days, at which time you must purchase *Identity Manager* and the Integration Modules you want to use.

The User Application and the service drivers (Loopback, Manual Task, and Entitlements) are not included as part of the license agreement for the Bundle Edition. In order to use these Identity Manager components, you must purchase *Identity Manager*.

15.4.2 System Requirements

For the latest Identity Manager system requirements, see the [NetIQ Identity Manager Integrated Installation Guide](#).

The Bundle Edition does not include Solaris or AIX support. To run the Identity Manager engine or Integration Modules on these platforms, you must purchase Identity Manager.

15.4.3 Installation Considerations

NetIQ Identity Manager Bundle Edition contains components that can be installed within your environment on multiple systems and platforms. Depending on your system configuration, you might need to run the installation program several times to install Identity Manager components on the appropriate systems.

In order for the product to be activated, you must install Open Enterprise Server before installing the Identity Manager Bundle Edition. For more information on Activation issues, see [“Activating the Bundle Edition” on page 164](#).

NOTE: To install IDM 4.5 Bundle Edition, download the IDM 4.5 Standard Edition and use the IDM 4.5 Bundle Edition activation keys.

15.4.4 Getting Started

The following sections from the [Identity Manager 4.5 documentation](#) will help you plan, install, and configure your Identity Manager 4.5 Bundle Edition.

- ◆ [Overview](#)
- ◆ [Planning](#)
- ◆ [Installing Identity Manager](#)
- ◆ [Installing Active Directory and eDirectory Drivers](#)
- ◆ [Password Synchronization across Connected Systems](#)

See [Policy Builder and Driver Customization Guide](#) for information about customizing your Identity Manager implementation.

15.4.5 Activating the Bundle Edition

If you choose to purchase additional Identity Manager Integration Modules, you need to install the activation credential for those Integration Modules *and* also the credential for *Identity Manager*. See [Activating Identity Manager Products Using a Credential](#) for more information on activating other Identity Manager products.

In order to use the Bundle Edition, you must obtain and install an activation credential. Use the following instructions to complete the Bundle Edition activation tasks:

- 1 Browse to the [Identity Manager Bundle Edition Registration Web site](#).
- 2 Enter your OES activation code, then click **Submit**.
- 3 Do one of the following:
 - ◆ Save the Product Activation Credential file.
 - or
 - ◆ Open the Product Activation Credential file, then copy the contents of the Product Activation Credential to your clipboard. Carefully copy the contents, and make sure that no extra lines or spaces are included. You should begin copying from the first dash (-) of the credential (--BEGIN PRODUCT ACTIVATION CREDENTIAL) through the last dash (-) of the credential (END PRODUCT ACTIVATION CREDENTIAL-----).
- 4 Open iManager, then choose **Identity Manager > Identity Manager Overview** and select the driver set or browse to a driver set, then click **Next**.

- 5 On the Identity Manager Overview page, locate the driver set, click the red **Activation required by** link, then click **Install Activation**.
- 6 Select the driver set where you want to activate an Identity Manager component.
- 7 Do one of the following:
 - ◆ Specify where you saved the Identity Manager Activation Credential, then click **Next**.
 - or
 - ◆ Paste the contents of the Identity Manager Activation Credential into the text area, then click **Next**.
- 8 Click **Finish**.

Frequently Asked Questions about Activation

Do I need to Install Identity Manager on a specific server?

Yes. As a Bundle Edition user, you must install Identity Manager on the server where you installed Open Enterprise Server. In order for activation to work properly, you must install Identity Manager on OES, and create a driver set on the server.

I installed the Bundle Edition but it's not activated. Why?

You must install the Bundle Edition on the server where OES exists. If you install it on a non-OES server, the Bundle Edition cannot activate.

Can I run Identity Manager on a Windows Server?

Not with the Bundle Edition. However, you can still synchronize data held on a Windows server by using the Identity Manager Remote Loader service. The Remote Loader enables synchronization between the Identity Manager Engine (on your OES server) and a remote driver (on the Windows server.)

In order to run Identity Manager on a Windows server, you need to purchase *Identity Manager*.

Can I run Identity Manager on a Solaris or AIX Server?

Not with the Bundle Edition. However, you can still synchronize data held on these platforms by using the Identity Manager Remote Loader service. The Remote Loader enables synchronization between the Identity Engine and a remote driver (on the Solaris or AIX server.)

In order to run Identity Manager on Solaris or AIX, you need to purchase *Identity Manager*.

My drivers stopped working. What happened?

You might have installed the Bundle Edition on a non-OES server. The Bundle Edition must be installed on your OES server where OES exists. If Identity Manager is installed on a non-OES platform, activation cannot work. After 90 days, your drivers stop running.

I purchased an additional Integration Module. Why doesn't it work?

With your OES purchase, you are entitled to use the Bundle Edition products. If you want to add new Integration Modules, you also need to purchase *Identity Manager*. The Integration Module cannot activate until you purchase *Identity Manager*.

If I purchase licenses for NetIQ Identity Manager and an additional Integration Module, must I re-install?

No, you just need to install the activation credentials associated with your purchase.

How do I know what's activated?

For information about how to view currently activated products, see [Viewing Product Activations for Identity Manager and for Drivers](#).

16 Access Control and Authentication

Access Control and Authentication are the keys to:

- ♦ Providing services for users.
- ♦ Ensuring that the network is secure.

This section discusses the following:

- ♦ [Section 16.1, “Controlling Access to Services,” on page 167](#)
- ♦ [Section 16.2, “Authentication Services,” on page 179](#)

16.1 Controlling Access to Services

IMPORTANT: Beginning with OES 2015 SP1 and NSS-AD integration support, Novell CIFS now supports Kerberos authentication for Active Directory users accessing NSS volumes. For more information, see the [OES 2015 SP1: NSS AD Administration Guide](#).

OES supports a number of options for service access, including:

- ♦ Web browsers.
- ♦ File managers and applications on Linux, Macintosh, and Windows workstations.
- ♦ Novell Client software.
- ♦ Personal digital assistants (PDAs) and other electronic devices that are enabled for Web access.

You control which of these options can be used through the services you offer and the ways you configure those services.

This section can help you understand access control at a high level so that you can plan, implement, and control access to services. More detail about the items discussed is contained in individual service guides.

The topics that follow are:

- ♦ [Section 16.1.1, “Overview of Access Control,” on page 167](#)
- ♦ [Section 16.1.2, “Planning for Service Access,” on page 174](#)
- ♦ [Section 16.1.3, “Coexistence and Migration of Access Services,” on page 177](#)
- ♦ [Section 16.1.4, “Access Implementation Suggestions,” on page 177](#)
- ♦ [Section 16.1.5, “Configuring and Administering Access to Services,” on page 177](#)

16.1.1 Overview of Access Control

The following sections present overviews of methods for accessing Open Enterprise Server 2015 or later services.

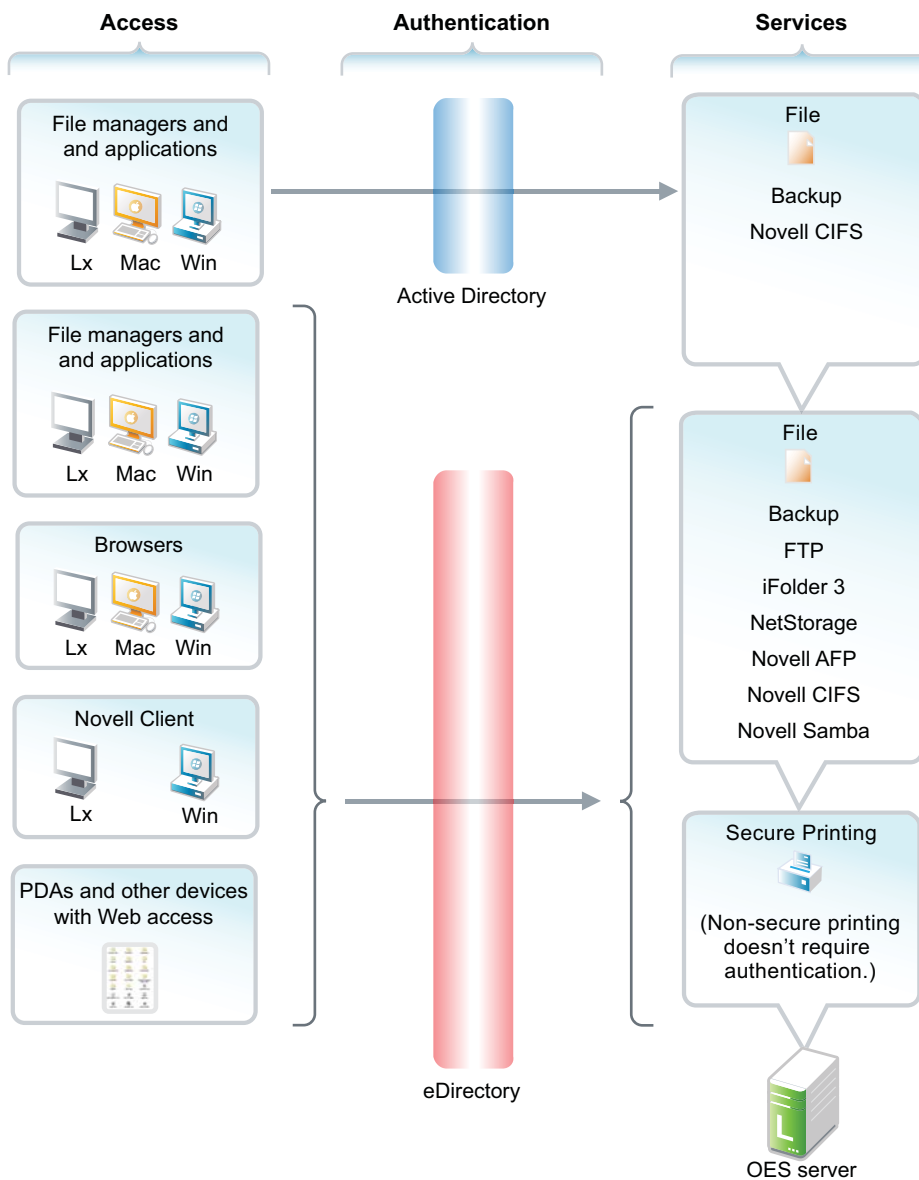
- ♦ [“Access to OES 2015 SP1 Services” on page 168](#)
- ♦ [“Access Control Options in OES” on page 169](#)

- ♦ “The Traditional Novell Access Control Model” on page 170
- ♦ “NSS Access Control on OES” on page 172
- ♦ “Novell Client (NCP File Services) Access” on page 173
- ♦ “eDirectory User Access to OES Servers” on page 174
- ♦ “Active Directory User Access to OES Servers” on page 174

Access to OES 2015 SP1 Services

Figure 16-1 illustrates the access methods supported by OES 2015 SP1 services. NetIQ eDirectory provides authentication to each service.

Figure 16-1 Access Interfaces and the Services They Can Access



The interfaces available for each service are largely determined by the protocols supported by the service.

- ◆ Browsers and personal digital assistants require support for the HTTP protocol.
- ◆ Each workstation type has file access protocols associated with it. Linux uses NFS as its native protocol for file services access, Macintosh workstations communicate using AFP or CIFS, and Windows workstations use the CIFS protocol for file services.
- ◆ Novell Client software for both Windows and Linux uses the NetWare Core Protocol (NCP) to provide the file services for which Novell is well known.

Understanding the protocol support for OES services can help you begin to plan your OES implementation. For more information, see [“Matching Protocols and Services to Check Access Requirements” on page 176](#).

Access Control Options in OES

Because OES offers both traditional Novell access control and POSIX access control, you have a variety of approaches available to you, including combining the two models to serve various aspects of your network services.

[Table 16-1](#) provides links to documentation that discusses OES access control features.

Table 16-1 *General File System Access Control*

Feature	To Understand	See
Access Control Lists (ACLs) on Linux	How ACLs are supported on the most commonly used Linux POSIX file systems, and how they let you assign file and directory permissions to users and groups who do not own the files or directories.	“Access Control Lists in Linux” (http://www.suse.com/documentation/sles11/book_security/data/cha_acls.html) in the <i>SLES 11 SP4: Security Guide</i> (http://www.suse.com/documentation/sles11/index.html)
Aligning NCP and POSIX access rights	How to approximate the Novell access control model on POSIX file systems.	“Section 18.4, “Aligning NCP and POSIX File Access Rights,” on page 200”
Directory and file attributes	Directory and file attributes on NSS volumes.	“Understanding Directory and File Attributes for NSS Volumes” in the <i>OES 2015 SP1: File Systems Management Guide</i>
File system trustee rights	File system trustee rights on NetWare (NSS and traditional volumes), including how file system trustee rights work.	“Understanding the OES Trustee Model for File System Access” in the <i>OES 2015 SP1: File Systems Management Guide</i>
Novell trustee rights and directory and file attributes	How to control who can see which files and what they can do with them.	“Understanding File System Access Control Using Trustees” in the <i>OES 2015 SP1: File Systems Management Guide</i>

Feature	To Understand	See
POSIX file system rights and attributes on Linux	How to configure file system attributes on OES 2015 SP1 servers.	"Access Control Lists in Linux" (http://www.suse.com/documentation/sles11/book_security/data/cha_acls.html) in the <i>SLES 11 SP4: Security Guide</i> (http://www.suse.com/documentation/sles11/index.html)
Security Equivalence in eDirectory	The concept of Security Equivalence in eDirectory.	"Security Equivalence" in the <i>OES 2015 SP1: File Systems Management Guide</i>

The Traditional Novell Access Control Model

NetWare is known for its rich access control. OES makes these controls available on Linux through NSS volume support. In addition, some of the controls are available on Linux POSIX file systems through NCP volume creation. NCP volume access controls are not equivalent to NSS because they are constrained by Linux POSIX access controls, which offer only a subset of the directory and file attributes that NSS offers.

In the Novell access control model, eDirectory objects, such as users and groups, are assigned File System Trustee Rights to directories and files on NSS and NCP volumes. These trustee rights determine what the user or group can do with a directory or file, provided that the directory or file attributes allow the action.

This is illustrated in [Figure 16-2](#).

Figure 16-2 Directory and File Access under the NetWare Access Control Model

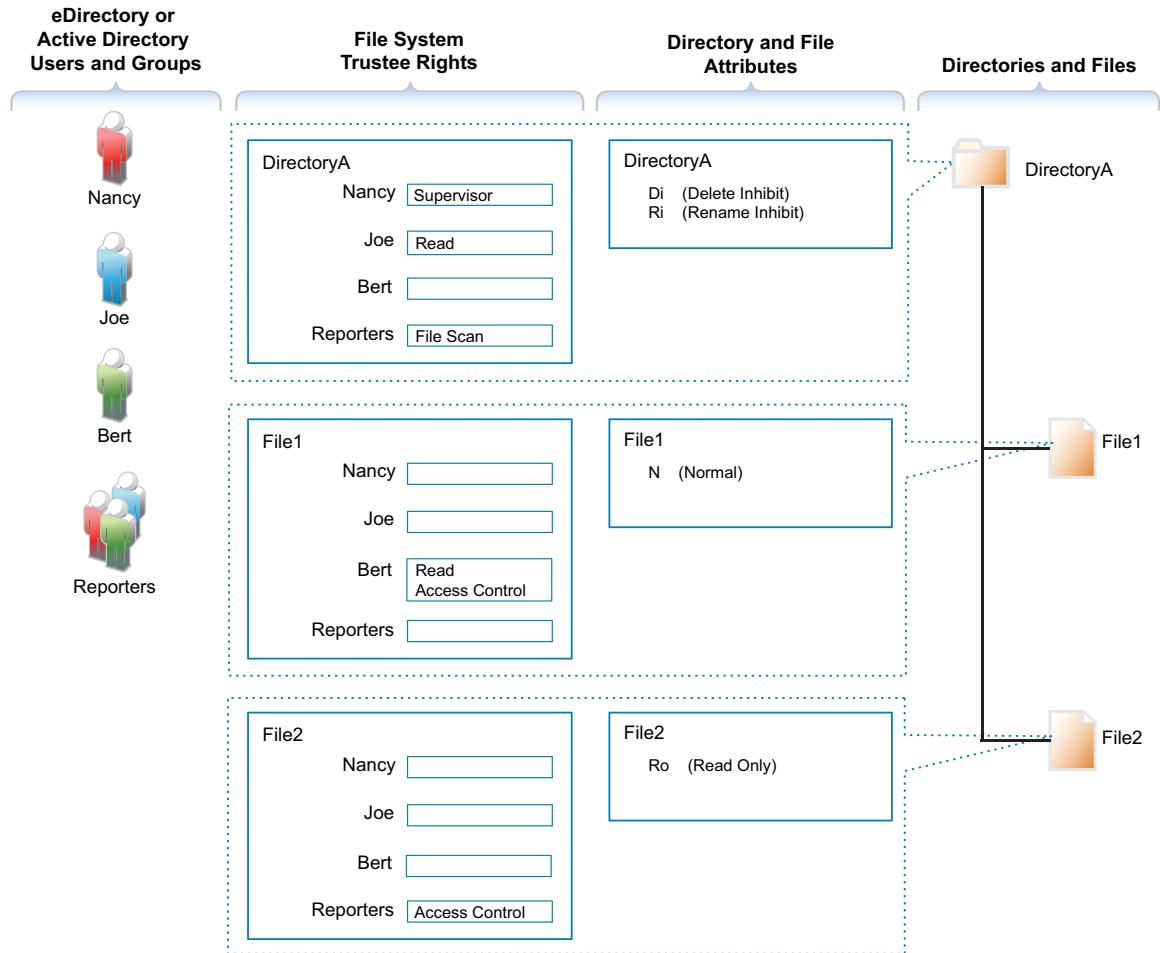


Table 16-2 explains the effective access rights illustrated in Figure 16-2.

Table 16-2 Access Rights Explanation

eDirectory or Active Directory Users and Groups	File System Trustee Rights	Directory and File Attributes	Directories and Files
<p>eDirectory and AD users and groups gain access to the file system through their respective authentication mechanisms.</p>	<p>File system trustee rights govern access and usage for the directory or file to which the rights are granted.</p> <p>Trustee rights are overridden by directory and file attributes.</p> <p>For example, even though Nancy has the Supervisor (all) trustee right at the directory (and, therefore, to the files it contains), she cannot delete File2 because it has the Read Only attribute set.</p> <p>Of course, because she has the Supervisor right, Nancy could modify the file attributes so that File2 could then be deleted.</p>	<p>Each directory and file has attributes associated with it. These attributes apply universally to all trustees regardless of the trustee rights an object might have.</p> <p>For example, a file that has the Read Only attribute is Read Only for all users.</p> <p>Attributes can be set by any trustee that has the Modify trustee right to the directory or file.</p>	<p>The possible actions by the users and group shown in this example are as follows:</p> <ul style="list-style-type: none"> ◆ Nancy has the Supervisor trustee right at the directory level, meaning that she can perform any action not blocked by a directory or file attribute. <p>The Di (Delete Inhibit) and Ri (Rename Inhibit) Attributes on Directory A prevent Nancy from deleting or renaming the directory unless she modifies the attributes first. The same principle applies to her ability to modify File2.</p> <ul style="list-style-type: none"> ◆ Because Joe is a member of the Reporters group, he can view file and directory names inside DirectoryA and also see the directory structure up to the root directory. <p>Joe also has rights to open and read any files in DirectoryA and to execute any applications in DirectoryA.</p> <ul style="list-style-type: none"> ◆ Because Bert is a member of the Reporters group, he can view file and directory names inside DirectoryA and also see the directory structure up to the root directory. <p>Bert also has rights to open and read File1 and to execute it if it's an application.</p> <p>And Bert has rights to grant any eDirectory user access to File1.</p> <ul style="list-style-type: none"> ◆ Because all three users are members of the Reporters group, they can grant any eDirectory user access to File2. <p>Of course, for Nancy this is redundant because she has the Supervisor right at the directory level.</p>

NSS Access Control on OES

Table 16-3 provides links to documentation that discusses the various NSS-specific access control features.

Table 16-3 Summary of NSS Access Control Documentation Links

Feature	To Understand	See
Independent Mode vs. NetWare Mode This applies only to OES servers, not NetWare.	The difference between Independent Mode access and NetWare Mode access.	“Access Control for NSS on Linux” in the <i>OES 2015 SP1: File Systems Management Guide</i>
POSIX directory and file attributes on NSS volumes on OES This describes what is displayed. POSIX permissions are not actually used for access control to NSS volumes.	How NSS file attributes are reflected in Linux directory and file permissions viewable through POSIX.	“Viewing Key NSS Directory and File Attributes as Linux POSIX Permissions” in the <i>OES 2015 SP1: File Systems Management Guide</i>

Novell Client (NCP File Services) Access

If you have not already determined whether to use the Novell Client on your network, we recommend that you consider the following information:

- ◆ [“About the Novell Client”](#) on page 173
- ◆ [“Is the Novell Client Right for Your Network?”](#) on page 173
- ◆ [“Differences between Linux and Windows”](#) on page 174

About the Novell Client

The Novell Client extends the capabilities of Windows and Linux desktops with access to NetWare and OES servers.

After installing Novell Client software, users can enjoy the full range of Novell services, such as

- ◆ Authentication via NetIQ eDirectory
- ◆ Network browsing and service resolution
- ◆ Secure and reliable file system access
- ◆ Support for industry-standard protocols

The Novell Client supports the traditional Novell protocols (NDAP, NCP, and RSA) and interoperates with open protocols (LDAP, CIFS, and NFS).

Is the Novell Client Right for Your Network?

Although Novell offers services that don't require Novell Client, (such as NetStorage, Novell iFolder 3.9.2, and iPrint), many network administrators prefer that their network users access the network through the client for the following reasons:

- ◆ They prefer eDirectory authentication to LDAP authentication because they believe it is more secure.
- ◆ They prefer the NetWare Core Protocol (NCP) over the Microsoft CIFS protocol because they believe that CIFS is more vulnerable to the propagation of viruses on the network.

Conversely, other network administrators are equally adamant that their users function better without the added overhead of running an NCP client on each workstation.

We can't determine what is best for you or your network, but we do provide you with viable choices.

Differences between Linux and Windows

There are some differences between the Linux and Windows clients. These are documented in [“Understanding How the Novell Client for Linux Differs from the Novell Client for Windows 2000/XP”](#) in the *Novell Client 2.0 SP3 for Linux Administration Guide*.

eDirectory User Access to OES Servers

eDirectory users have access to services on OES servers just like they do on NetWare, with one additional consideration—to access some of the services, users must have Linux user credentials, such as a user ID (UID) and primary group ID (GID).

Because eDirectory users don't have Linux user credentials by default, Novell provides the Linux User Management (LUM) technology. Users and groups who need access to the affected services, must be enabled for eDirectory LDAP authentication to the local server. For more information, see [“Linux User Management: Access to Linux for eDirectory Users”](#) on page 153.

Beginning in OES 2015 SP1, Novell also provides the Novell Identity Translator (NIT). For more information, see [Section 1.18, “Novell Identity Translator \(NIT\),”](#) on page 19.

Active Directory User Access to OES Servers

Active Directory users can be granted access to Novell CIFS shares on NSS volumes. The NSS AD integration service must be installed and the Novell Identity Translator must be configured to provide user IDs (UIDs) for AD users. For more information, see the *OES 2015 SP1: NSS AD Administration Guide*.

16.1.2 Planning for Service Access

After you understand the access options available to your network users, you can decide which will work best on your network.

Planning tips for network services are contained in the following sections:

- ♦ [“Planning File Service Access”](#) on page 174
- ♦ [“Planning Print Service Access”](#) on page 175
- ♦ [“Matching Protocols and Services to Check Access Requirements”](#) on page 176

Planning File Service Access

As you plan which file services to provide, be aware of the file service/volume and feature support limitations outlined in the following sections.

- ♦ [“Service Access to Volume Type Limitations”](#) on page 174
- ♦ [“Feature Support”](#) on page 175

Service Access to Volume Type Limitations

Supported combinations are outlined in [Table 16-4](#).

Table 16-4 Service Access to Volume Types

File Service	Linux POSIX Volumes	NSS Volumes on Linux
AFP	No	Yes-Novell AFP
CIFS	Yes-Novell Samba	Yes-Novell CIFS, Novell Samba
NetStorage	Yes	Yes
NetWare Core Protocol (NCP)	Yes	Yes
NFS	Yes	Yes-NFSv3
Novell iFolder 2.1x	No	No
Novell iFolder 3.9.2	Yes	Yes

Details about the file systems supported by each file service are explained in the documentation for the service.

Be aware that file services support different sets of access protocols. A summary of the protocols available for access to the various OES file services is presented in [“Matching Protocols and Services to Check Access Requirements”](#) on page 176.

Feature Support

Table 16-5 Features Supported on Each Volume Type

Feature	Linux POSIX Volumes	NSS Volumes on Linux
Directory quotas	No	Yes
Login scripts	Yes (if also defined as an NCP volume)	Yes
Mapped drives	Yes (if configured as an NCP volume)	Yes
Novell directory and file attributes	No	Yes
Purge/Salvage	No	Yes
Trustee rights	Yes (if configured as an NCP volume)	Yes
User space quotas	No	Yes

Planning Print Service Access

Novell iPrint has access control features that let you specify the access for each eDirectory User, Group, or container object to your printing resources.

You can also use iPrint to set up print services that don't require authentication.

NOTE: Access control for printers is supported only on the Windows iPrint Client.

For more information on access control and iPrint, see [“Setting Access Control for Your Print System”](#) in the *OES 2015 SP1: iPrint Linux Administration Guide*

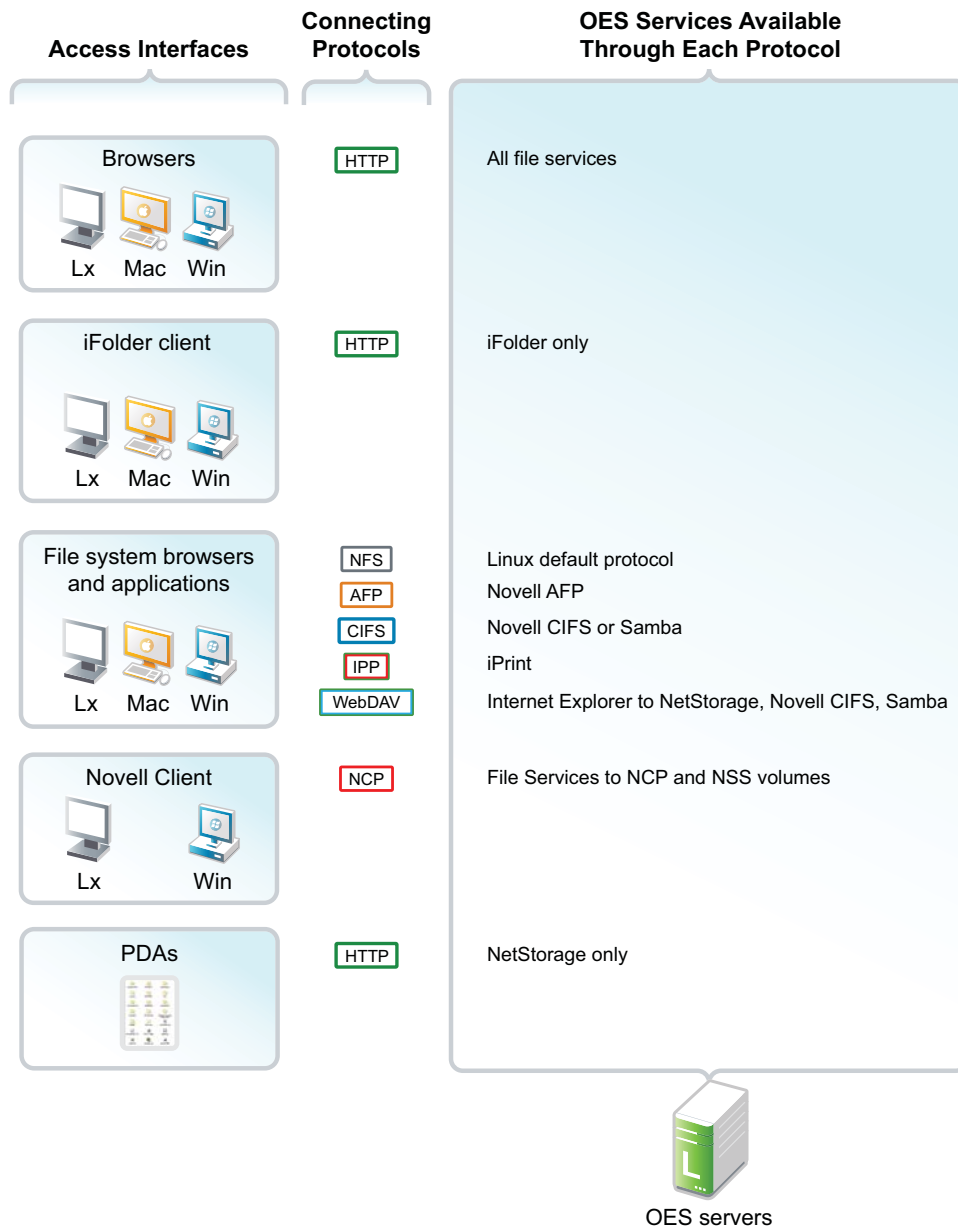
Matching Protocols and Services to Check Access Requirements

Figure 16-3 illustrates the access interfaces available to users in OES and the services that each interface can connect to. It also shows the protocols that connect access interfaces with network services.

To use this for planning:

1. Review the different access interfaces in the left column.
2. In the middle column, review the protocols each interface supports.
3. In the right column, view the services available to the interfaces via the protocols.

Figure 16-3 Access Interfaces and Services, and the Protocols That Connect Them



16.1.3 Coexistence and Migration of Access Services

Because NetWare Core Protocol (NCP) is available in OES, your Novell Client users can attach to OES servers as easily as they have been able to attach to NetWare servers. In fact, they probably won't notice any changes.

NCP Server for Linux enables support for login scripts, mapping drives to OES servers, and other services commonly associated with Novell Client access. This means that Windows users with the Novell Client installed can now be seamlessly transitioned to file services on OES. And with the Novell Client for Linux, Windows users can be moved to SUSE Linux Enterprise Desktop with no disruption in NCP file services.

For more information, see the [OES 2015 SP1: NCP Server for Linux Administration Guide](#).

16.1.4 Access Implementation Suggestions

After you plan and install OES services, be sure to provide clear access instructions to your network users. For a summary of access methods, see [Appendix D, "Quick Reference to OES User Services," on page 247](#).

16.1.5 Configuring and Administering Access to Services

The following sections discuss administering access to services.

- ♦ ["Password Management" on page 177](#)
- ♦ ["Linux \(POSIX\) File System Access Rights" on page 177](#)
- ♦ ["NSS File and Directory Trustee Management" on page 178](#)

Password Management

Many network administrators let users administer their own passwords. For more information on password self management, see ["Password Self-Service"](#) in the [NetIQ Password Management Administration Guide](#).

Linux (POSIX) File System Access Rights

Access control to Linux POSIX file systems is controlled through POSIX file system access rights or attributes associated with directories and files. In general, the directories and files can be accessed by three POSIX entities:

- ♦ The user who owns the directory or file
- ♦ The group who owns the directory or file
- ♦ All other users defined on the system

These users and the affected group are each assigned (or not assigned) a combination of three attributes for each directory and file:

Table 16-6 *Linux Access Rights*

Attribute	Effect on Directory when Assigned	Effect on File when Assigned
Read	Lets the user or group view the directory's contents.	Lets the user or group open and read the file.
Write	Lets the user or group create or delete files and subdirectories in the directory.	Lets the user or group modify the file.
Execute	Lets the user or group access the directory by using the <code>cd</code> command.	Lets the user or group run the file as a program.

For more information, see “[Configuring Trustees and File System Attributes](#)” in the *OES 2015 SP1: File Systems Management Guide*.

NSS File and Directory Trustee Management

The *OES 2015 SP1: File Systems Management Guide* contains a thorough discussion of file and directory trustee management in its “[Configuring Trustees and File System Attributes](#)” section.

The following sections present brief information about managing trustees on NSS volumes.

- ◆ “[Using NetStorage to Change File and Directory Attributes and Trustees](#)” on page 178
- ◆ “[Using iManager 2.7 to Change File and Directory Attributes and Trustee Rights](#)” on page 178
- ◆ “[Using the Linux Command Prompt to Change File Attributes](#)” on page 178
- ◆ “[Using the Linux Command Prompt to Change Trustee Rights](#)” on page 178
- ◆ “[Using rights and NFARM to Manage AD Trustee Assignments on NSS Volumes](#)” on page 179

Using NetStorage to Change File and Directory Attributes and Trustees

You can use the NetStorage Web browser interface to change attributes and trustees for directories and files on NSS volumes, but you can't change them by using a WebDAV connection to NetStorage.

Using iManager 2.7 to Change File and Directory Attributes and Trustee Rights

You can use the iManager 2.7 Files and Folders plug-in to manage directories and files on NCP and NSS volumes. For more information, see the plug-in help.

Using the Linux Command Prompt to Change File Attributes

Use the `attrib` command to change file and directory attributes on an NSS volume.

The `attrib` command is also documented in “[Using the Attrib Utility to Set NSS File System Attributes](#)” in the *OES 2015 SP1: File Systems Management Guide*.

You can also enter the following command at the command prompt:

```
attrib --help
```

Using the Linux Command Prompt to Change Trustee Rights

To grant NSS trustee rights to an NSS volume, enter the following command:

```
rights -f /full/directory/path -r rights_mask trustee full.object.context
```

where */full/directory/path* is the path to the target directory on the NSS volume, *rights_mask* is the list of NSS rights, and *full.object.context* is the object (User or Group) in its full eDirectory context including the tree name.

For example, you might enter the following:

```
rights -f /data/groupstuff -r rwfc trustee mygroup.testing.example_tree
```

For a complete list of command options, enter `rights` at the command prompt.

The rights command is also documented in “Using the Rights Utility to Set Trustee Rights for the NSS File System” in the *OES 2015 SP1: File Systems Management Guide*.

Using rights and NFARM to Manage AD Trustee Assignments on NSS Volumes

For information, see the *OES 2015 SP1: NSS AD Administration Guide*.

16.2 Authentication Services

This section briefly discusses the following topics:

- ◆ Section 16.2.1, “Overview of Authentication Services,” on page 179
- ◆ Section 16.2.2, “Planning for Authentication,” on page 182
- ◆ Section 16.2.3, “Authentication Coexistence and Migration,” on page 182
- ◆ Section 16.2.4, “Configuring and Administering Authentication,” on page 182

16.2.1 Overview of Authentication Services

This section provides specific overview information for the following key OES components:

- ◆ “NetIdentity Agent” on page 179
- ◆ “NetIQ Modular Authentication Services (NMAS)” on page 180
- ◆ “Password Support in OES” on page 180

For more authentication topics, see “access, authenticate, log in (http://www.novell.com/documentation/oes11/index.html#cat_acc-auth-log)” in the OES online documentation.

NetIdentity Agent

In OES 2015 SP1, the NetIdentity Agent works with NetIQ eDirectory authentication to provide background eDirectory authentication to NetStorage through a secure identity “wallet” on the workstation.

NetIdentity Agent browser authentication is supported only by Windows Internet Explorer.

The Novell Client provides authentication credentials to NetIdentity, but it does not obtain authentication credentials from NetIdentity because it is not a Web-based application.

NetIdentity Agent requires

- ◆ XTier (NetStorage) on the OES 2015 SP1 server included in the URL for the Web-based applications.
- ◆ The NetIdentity agent installed on the workstations.

For more information on using the NetIdentity agent, see the [NetIdentity Administration Guide for NetWare 6.5](#).

NetIQ Modular Authentication Services (NMAS)

NetIQ Modular Authentication Services (NMAS) lets you protect information on your network by providing various authentication methods to NetIQ eDirectory on NetWare, Windows, and UNIX networks.

These login methods are based on three login factors:

- ◆ Password
- ◆ Physical device or token
- ◆ Biometric authentication

For example:

- ◆ You can have users log in through a password, a fingerprint scan, a token, a smart card, a certificate, a proximity card, etc.
- ◆ You can have users log in through a combination of methods to provide a higher level of security.

Some login methods require additional hardware and software. You must have all of the necessary hardware and software for the methods to be used.

NMAS software consists of the following:

- ◆ **NMAS server components:** Installed as part of OES.
- ◆ **The NMAS Client:** Required on each Windows workstation that will be authenticating using NMAS.

Support for Third-Party Authentication Methods

Novell Client distributions include a number of NMAS login methods.

For more information on how to use NMAS, see the [NetIQ Modular Authentication Services Administration Guide](#).

Password Support in OES

In the past, administrators have needed to manage multiple passwords (simple password, NDS passwords, Samba passwords) because of password differences. Administrators have also needed to deal with keeping the passwords synchronized.

In OES you have the choice of retaining your current password maintenance methods or deploying Universal Password to simplify password management. For more information, see the [NetIQ Password Management Administration Guide](#).

All Novell products and services are being developed to work with extended character (UTF-8 encoded) passwords. For a current list of products and services that work with extended characters, see [Novell TID 3065822 \(http://www.novell.com/support/search.do?cmd=displayKC&docType=kc&externalId=3065822&sliceId=1&docTypeID=DT_TID_1_1&dialogID=77556590&stateId=0%200%2077560425\)](http://www.novell.com/support/search.do?cmd=displayKC&docType=kc&externalId=3065822&sliceId=1&docTypeID=DT_TID_1_1&dialogID=77556590&stateId=0%200%2077560425).

The password types supported in eDirectory are summarized in [Table 16-7](#).

Table 16-7 eDirectory Password Types

Password Type	Description
NDS	The NDS password is stored in a hash form that is nonreversible in eDirectory. Only the NDS system can make use of this password, and it cannot be converted into any other form for use by any other system.
Novell AFP and Novell CIFS	In OES 2015 SP1, AFP and CIFS users have Universal Password policies assigned by default. More information about password policy planning is available in Appendix J, "Coordinating Password Policies Among Multiple File Services," on page 285.
Samba	<p>In OES 2015 SP1, Samba users have a Universal Password policy assigned by default.</p> <p>OES 2015 SP1 also supports the Samba hash password if desired. However, you must choose to not deploy Universal Password if you want to use the Samba hash password. Choosing the Samba password requires that users always remember to synchronize it when changing their eDirectory password.</p> <p>For more information, see "Samba Passwords" in the <i>OES 2015 SP1: Novell Samba Administration Guide</i>.</p>
Simple	<p>The simple password provides a reversible value stored in an attribute on the User object in eDirectory. NMAS securely stores a clear-text value of the password so that it can use it against any type of authentication algorithm. To ensure that this value is secure, NMAS uses either a DES key or a triple DES key (depending on the strength of the Secure Domain Key) to encrypt the data in the NMAS Secret and Configuration Store.</p> <p>The simple password was originally implemented to allow administrators to import users and hashed passwords from other LDAP directories such as Active Directory and iPlanet.</p> <p>The limitations of the simple password are that no password policy (minimum length, expiration, etc.) is enforced. Also, by default, users do not have rights to change their own simple passwords.</p>
Universal	<p>Universal Password (UP) enforces a uniform password policy across multiple authentication systems by creating a password that can be used by all protocols and authentication methods.</p> <p>Universal Password is managed in iManager by the Secure Password Manager (SPM), a component of the NMAS module installed on OES servers. All password restrictions and policies (expiration, minimum length, etc.) are supported.</p> <p>All the existing management tools that run on clients with the UP libraries automatically work with the Universal Password.</p> <p>Universal Password is not automatically enabled unless you install Novell AFP, Novell CIFS, Domain Services for Windows, or Novell Samba on an OES server. (You can optionally choose to have the Samba hash password stored separately. This requires, however, that users always synchronize the Samba password when changing their eDirectory password.)</p> <p>The Novell Client supports the Universal Password. It also supports the NDS password for older systems in the network. The Novell Client automatically upgrades to use Universal Password when UP is deployed.</p> <p>For more information, see "Deploying Universal Password" in the <i>NetIQ Password Management Administration Guide</i>.</p>

16.2.2 Planning for Authentication

For planning topics, see the “[access, authenticate, log in](http://www.novell.com/documentation/oes11/index.html#cat_acc-auth-log) (http://www.novell.com/documentation/oes11/index.html#cat_acc-auth-log)” in the OES online documentation.

16.2.3 Authentication Coexistence and Migration

For authentication and security coexistence and migration information, see “[Chapter 21, “Security,” on page 225](#) and [Chapter 22, “Certificate Management,” on page 233](#)” in this guide.

16.2.4 Configuring and Administering Authentication

For a list of configuration and administration topics, see “[access, authenticate, log in](http://www.novell.com/documentation/oes11/index.html#cat_acc-auth-log) (http://www.novell.com/documentation/oes11/index.html#cat_acc-auth-log)” in the OES online documentation.

17 Backup Services

The following sections briefly outline the backup services available in Open Enterprise Server 2015 or later.

- ♦ [Section 17.1, “Services for End Users,” on page 183](#)
- ♦ [Section 17.2, “System-Wide Services,” on page 183](#)

17.1 Services for End Users

OES 2015 SP1 offers a number of services to automatically back up your network users’ data files.

- ♦ **iFolder 3.9.2:** By implementing Novell iFolder 3.9.2, you empower your users to have their local files automatically follow them everywhere—online, offline, all the time—across computers. Users can share files in multiple iFolders, and share each iFolder with a different group of users. Users control who can participate in an iFolder and their access rights to the files in it. Users can also participate in iFolders that others share with them.
- ♦ **Salvage and Purge:** By default, all NSS volumes have the Salvage system enabled at the time they are created. With Salvage enabled, deleted files are retained on the volume so that users can restore (salvage) them. Files are eventually purged from the system, either manually, or by the system when the Purge Delay setting times out or space is needed on the volume. For more information, see “[Understanding the NSS Salvage System](#)” in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

17.2 System-Wide Services

OES offers both Novell Storage Management Services and services that are available as part of the SUSE Linux Enterprise Server distribution.

- ♦ [Section 17.2.1, “Links to Backup Partners,” on page 183](#)
- ♦ [Section 17.2.2, “Novell Storage Management Services \(SMS\),” on page 183](#)
- ♦ [Section 17.2.3, “SLES 11 Backup Services,” on page 184](#)

17.2.1 Links to Backup Partners

See the [Partners and Communities page on Novell.com](http://www.novell.com/products/openenterpriseserver/partners_communities.html) (http://www.novell.com/products/openenterpriseserver/partners_communities.html).

17.2.2 Novell Storage Management Services (SMS)

- ♦ [“Understanding SMS” on page 184](#)
- ♦ [“SMS Coexistence and Migration Issues” on page 184](#)

Understanding 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 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 2015 SP1, the SMS API framework is available on SLES 11 so that there is a single consistent interface to back up file systems on NetWare, file systems on Linux, and applications such as Novell Groupwise, NetIQ eDirectory, 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 servers. Although NSS is exposed as a Virtual File System-compliant file system, the Linux interfaces are inadequate to back up NSS file system attributes, rich ACLs, trustees, and multiple data streams.

For additional information, see “[Coexistence and Migration Issues](#)” in the *OES 2015 SP1: Storage Management Services Administration Guide for Linux*.

17.2.3 SLES 11 Backup Services

Two SLES 11 services might be of interest.

- ♦ **DRBD:** This lets you to create a mirror of two block devices at two different sites across an IP network. When used with HeartBeat 2 (HB2), DRBD supports distributed high-availability Linux clusters. For more information, see [Distributed Replicated Block Device \(DRBD\)](http://www.novell.com/documentation/sle_ha/book_sleha/data/cha_ha_drbd.html) (http://www.novell.com/documentation/sle_ha/book_sleha/data/cha_ha_drbd.html) in the *SLES 11 High Availability Guide* (http://www.novell.com/documentation/sle_ha/book_sleha/data/book_sleha.html).
- ♦ **rsync:** This is useful when large amounts of data need to be backed up regularly or moved to another server, such as from a staging server to a Web server in a DMZ. For more information, see “[Extended Attributes \(XAttr\) Commands](#)” in the *OES 2015 SP1: NSS File System Administration Guide for Linux*.

18 File Services

The file services in Open Enterprise Server 2015 SP1 let you provide Web-based and network-based file services to your network users.

This section contains the following information:

- ◆ [Section 18.1, “Overview of File Services,” on page 185](#)
- ◆ [Section 18.2, “Planning for File Services,” on page 195](#)
- ◆ [Section 18.3, “Coexistence and Migration of File Services,” on page 198](#)
- ◆ [Section 18.4, “Aligning NCP and POSIX File Access Rights,” on page 200](#)
- ◆ [Section 18.5, “Novell FTP \(Pure-FTPd\) and OES 2015 SP1,” on page 203](#)
- ◆ [Section 18.6, “NCP Implementation and Maintenance,” on page 210](#)
- ◆ [Section 18.7, “NetStorage Implementation and Maintenance,” on page 212](#)
- ◆ [Section 18.8, “Novell AFP Implementation and Maintenance,” on page 214](#)
- ◆ [Section 18.9, “Novell CIFS Implementation and Maintenance,” on page 214](#)
- ◆ [Section 18.10, “Novell iFolder 3.9.2 Implementation and Maintenance,” on page 215](#)
- ◆ [Section 18.11, “Samba Implementation and Maintenance,” on page 216](#)

18.1 Overview of File Services

The file service components in OES include the following:

- ◆ [FTP Services \(page 186\)](#): Lets users securely transfer files to and from OES servers.
- ◆ [NetWare Core Protocol \(page 186\)](#): Provides NetWare Core Protocol (NCP) access to NCP volumes (including NSS volumes) that you define on OES server partitions.
- ◆ [NetStorage \(page 187\)](#): Provides network and Web access to various file services through common file service protocols, such as CIFS.

The NetStorage server doesn't actually store files and folders. Rather, it provides access to other file services that support the native TCP/IP protocol.
- ◆ [Novell AFP \(page 190\)](#): Provides native Macintosh access to files stored on an NSS volume on an OES server.
- ◆ [Novell CIFS \(page 191\)](#): Provides native Windows (CIFS and HTTP-WebDAV) access to files stored on an NSS volume on an OES server.
- ◆ [Novell iFolder 3.9.22 \(page 192\)](#): Provides a Web-based and network-based repository (Novell iFolder server) that stores master copies of locally accessible files on the OES server.
- ◆ [Novell Samba \(page 194\)](#): Provides Windows (CIFS and HTTP-WebDAV) access to files stored on an OES server's file system.

The file service components in OES are generally compatible. However you cannot run Novell Samba on the same OES server as Novell AFP, Novell CIFS, or Domain Services for Windows, which is not reviewed as a file service, but includes an alternative Samba file service instead of Novell Samba.

18.1.1 Using the File Services Overviews

Each graphical overview in the following sections introduces one of the OES file service components. If visual presentations help you grasp basic concepts, continue with the following overviews. If you prefer to skip the overviews, go to [Section 18.2, “Planning for File Services,”](#) on page 195.

18.1.2 FTP Services

OES 2015 SP1 offers a level of integration between eDirectory and Pure-FTP that allows users to authenticate to eDirectory for FTP access to the server. You simply select the **Novell FTP Server** pattern in the OES 2015 SP1 installation, then make sure the users needing access are [LUM-enabled](#) and have access rights to the areas on the server they need to use. You can also migrate an existing FTP server configuration from a NetWare server to OES 2015 SP1.

For migration instructions and a brief FAQ, see “[Migrating FTP to OES 2015 SP1](#)” in the *OES 2015 SP1: Migration Tool Administration Guide*.

For documentation on Pure-FTP, visit the [Pure-FTP Web site \(http://pureftpd.sourceforge.net/documentation.shtml\)](http://pureftpd.sourceforge.net/documentation.shtml).

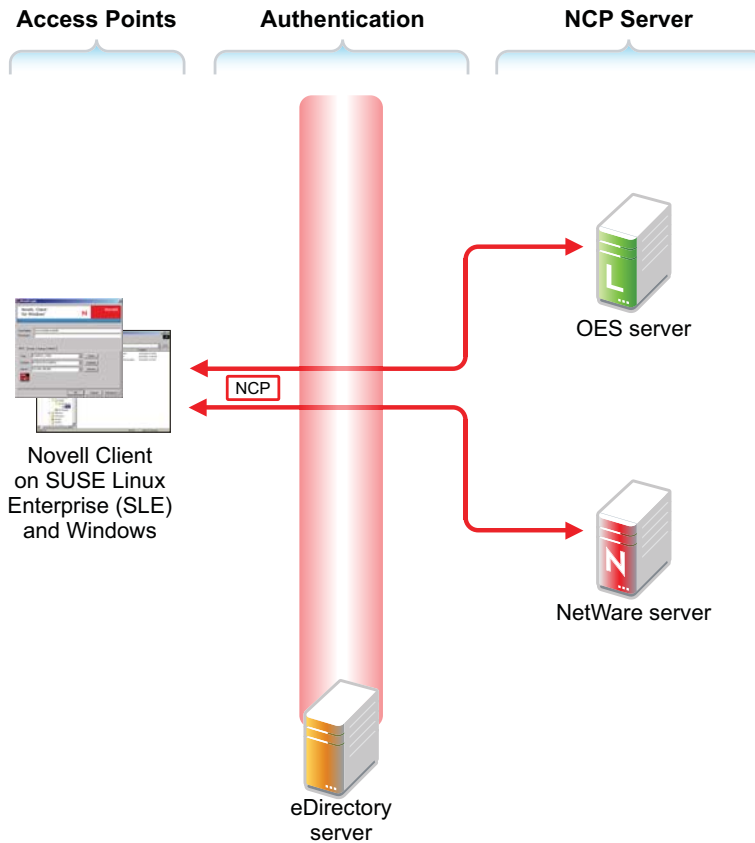
18.1.3 NetWare Core Protocol

NetWare Core Protocol (NCP) is the technology beneath many of the network services for which NetWare is famous.

In OES, NCP is also available on Linux. The Novell NCP Server for Linux provides the rich file services that Novell is known for. Windows and Linux users who run Novell Client software can access data, manage files and folders, map drives, etc., using the same methods as they do on NetWare servers.

[Figure 18-1](#) illustrates the basics of NCP file services. For more information on how NCP can help you manage access to network resources, see “[Access Control and Authentication](#)” on page 167.

Figure 18-1 NCP Services for Linux and NetWare



The following table explains the information illustrated in Figure 18-1.

Table 18-1 NCP Access

Access Methods	Authentication	NCP Services
Access is through an NCP client—specifically, the Novell Client.	All file service access is controlled by eDirectory authentication.	Files are stored on NetWare or NCP volumes that the administrator has created. The same core set of NetWare file attributes are available on both Linux and NetWare.

18.1.4 NetStorage

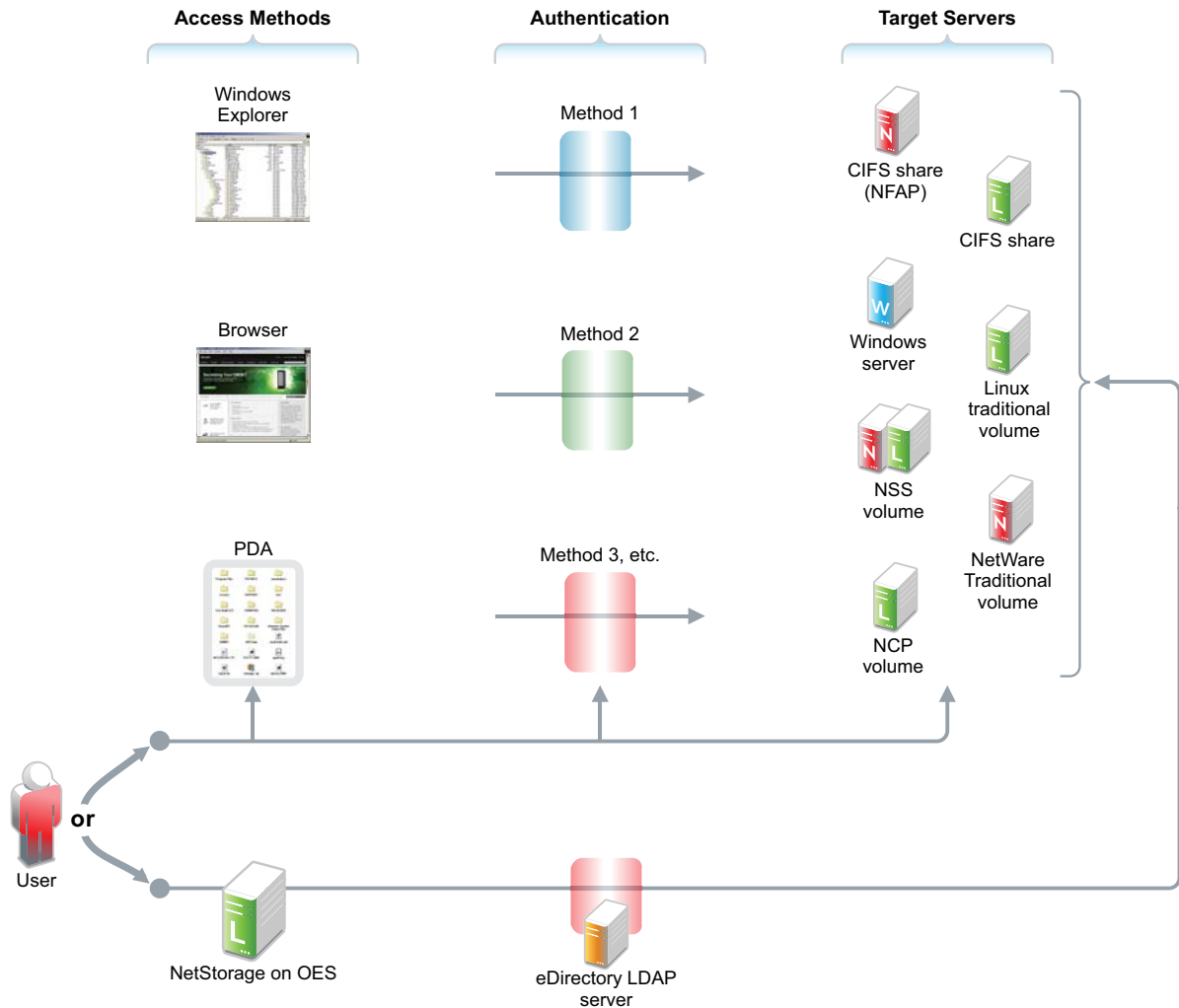
- ♦ “Common Network File Storage Problems” on page 187
- ♦ “NetStorage” on page 188

NetStorage makes network files available anywhere, any time.

Common Network File Storage Problems

Network file access is often confusing and frustrating to users, as illustrated in Figure 18-2.

Figure 18-2 Common Network File Storage Problems



The following table explains the information illustrated in Figure 18-2.

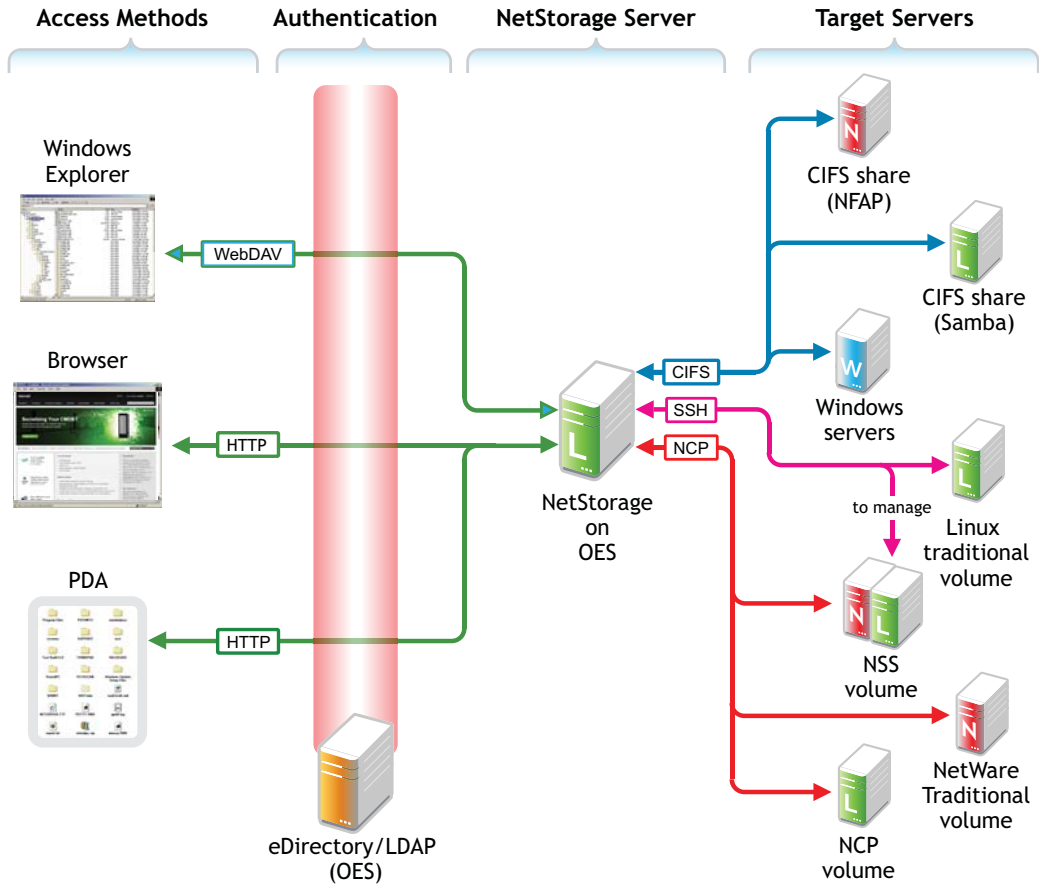
Table 18-2 NetStorage Access Solutions

Access Methods	Authentication	Target File Systems	Solution: NetStorage
Browser or PDA access is critical to those who must travel. However, access method support varies widely among file service providers.	Authentication helps protect information assets, but having diverse authentication methods leads to frustration and lost productivity.	Having diverse file storage services only adds to the complexity and confusion.	Novell NetStorage ties all of these issues together with an easy-to-administer, easy-to-use solution.

NetStorage

NetStorage on OES provides local and Web access to files on many systems without requiring the Novell Client (see Figure 18-3).

Figure 18-3 How NetStorage Works on OES



The following table explains the information illustrated in Figure 18-3.

Table 18-3 NetStorage on Linux

Access Methods	Authentication	NetStorage Server	Target Servers
<p>Users have read and write access to files from</p> <ul style="list-style-type: none"> Windows Explorer: Enabled by the HTTP protocol with WebDAV extensions. Browsers: Users can access files directly by connecting to the NetStorage server. PDAs: PDA users with network connections can access their files as well. <p>Access is granted through login script drive mapping (NCP server required) or through Storage Location Objects.</p>	<p>File service access is controlled by LDAP-based authentication through the eDirectory LDAP server.</p> <p>Although shown separately, eDirectory could be running on the OES server.</p>	<p>The NetStorage server receives and processes connection requests and provides access to storage on various servers on the network.</p>	<p>NetStorage on Linux can connect eDirectory users to their files and folders stored in the following locations:</p> <ul style="list-style-type: none"> Windows workgroup shares (CIFS or Samba shares) Linux POSIX volumes through an SSH connection. <p>Linux volumes can also be made available as NCP volumes.</p> <p>Management of NSS volumes on OES through NetStorage requires SSH access to the server. See “When Is SSH Access Required?” on page 93.</p>

18.1.5 Novell AFP

The Novell AFP service lets users on Macintosh workstations access and store files on OES servers with NSS volumes (see [Figure 18-4](#)).

Figure 18-4 How Novell AFP Works

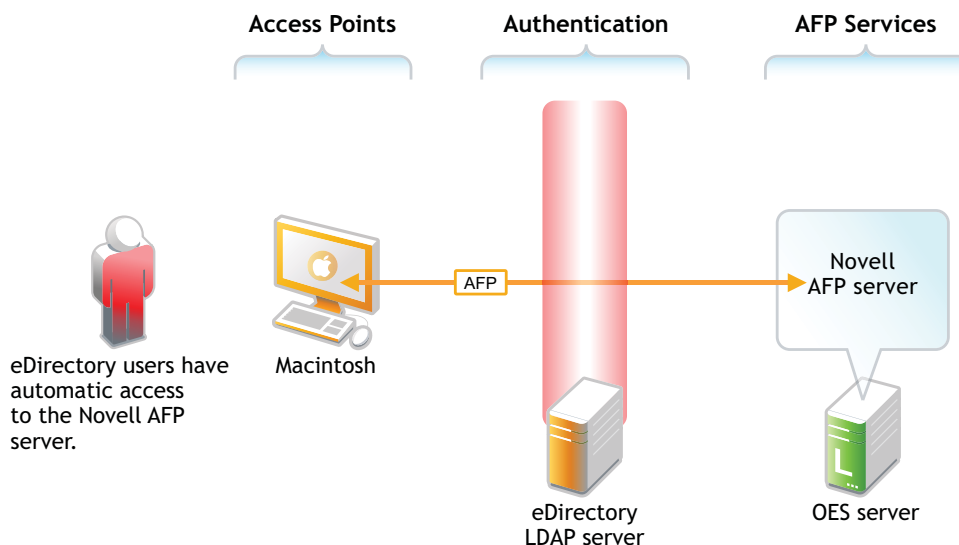


Table 18-4 AFP Access

Access Points	Authentication
eDirectory users on Macintosh workstations have native access to NSS volumes on the OES server.	All file service access is controlled by LDAP-based authentication through the eDirectory LDAP server.

18.1.6 Novell CIFS

The Novell CIFS service lets users on Windows workstations access and store files on OES servers with NSS volumes without installing any additional software, such as the Novell Client (see Figure 18-4).

Figure 18-5 How Novell CIFS Works for eDirectory Users

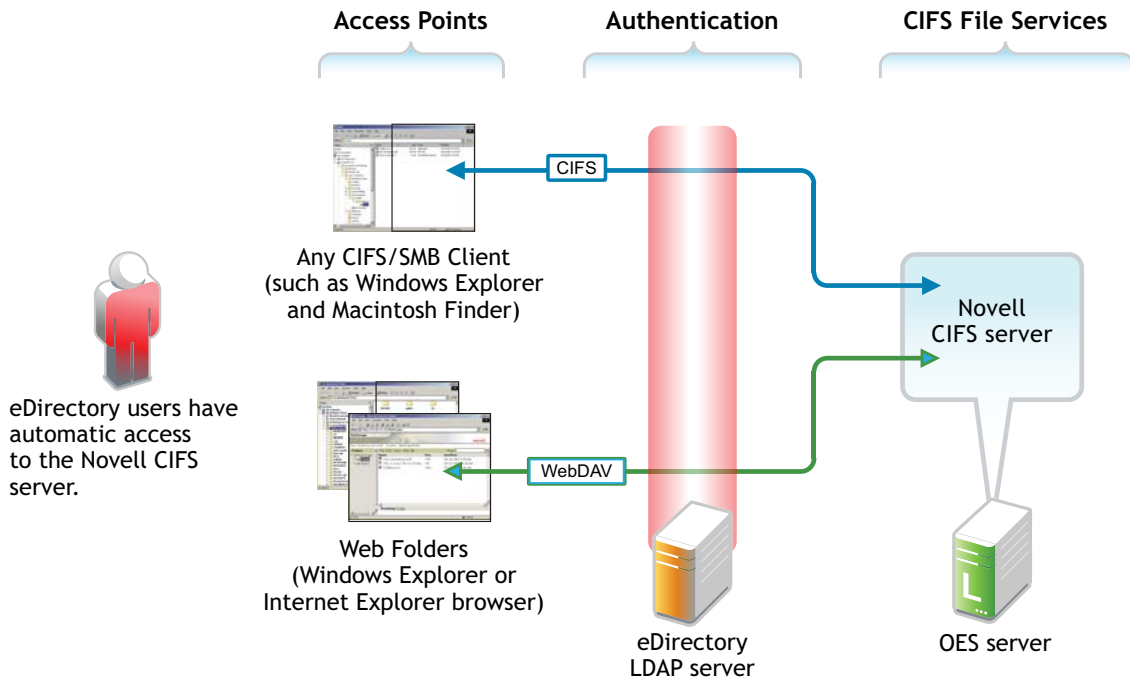


Table 18-5 CIFS Access for eDirectory Users

Access Methods	Authentication
<p>eDirectory users on Windows workstations have two native Windows file access options:</p> <ul style="list-style-type: none"> ♦ CIFS Client Access: Windows Explorer users can access and modify files on the OES server just as they would on any workgroup server share. ♦ Web Folder: Users can create Web Folders in Windows Explorer or Internet Explorer. <p>Files on the OES server are accessed and maintained with the HTTP-WebDAV protocol.</p>	<p>All file service access is controlled by LDAP-based authentication through the eDirectory server.</p>

Figure 18-6 How Novell CIFS Works for Active Directory Users

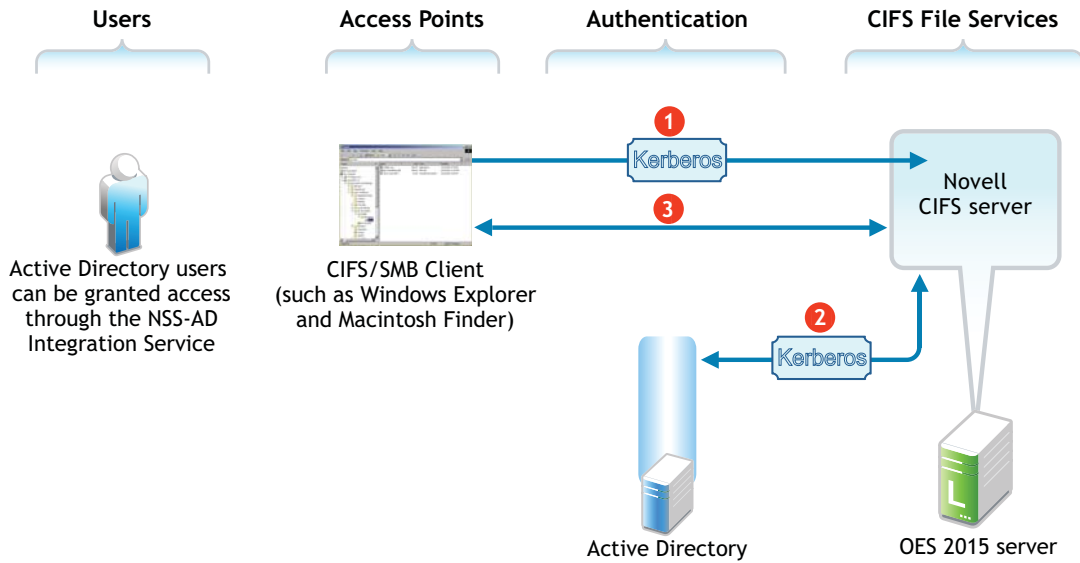


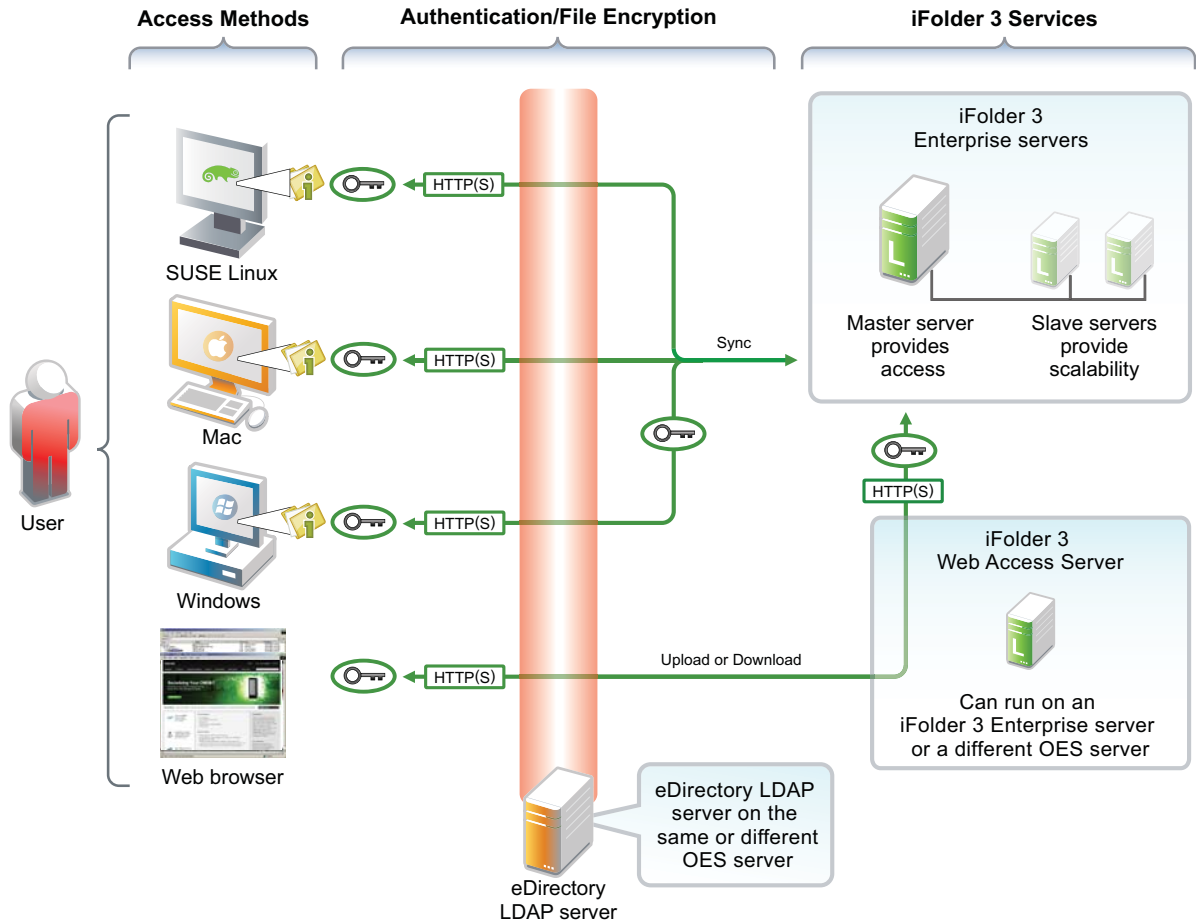
Table 18-6 CIFS Access for Active Directory Users

Access Methods	Authentication
<p>Active Directory users gain access to CIFS file services as follows:</p> <ol style="list-style-type: none"> 1. The user presents a Kerberos ticket obtained from Active Directory to the Novell CIFS server. 2. The CIFS server validates the ticket with Active Directory. 3. After validation, files on the OES server are accessed and maintained through the CIFS protocol. 	<p>All CIFS file service access is controlled by Kerberos-based authentication and Active Directory.</p>

18.1.7 Novell iFolder 3.9.22

Novell iFolder 3.9.2 supports multiple iFolders per user, user-controlled sharing, and a centralized network server for file storage and secure distribution (see [Figure 18-7](#)).

Figure 18-7 How Novell iFolder Works



The following table explains the information illustrated in Figure 18-7.

Table 18-7 iFolder Access

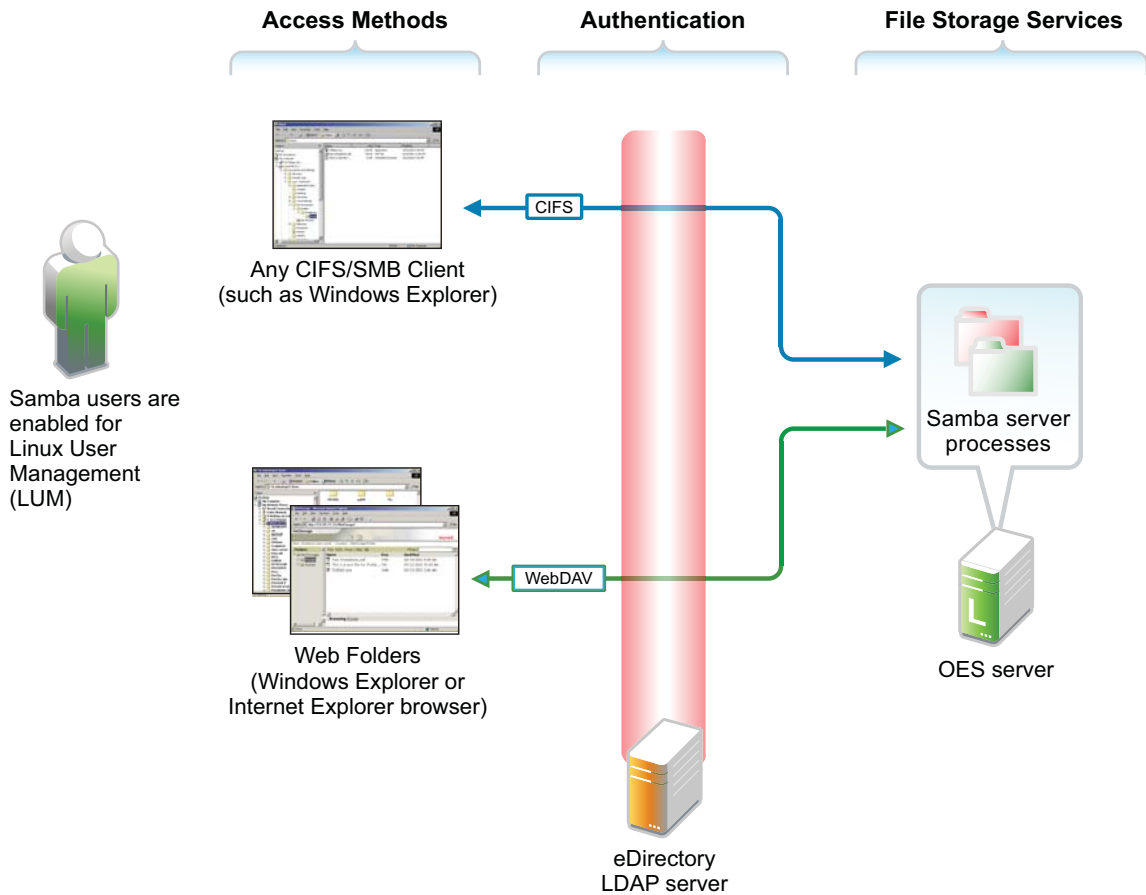
Access Methods	Authentication/File Encryption	Novell iFolder 3.9.2 Services
Linux, Mac, and Windows workstation users who have the Novell iFolder Client installed can access and modify their files in one or more workstation folders. Changes are automatically synchronized with the iFolder 3.9.2 Enterprise servers. A Web interface lets users access their files from any computer with an active network or Internet connection.	All file service access is controlled by LDAP- based authentication through the eDirectory LDAP server. Although shown separately, eDirectory could be installed on the OES server. Files can be encrypted for transport using SSL connections (HTTPS).	Slave servers can be added as needed, providing the ability to dynamically grow iFolder services without disrupting users. Local and network copies of each file are automatically synchronized by the Novell iFolder Client and Server pieces.

Additional overview information is available in the [Novell iFolder 3.9.2 Administration Guide](#).

18.1.8 Novell Samba

Novell Samba on an OES server provides Windows (CIFS and HTTP-WebDAV) access to files stored on the OES server (see [Figure 18-8](#)).

Figure 18-8 How Samba on OES Works



The following table explains the information illustrated in [Figure 18-8](#).

Table 18-8 Samba Access

Access Methods	Authentication
<p>eDirectory users on Windows workstations have two native Windows file access options (if their eDirectory accounts have been enabled for LUM and Samba):</p> <ul style="list-style-type: none"> ♦ CIFS Client Access: Windows Explorer users can access and modify files on the Samba server just as they would on any workgroup server share. ♦ Web Folder: Users can create Web Folders in Windows Explorer or Internet Explorer. <p>Files on the OES server running Samba are accessed and maintained with the HTTP-WebDAV protocol.</p>	<p>All file service access is controlled by LDAP-based authentication through the eDirectory LDAP server.</p>

Samba is an open source initiative. In addition to Linux support, Samba initiatives provide support for other platforms such as Apple Computer’s operating systems. More information is available on the Web (<http://www.samba.org>).

18.2 Planning for File Services

Functional overviews of each file service product are included in [Section 18.1, “Overview of File Services,”](#) on page 185.

- ♦ [Section 18.2.1, “Deciding Which Components Match Your Needs,”](#) on page 195
- ♦ [Section 18.2.2, “Comparing Your CIFS File Service Options,”](#) on page 196
- ♦ [Section 18.2.3, “Planning Your File Services,”](#) on page 197

18.2.1 Deciding Which Components Match Your Needs

To decide which file service components to install, you should match service features listed in [Table 18-9](#) to your network’s file service requirements.

Table 18-9 OES File Services Feature Breakdown

Service	Access Method Features	Back-End Storage Features	Security Features
NCP Server (NetWare Core Protocol)	Novell Client (NCP client)	♦ Any Linux volumes (including NSS) that are defined as NCP volumes	♦ eDirectory Authentication
NetStorage	<ul style="list-style-type: none"> ♦ Any supported browsers ♦ Personal Digital Assistant (PDA) ♦ Remote access (browser-based) ♦ Web Folders (on either an Internet Explorer browser or in Windows Explorer) ♦ Windows Explorer 	<ul style="list-style-type: none"> ♦ Linux POSIX volumes ♦ NCP volumes ♦ NSS volumes ♦ Samba (CIFS) servers ♦ Windows (CIFS) servers 	♦ Secure LDAP Authentication
Novell AFP	♦ Macintosh Chooser	♦ NSS volumes	♦ Secure LDAP Authentication
Novell CIFS	<ul style="list-style-type: none"> ♦ Any CIFS client ♦ Remote access (Web Folders in the Internet Explorer browser) ♦ Windows Explorer 	♦ NSS volumes	♦ Secure LDAP Authentication

Service	Access Method Features	Back-End Storage Features	Security Features
Novell iFolder 3.9.2	<ul style="list-style-type: none"> ◆ Linux File Managers ◆ Macintosh Chooser ◆ Offline access with file synchronization (between local and network copies) on reconnect ◆ Web browsers ◆ Windows Explorer <p>Except for Web browser access, each method above requires an installed iFolder client.</p>	<ul style="list-style-type: none"> ◆ Novell iFolder 3.9.2 Enterprise server file repository on OES server 	<ul style="list-style-type: none"> ◆ Files can be encrypted for transport through SSL (HTTPS). ◆ Secure LDAP Authentication
Novell Samba	<ul style="list-style-type: none"> ◆ Any CIFS client ◆ Remote access (Web Folders in the Internet Explorer browser) ◆ Windows Explorer 	<ul style="list-style-type: none"> ◆ Linux POSIX file system on OES server ◆ NSS volumes 	<ul style="list-style-type: none"> ◆ Secure LDAP Authentication

18.2.2 Comparing Your CIFS File Service Options

OES offers three file services that use the CIFS protocol: Novell CIFS, Novell Samba, and Samba in Domain Services for Windows (DSfW).

Table 18-10 Comparing OES CIFS Solutions

Item	Novell CIFS	Novell Samba	Samba in DSfW
Authentication	<p>A Universal Password Policy that allows the CIFS proxy user to retrieve passwords is required.</p> <p>The user who migrates ACLs for AD users to NSS must have the CIFS universal password policy applied. This includes the eDirectory Admin user if applicable.</p> <p>The authentication method for NSS AD access is Kerberos.</p>	<p>A Samba-compatible Password policy is required for compatibility with Windows workgroup authentication.</p>	<p>The Domain Services Password policy is required for DSfW users. The domain is set up as a trusted environment.</p> <p>DSfW uses Active Directory authentication methods, such as Kerberos, to ensure that only authorized users can log in to the domain.</p>

Item	Novell CIFS	Novell Samba	Samba in DSfW
File system support	NSS is the only file system supported for this release.	It is recommended (but not required) that you create Samba shares on NSS data volumes. NSS is fully integrated with eDirectory for easier management, and using an NSS volume allows you to take advantage of the rich data security model in NSS. You can use either iManager or the nssmu utility to create an NSS volume on an OES server. For instructions on how to set up an NSS volume, see “Managing NSS Volumes” in the <i>OES 2015 SP1: File Systems Management Guide</i> .	
LUM and Samba enablement	LUM and Samba enablement are not required.	Users must be enabled for LUM and Samba and assigned to a Samba group.	eDirectory users in the domain (eDirectory partition) are automatically Samba users and are enabled to access Samba shares. See “Creating Users” in the <i>OES 2015 SP1: Domain Services for Windows Administration Guide</i> . Domain users are set up with the necessary UID and default group (DomainUsers) membership. Every additional eDirectory group created within the domain is automatically Linux-enabled.
Username and password	Beginning with OES 2015, both eDirectory and Active Directory users can access Novell CIFS.	eDirectory users can access Novell Samba.	eDirectory users in the domain (eDirectory partition) can log into any workstation that has joined the domain. There is no need for a corresponding user object on the workstation.

18.2.3 Planning Your File Services

- For the file services you plan to install, compute the total additional RAM required (above the basic system requirement).
 - NCP:** There are no additional RAM requirements.
 - NetStorage:** There are no additional RAM requirements.
 - Novell AFP:** There are no additional RAM requirements.
 - Novell CIFS:** There are no additional RAM requirements.
 - Novell iFolder 3.9.2:** Suggestions for calculating the additional RAM you need are contained in [“Server Workload Considerations”](#) in the *Novell iFolder 3.9.2 Administration Guide*.
 - Samba:** There are no additional RAM requirements.
- Record the additional required RAM in your planning notes.

- 3 For the file services you plan to install, compute the total additional disk space required (above the basic system requirement).
 - ♦ **NCP:** Allocate enough disk space to meet your users' file storage needs. On Linux, this space must exist on partitions you have designated as NCP volumes.
 - ♦ **NetStorage:** There are no disk space requirements because NetStorage provides access only to other file storage services.
 - ♦ **Novell AFP:** Allocate enough disk space for the partition containing the /home directories to meet your users' file storage needs.
 - ♦ **Novell CIFS:** Allocate enough disk space for the partition containing the /home directories to meet your users' file storage needs.
 - ♦ **Novell iFolder 3.9.2:** Suggestions for calculating the additional disk space you need are contained in "Server Workload Considerations" in the [Novell iFolder 3.9.2 Administration Guide](#).
 - ♦ **Samba:** Allocate enough disk space for the partition containing the /home directories to meet your users' file storage needs.
- 4 Record the additional required disk space in your planning notes.
- 5 For the file services you plan to install, refer to the information in the sections of the OES 2015 SP1 installation guide that are indicated in the following table.

Note your planning choices on your planning sheet.

File Service Product	Linux Planning References
NCP	"Novell NCP Server / Dynamic Storage Technology" in the OES 2015 SP1: Installation Guide
NetStorage	"Novell NetStorage" in the OES 2015 SP1: Installation Guide
Novell AFP	"Novell AFP Services" in the OES 2015 SP1: Installation Guide
Novell CIFS	"Novell CIFS for Linux" in the OES 2015 SP1: Installation Guide
Novell FTP	"Novell FTP Services" in the OES 2015 SP1: Installation Guide
Novell iFolder 3.9.2	"Novell iFolder" in the OES 2015 SP1: Installation Guide
Samba	"Novell Samba" in the OES 2015 SP1: Installation Guide

18.3 Coexistence and Migration of 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.

This section discusses migration of the following services:

- ♦ [Section 18.3.1, "Novell Client \(NCP\)," on page 199](#)
- ♦ [Section 18.3.2, "NetStorage," on page 199](#)
- ♦ [Section 18.3.3, "Novell AFP," on page 199](#)
- ♦ [Section 18.3.4, "Novell CIFS," on page 199](#)
- ♦ [Section 18.3.5, "Novell iFolder 3.9.2," on page 199](#)
- ♦ [Section 18.3.6, "Samba," on page 200](#)

18.3.1 Novell Client (NCP)

Novell Client for Windows is the long-standing software solution for providing NCP 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 7, see the [Novell Client 2 SP3 for Windows Administration Guide](#).

For more information on NCP Server for Linux, see the [OES 2015 SP1: NCP Server for Linux Administration Guide](#).

18.3.2 NetStorage

NetStorage provides Web access to the files and directories on OES servers from browsers and Web-enabled devices such as PDAs.

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 about NetStorage, see the [OES 2015 SP1: NetStorage Administration Guide for Linux](#).

18.3.3 Novell AFP

Novell AFP provides native AFP protocol access from Macintosh workstations to data on OES servers, offering the same basic AFP connectivity that was previously available only on NetWare. No Novell Client software is required.

For information on migrating AFP services from NetWare to OES 2015 SP1, see “[Migrating AFP to OES 2015 SP1](#)” in the [OES 2015 SP1: Migration Tool Administration Guide](#).

18.3.4 Novell CIFS

Novell CIFS provides native CIFS protocol access from Windows workstations to data on OES servers, offering the same basic CIFS connectivity that was previously available only on NetWare. No Novell Client software is required.

For information on migrating CIFS services from NetWare to OES 2015 SP1, see “[Migrating CIFS to OES 2015 SP1](#)” in the [OES 2015 SP1: Migration Tool Administration Guide](#).

18.3.5 Novell iFolder 3.9.2

iFolder 3.9.2 supports multiple iFolders per user, user-controlled sharing, and a centralized network of servers to provide scalable 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 is only available on OES.

For information on migrating from iFolder 2 to iFolder 3.9.2, see “[Migrating iFolder 2.x](#)” in the [OES 2015 SP1: Migration Tool Administration Guide](#).

18.3.6 Samba

OES includes Samba software to provide Microsoft CIFS and HTTP-WebDAV access to files on the server. Like Novell CIFS, this is useful to those who don't want to use the Novell Client.

There is no migration path from Novell CIFS (NFAP) to Samba.

For more information about Samba in OES 2015 SP1, see the [OES 2015 SP1: Novell Samba Administration Guide](#).

18.4 Aligning NCP and POSIX File Access Rights

NetWare administrators have certain expectations regarding directory and file security. For example, they expect that home directories are private and that only the directory owner can see a directory's contents. However, because of the differences in the NetWare Core Protocol (NCP) and POSIX file security models (see [Section 21.2.1, "Comparing the Linux and the Novell Trustee File Security Models," on page 227](#)) that is not the case by default on POSIX file systems.

Fortunately, when you install Linux User Management (LUM) in OES, there is an option to make home directories private. This option automatically provides the privacy that NetWare administrators are used to seeing. Unfortunately, the option only applies to newly created home directories, so there is more to understand and do if aligning access rights is an issue for you.

Use the information in this section to understand how you can configure POSIX directories to more closely align with the NCP model.

- ◆ [Section 18.4.1, "Managing Access Rights," on page 200](#)
- ◆ [Section 18.4.2, "Providing a Private Work Directory," on page 201](#)
- ◆ [Section 18.4.3, "Providing a Group Work Area," on page 202](#)
- ◆ [Section 18.4.4, "Providing a Public Work Area," on page 202](#)
- ◆ [Section 18.4.5, "Setting Up Rights Inheritance," on page 203](#)

18.4.1 Managing Access Rights

NCP directories are, by default, private. When you assign a user or a group as a trustee of a directory or file, those trustees can automatically navigate to the assigned area and exercise whatever access privileges you have assigned at that level and below. You can assign as many trustees with different access privileges as you need.

On the other hand, Linux POSIX directories can be accessed through three sets of permissions defined for each file object on a Linux system. These sets include the read (r), write (w), and execute (x) permissions for each of three types of users: the file owner, the group, and other users. The Linux kernel in OES also supports access control lists (ACLs) to expand this capability. However, ACLs are outside the scope of this discussion. For more information on ACLs, see "[Access Control Lists in Linux](#)" (http://www.suse.com/documentation/sles11/book_security/data/cha_acls.html) in the *SLES 11 SP4: Security Guide* (<http://www.suse.com/documentation/sles11/index.html>).

The Linux `chown` command lets you change the file owner and/or group to a LUM user or a LUM-enabled group. For example, `chown -R user1 /home/user1` changes the owner of the `user1` home directory and all its subdirectories and files to `user1`. For more information, see the `chown` man page on your OES server.

The Linux `chmod` command provides a very simple and fast way of adjusting directory and file access privileges for the three user types: owner, group, and other (all users). In its simplest form, the command uses three numbers, ranging from 0 through 7, to represent the rights for each of the three user types. The first number sets the rights for the owner, the second number sets the rights for the group, and the third number sets the rights for all others. Each number represents a single grouping of rights, as follows:

Number	Setting	Binary Representation
0	---	0 0 0
1	--x	0 0 1
2	-w-	0 1 0
3	-wx	0 1 1
4	r--	1 0 0
5	r-x	1 0 1
6	rw-	1 1 0
7	rwx	1 1 1

Those familiar with the binary number system find this method an easy way to remember what each number represents.

For example, the command `chmod 777 /home` would grant read, write and execute rights (7) to owner, group, and other for the `/home` directory, while `chmod 700 /home` would grant the three rights to only the directory owner, with group and other having no rights. `chmod 750 /home` would grant `rw` rights to the owner, `r-x` rights to the group, and no rights to other users.

For more information about the `chmod` command, see the `chmod` man page on your OES server.

18.4.2 Providing a Private Work Directory

To make an NCP directory private, you assign a single user as the trustee and make sure that no unexpected users or groups have trustee rights in any of the parent directories.

To provide a private work area on a Linux POSIX volume:

- 1 Make a LUM-enabled user the directory owner. For example, you could use the `chown` command to change the owner (user),

```
chown -R user /path/user_dir
```

where *user* is the eDirectory user, *path* is the file path to the work directory, and *user_dir* is the work directory name. The `-R` option applies the command recursively to all subdirectories and files.

- 2 Grant only the LUM-enabled user read, write, and execute rights (`rw` --- ---) to the directory. For example, you could use the `chmod` command as follows,

```
chmod -R 700 /path/user_dir
```

where *path* is the file path to the work directory, and *user_dir* is the work directory name.

- 3 Check each parent directory in the path up to the `root (/)` directory, making sure that all users (referred to as "other users" in Linux) have read and execute rights (`r-x`) in each directory as shown by the third group of permissions (`. r-x`). (Owner and group permissions are represented by dots because their settings are irrelevant.)

The reason for checking directories is that in the parent directories the directory owners are “other” users and they need to be able to see the path down to their own private directories.

Because `r-x` is the default for most directories on Linux, you probably won’t need to change the permissions.

18.4.3 Providing a Group Work Area

On an NCP volume, you can provide a group work area by assigning users to a LUM-enabled group and then granting the group trustee rights to the directory. As an alternative, if users need different levels of access within the work area, you can assign each user as a trustee and grant only the rights needed.

To provide a group work area on a Linux POSIX volume:

- 1 Use the `chown` command to set group ownership for the directory. For example, you could enter

```
chown -R :group /path/group_dir
```

where *group* is the LUM-enabled group name, *path* is the file path to the work area, and *group_dir* is the group work directory. The `-R` option applies the action to all subdirectories and files in *group_dir*.

- 2 Grant the LUM-enabled group read, write, and execute rights (`. . . rwx . . .`). (Owner and other permissions are represented by dots because their settings are irrelevant.)

For example, you could enter

```
chmod -R 770 /path/group_dir
```

where *path* is the file path to the work area, and *group_dir* is the group work directory. The second 7 grants `rwx` to the group. (The example assumes that the owner of the directory should also retain all rights. Therefore, the first number is also 7.)

- 3 Check each parent directory in the path up to the `root (/)` directory, making sure that the group has read and execute rights (`r-x`) in each directory as shown by the second group of permissions (`. . . r-x . . .`).

Use the `chmod` command to adjust this where necessary by specifying the number 5 for the group permission. For more information, see [“Section 18.4.1, “Managing Access Rights,” on page 200.”](#)

18.4.4 Providing a Public Work Area

On an NCP volume, you can provide a public work area by assigning [Public] as a trustee and then granting the required trustee rights to the directory.

For the work area itself, you would set permissions for the owner, group, and all others to read, write, and execute rights (`rwX rwX rwX`) (`chmod 777`).

All others must also have read and execute rights on the system in each parent directory in the path all the way to the root of the Linux system. This means that you set permissions for all parent directories to `rwX --- r-x`.

To provide a public work area on a Linux POSIX volume:

- 1 Use the `chown` command to assign all rights (`rwX`) to other (all users). For example, you could enter

```
chmod -R 707 /path/group_dir
```

where *path* is the file path to the work area, and *group_dir* is the group work directory. The third 7 grants *rx* to the group. (The example assumes that the owner of the directory should also retain all rights and that the group setting is irrelevant.)

- 2 Check each parent directory in the path up to the `root (/)` directory, making sure that all users (other) have read and execute rights (*r-x*) in each directory as shown by the third group of permissions (`. rx`). (Owner and group permissions are represented by dots because their settings are irrelevant.)

Use the `chmod` command to adjust this where necessary by specifying the number 5 for the other permission. For more information, see [“Managing Access Rights”](#) at the beginning of this section.

18.4.5 Setting Up Rights Inheritance

The final step in aligning POSIX rights to the NCP model is setting the Inherit POSIX Permissions volume flag in the NCP configuration file so that all files and subdirectories created in these areas inherit the same permissions as their parent directory. For instructions, see [“Configuring Inherit POSIX Permissions for an NCP Volume”](#) in the *OES 2015 SP1: NCP Server for Linux Administration Guide*.

18.5 Novell FTP (Pure-FTPd) and OES 2015 SP1

FTP file services on OES 2015 SP1 servers are provided by Pure-FTPd, a free (BSD), secure, production-quality and standard-conformant FTP server. The OES implementation includes support for FTP gateway functionality as on NetWare and offers a level of integration between eDirectory and Pure-FTP that allows users to authenticate to eDirectory for FTP access to the server.

The OES implementation also includes support for FTP gateway functionality between Active Directory (AD) and Pure-FTP that allows users to authenticate to AD for FTP access to the server. For more information, see [FTP \(Pure-FTPd\) and OES 2015 SP1 for AD Users](#) in the *OES 2015 SP1: NSS AD Administration Guide*.

This section discusses the following topics:

- ♦ [Section 18.5.1, “Planning for Pure-FTPd,” on page 203](#)
- ♦ [Section 18.5.2, “Installing Pure-FTPd,” on page 203](#)
- ♦ [Section 18.5.3, “Home Directory Support in Pure-FTPd,” on page 204](#)
- ♦ [Section 18.5.4, “Configuring Pure-FTPd on an OES 2015 SP1 Server,” on page 205](#)
- ♦ [Section 18.5.5, “Administering and Managing Pure-FTPd on an OES 2015 SP1 Server,” on page 205](#)
- ♦ [Section 18.5.6, “Cluster Enabling Pure-FTPd in an OES 2015 SP1 Environment,” on page 209](#)
- ♦ [Section 18.5.7, “Migrating Pure-FTPd From NetWare to Linux,” on page 210](#)

18.5.1 Planning for Pure-FTPd

Before installing Pure-FTPd, make sure that users requiring FTP access are LUM-enabled and have access rights to the areas on the server they need to use.

18.5.2 Installing Pure-FTPd

To install Pure-FTPd, select the **Novell FTP** pattern in the OES 2015 SP1 installation.

18.5.3 Home Directory Support in Pure-FTPd

The FTP server supports a home directory for users on local and remote NCP servers. The remote server can be an OES server. When the home directory is set for the user in eDirectory, the user is placed in the home directory on successful login to the Linux server.

Pure-FTPd supports three levels of home directory, default home directory, a user specific home directory on the local system, and a user specific home directory identified by the value set in eDirectory.

POSIX User Home Directory

The POSIX home directory is the directory that is available by default on POSIX file systems. The POSIX home directory is defined at the file system level and cannot be disabled.

DefaultHomeDirectory and eDirectory home directories can be disabled. If one or both of them are enabled, the following is used to establish the precedence:

- ◆ User specific home directory set in eDirectory
- ◆ Default home directory
- ◆ POSIX user home directory

User Specific Home Directory in eDirectory

An administrator can set the home directory for eDirectory users as part of the User object in eDirectory. On successful login to the FTP server, the user is placed in the home directory set in the user object. The User's home directory can exist either on the OES server that is hosting the FTP service or on any other OES server in the same tree.

A new `EnableRemoteHomeDirectory` option is now available to support this home directory. By default, this option is set to `NO` and the home directory set for the user in eDirectory is ignored.

To enable eDirectory based home directory support, you must set both `EnableRemoteHomeDirectory` and `remote_server` to `YES`. FTP will then read the user's home directory from eDirectory and mount it locally.

Default Home Directory

`DefaultHomeDirectory` indicates the path to the common home directory for all FTP users. On successful login to the Pure-FTPd, users are placed in the default home directory. The default home directory can be local or on a locally mounted NSS path or on a remote NCP Server. It can be either an NCP volume or an NSS volume and it can be configured by using the `DefaultHomeDirectory` and `DefaultHomeDirectoryServer` settings. If the home directory is on a remote server, use `DefaultHomeDirectoryServer`, and set it to the IP or DNS name of the remote NCP server. As with any NSS volume, the FTP client should have required rights over the NSS volume whether `DefaultHomeDirectory` is on a local or remote server or not.

The `DefaultHomeDirectoryServer` option is now available to differentiate whether `DefaultHomeDirectory` is on a local or remote server. By default, this option is set to `NO` so `DefaultHomeDirectory` points to a local path.

To set `DefaultHomeDirectory` to point to a remote NCP server with a DNS entry, you must specify the full path to the remote server, including the volume name. For example, `DefaultHomeDirectory /ftphome`. You must also set both `DefaultHomeDirectory` and `remote_server` to `YES`.

NOTE

- ◆ If DefaultHomeDirectory path is a POSIX path (non NCP volume) then it is supported only on local FTP server and not on remote server. In that case DefaultHomeDirectory path should be /home/commonpath (any POSIX path) and DefaultHomeDirectoryServer should be Null or commented.
-

Backslash in Input Paths

Support for backslashes in input path is provided. Using FTP client on Windows, you can use backslash as separator in the path. `allow_backslash_in_path` option is now available to allow backslash in the path. By default the option is set to NO.

18.5.4 Configuring Pure-FTPd on an OES 2015 SP1 Server

To configure the Pure-FTPd server on OES 2015 SP1, edit the `/etc/pure-ftpd/pure-ftpd.conf` file.

NOTE: It is very strongly recommended that you read through the entire `/etc/pure-ftpd/pure-ftpd.conf` file and be familiar with the available parameters and settings.

For complete details, refer the `pure-ftpd` man page.

18.5.5 Administering and Managing Pure-FTPd on an OES 2015 SP1 Server

- ◆ [“Starting Pure-FTPd” on page 205](#)
- ◆ [“Initializing Multiple Instances” on page 205](#)
- ◆ [“Unloading Specific Instances” on page 206](#)
- ◆ [“Pure-FTPd Remote Server Navigation” on page 207](#)

Starting Pure-FTPd

Start the Pure-FTPd server using the `rcpure-ftpd` command.

Initializing Multiple Instances

Pure-FTPd is loaded by using a configuration file. Multiple instances of Pure-FTPd can be loaded using different configuration files.

By default, an instance of Pure-FTPd using `/etc/pure-ftpd/pure-ftpd.conf` file is loaded at the boot time by `init.d` script. For loading multiple instances, new configuration files need to be created.

To load a new instance of Pure-FTPd:

- 1 Create a new configuration file for each instance.

For example: Copy `/etc/pure-ftpd/pure-ftpd.conf` to a different location. Rename the file to `pure-ftpd1.conf` and move it to `/etc/opt/novell/pure-ftpd1.conf`.

2 Modify the following settings in the configuration file to avoid IP address or port conflicts between the instances:

- ♦ **PIDFile:** Points to the full path of the PID file created by the pure-ftpd instance. PID file is used for unloading a particular instance of pure-ftpd. Hence, ensure that the PID File path is unique for every instance.

For example: `/var/run/pure-ftpd1.pid`, `/var/run/pure-ftpd2.pid`.

- ♦ **Bind:** By default, pure-ftpd binds to all the IP addresses on the system and listens to requests over port 21. Modify the settings of the bind such that all the pure-ftpd instances bind to different IP addresses or port combinations.

also, modify the settings in the `/etc/pure-ftpd/pure-ftpd.conf` to avoid any IP address or port conflict from the second instance.

For example: If a system has two interfaces with two IP addresses 10.1.1.1 and 10.1.1.2, then the bind setting for two pure-ftpd instances can be *Bind 10.1.1.1,21* and *Bind 10.1.1.2,21*.

3 Load the new instance using `/usr/sbin/pure-config.pl <Full path of the config file>`

For example: `/usr/sbin/pure-config.pl /etc/opt/novell/pureftpd-confs/pure-ftpd1.conf` loads an instance using the config file `/etc/opt/novell/pureftpd-confs/pure-ftpd1.conf`.

Verifying the Load of a New Instance

Use the following methods to verify that the new instance of pure-ftpd is successfully loaded:

- ♦ The `ps -eaf | grep pure-ftpd` command lists all the instances of pure-ftpd loaded on the system.
- ♦ The PID file as specified using the `PIDFile` entry in the configuration file has been created.
- ♦ An FTP connection from the client to the server over the IP address being used by the pure-ftpd instance can be created.

Unloading Specific Instances

A new script, `pure-ftp-stop.pl`, is added to unload an instance of pure-ftpd and all its child processes. The full path of the configuration file used to load the instance of pure-ftpd must be passed to the `pure-ftp-stop.pl` script.

For example: `/usr/sbin/pure-ftp-stop.pl /etc/opt/novell/pureftpd-confs/pure-ftpd1.conf` unloads the instance of pure-ftpd that was loaded using `/etc/opt/novell/pureftpd-confs/pure-ftpd1.conf`.

The PID file of the pure-ftpd instance is also used for unloading the pure-ftpd instance.

Verifying the Unload of a New Instance

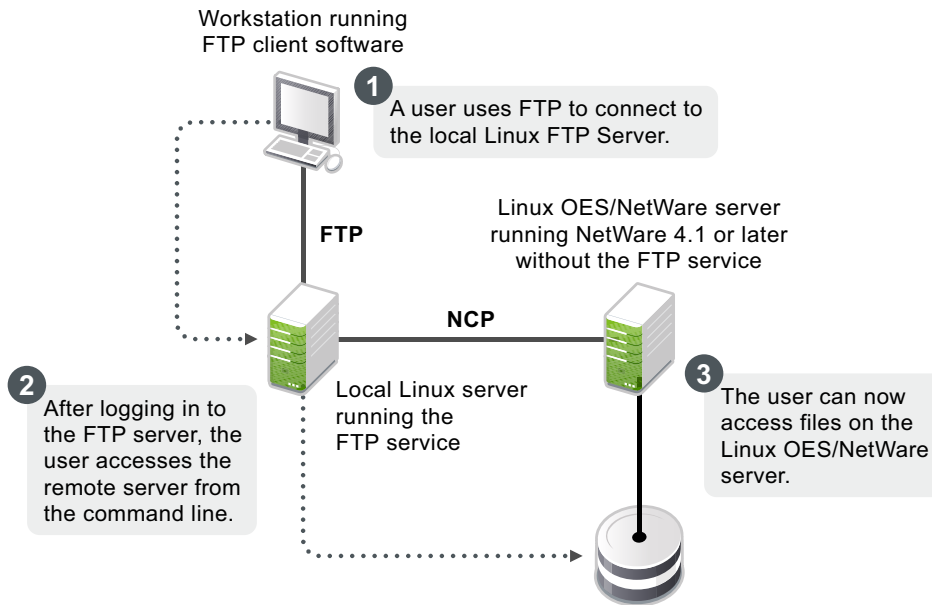
- ♦ The PID file specified using the `PIDFile` entry in the configuration file has been deleted.
- ♦ The number of instances displayed by `ps -eaf | grep pure-ftpd` is reduced.
- ♦ An FTP connection request to the server errors out.

Pure-FTPd Remote Server Navigation

After logging in to the eDirectory tree, users can access files and directories on a remote Linux server whether or not the server is running Linux FTP Server software. The remote server can be another Linux OES server.

This section describes how to configure and use the Remote Server Navigation feature.

- ♦ “Configuring Novell FTP” on page 207
- ♦ “Path Formats” on page 208
- ♦ “SITE Command” on page 208
- ♦ “Disable-ascii” on page 209



The NCP protocol lets you transfer files and navigate to and from remote OES servers.

To navigate to remote servers, use the following command:

```
cd //remote server name/volume/directory pathname
```

File operations such as `get`, `put`, and `delete` can be used on the remote server, even without changing the directory path to that server.

For example:

```
get //remote_server_name/volume/directory path/filename
```

The double slash (`//`) indicates that the user wants to access a remote server. After the double slash, the first entry must be the name of the remote server.

Configuring Novell FTP

Configuration file: `/etc/pure-ftpd/pure-ftpd.conf`

The configuration parameters for remote server navigation are as follows:

Entry	Value	Function
remote_server	yes	Enables remote server navigation for the Pure-FTPd server.
disallow_list_oes_server	yes	Disables SITE SLIST command for listing OES machines.
edir_ldap_port	389	eDirectory LDAP port

The following configuration parameters needs to be set for remote server navigation:

Entry	Value	Reason Why
ChrootEveryone	no	Option yes restricts users to login only to his home directory and cannot navigate to other directories including remote OES servers.
AnonymousOnly	no	Option yes allows only anonymous logins.

Path Formats

Table 18-11 Linux FTP Server path formats

Task	Command Format
Specifying the volume and directory path name	//server_name/volume_name/directory_path
Navigating to different volumes	cd //server_name/volume_name
Switching back to the home directory	cd ~
Switching to home directory of any user	cd ~user_name
Switching to the root of the server	/root

NOTE: The Linux FTP Server does not support wildcards at the root of the server.

SITE Command

The `SITE` command enables FTP clients to access features specific to the Linux FTP Server.

The `SITE` command has the following syntax:

```
SITE [SLIST]
```

NOTE: The settings done through `SITE` commands are valid only for the current session.

This command is unique to the Linux FTP service and are not standard FTP commands.

[Table 18-12](#) provides the `SITE` command along with the description:

Table 18-12 Linux FTP SITE command

Command	Description
SLIST	Lists all the OES servers within the eDirectory tree. Site list command accepts an eDirectory context in LDAP format. By default, site slist command lists all the NCP Servers in the entire tree. When context is passed to the command it lists all the NCP Servers within the context.

NOTE: All the FTP users needs to be LUM-enabled on the FTP server.

Disable-ascii

This command is to enable or disable ascii based file transfer. If this is set to YES, all the file transfers are done in a binary mode and the client command 'TYPE A' is ignored.

18.5.6 Cluster Enabling Pure-FTPd in an OES 2015 SP1 Environment

You can configure Pure-FTPd server in active/active mode of Novell Cluster Services.

- ◆ [“Prerequisites” on page 209](#)
- ◆ [“Active/Active Mode” on page 209](#)

Prerequisites

- ◆ Novell Cluster Services is installed and setup.

For step-by-step information on setting up Novell Cluster Services, refer to [“Installing, Configuring, and Repairing Novell Cluster Services”](#) in the [“OES 2015 SP1: Novell Cluster Services for Linux Administration Guide.”](#)

Active/Active Mode

In active/active cluster mode, multiple instances of FTP server runs on a single node cluster.

Pure-FTPd must be associated with a shared NSS volume and the DefaultHomeDirectory of users must be on the shared NSS volume.

Configuring Active/Active Mode

- 1 Install pure-ftpd on all the cluster nodes by selecting **Novell FTP** in the OES install. Upgrade pure-ftpd on all the nodes with the test RPM.
- 2 Enable hard links on the shared NSS volumes. For more information on hard links, see [“Hard Links Commands”](#) in the [OES 2015 SP1: NSS File System Administration Guide for Linux.](#)

- 3 Create a [unique configuration file](#) for every FTP server to be associated with a shared NSS volume. Ensure that:
 - ♦ The Bind setting in the configuration file is same as the IP Address of the virtual server created for the NSS pool.
 - ♦ The PID file must be unique for each FTP instance running on the cluster.
- 4 Copy the configuration file to the shared volume to `/etc/opt/novell` on the shared volume. Copying the configuration file to the shared volume, the file is automatically moved across the nodes with the volume and is always available to the FTP Server.

For example: If the shared volume is FTPVol1, the path to copy the configuration file is `/media/nss/FTPVol1/etc/opt/novell/pure-ftp.d`.
- 5 Configure all the FTP servers for DefaultHomeDirectory support. As NSS volume is shared, the DefaultHomeDirectory in the configuration file must be on the shared volume.

For example: If `FTPVol1` is the shared volume attached to an FTP Server, DefaultHomeDirectory in the configuration file is `/media/nss/FTPVol1/FTPShare`.
- 6 Update the load and unload scripts of the cluster resource.
 - ♦ **Load script:** Add the following command to load the FTP server with the shared volume:


```
/usr/sbin/pure-config.pl <Full Path to configuration file>
```

For example: If the shared volume is FTPVol1 and the Pure-FTP configuration file is `/etc/opt/novell/pure-ftp.d/ftpvoll.conf` on FTPVol1, the pure-ftp load command in the load script is `exit_on_error /usr/sbin/pure-config.pl /media/nss/FTPVol1/etc/opt/novell/pure-ftp.d/ftpvoll.conf`.
 - ♦ **Unload script:** Add the following command to unload the FTP server:


```
/usr/sbin/pure-ftp-stop.pl <Full Path to configuration file>
```

Configuration file path must be same as the one passed to pure-config.pl in the load script.

NOTE: In iManager, load and unload the cluster resources. Pure-ftp.d instances must be loaded along with the shared NSS volumes. During the migration process, the pure-ftp.d instances alongwith the associated shared volumes are moved across the cluster nodes.

18.5.7 Migrating Pure-FTPd From NetWare to Linux

You can also migrate an existing FTP server configuration from a NetWare server to OES 2015 SP1. For migration instructions and a brief FAQ, see [“Migrating FTP to OES 2015 SP1”](#) in the [OES 2015 SP1: Migration Tool Administration Guide](#).

18.6 NCP Implementation and Maintenance

If you have installed the NCP server for OES, eDirectory/Novell Client users can access files on the OES 2015 SP1 server with no additional configuration.

The implementation information in the following sections can help you get started with NCP on OES 2015 SP1 servers.

- ♦ [Section 18.6.1, “The Default NCP Volume,” on page 211](#)
- ♦ [Section 18.6.2, “Creating NCP Home and Data Volume Pointers,” on page 211](#)
- ♦ [Section 18.6.3, “Assigning File Trustee Rights,” on page 211](#)

- ♦ [Section 18.6.4, “NCP Caveats,” on page 211](#)
- ♦ [Section 18.6.5, “NCP Maintenance,” on page 212](#)

18.6.1 The Default NCP Volume

The NCP Server for OES enables NCP access to NCP and NSS volumes defined on the OES server. When you install the NCP server, the installation creates one NCP volume named `SYS:` that maps to the `/usr/novell/sys` folder on the OES server.

This NCP volume contains `LOGIN` and `PUBLIC` directories that, in turn, contain a small subset of the files traditionally found on a NetWare server in the directories with the same names.

18.6.2 Creating NCP Home and Data Volume Pointers

Initially, there are no NCP home directories or data volumes available to Novell Clients that attach to an OES server.

For existing eDirectory users: If you want users to have NCP home or data directories on the server, you must decide where you want these directories to reside on the server’s partitions and then create NCP volumes by using the `ncpcon` utility at the terminal prompt.

For example, if you wanted to create an NCP volume (pointer) named `HOME` and mount it to the `/usr` folder on the Linux server, you would enter the following command at the command prompt:

```
ncpcon create volume HOME /usr
```

After issuing this command, when a Novell Client attaches to the OES server, the `HOME:` volume appears along with the `SYS:` volume created by the installation.

For new eDirectory users: If you create an NCP or NSS volume on the server prior to creating users, then you have the option of specifying that volume in iManager as the location of the home directory for the new users.

IMPORTANT: NCP Volume pointers are always created with uppercase names (`HOME:`, `SYS:`, etc.) regardless of the case specified when the volume pointers are created.

18.6.3 Assigning File Trustee Rights

You can use the same methods for assigning file trustee rights on NCP volumes on OES servers that you use when assigning them on NetWare. For example, the Novell Client can be used by anyone with the Access Control right on the volume, or the root user can use the `ncpcon` utility `> rights` command at a command prompt to administer NCP trustee rights. See “[Managing File System Trustees, Trustee Rights, and Attributes on NCP Volumes](#)” in the *OES 2015 SP1: NCP Server for Linux Administration Guide*. (The `ncpcon rights` command is related to but not the same as the `rights` utility used to manage trustees on NSS volumes.)

18.6.4 NCP Caveats

Cross-protocol file locking (CPL) is enabled by default on all new servers with NCP installed. For more information, see [Section 3.8.6, “Cross-Protocol File Locking Might Need To Be Reconfigured if AFP or CIFS Is Functioning on an NCP Server,” on page 41](#).

18.6.5 NCP Maintenance

Because NCP provides Novell Client access to files on NetWare and OES servers, the service is covered by maintenance tasks that apply to file systems on these servers. For information on maintaining file services, see “[storage, file systems, & databases \(http://www.novell.com/documentation/oes11/index.html#cat_stor-file-systems-databases\)](http://www.novell.com/documentation/oes11/index.html#cat_stor-file-systems-databases)” in the online documentation.

18.7 NetStorage Implementation and Maintenance

The following sections are provided only as introductory information. For more information about using NetStorage, see the *OES 2015 SP1: NetStorage Administration Guide for Linux*.

- ◆ [Section 18.7.1, “About Automatic Access and Storage Locations,” on page 212](#)
- ◆ [Section 18.7.2, “About SSH Storage Locations,” on page 212](#)
- ◆ [Section 18.7.3, “Assigning User and Group Access Rights,” on page 213](#)
- ◆ [Section 18.7.4, “Authenticating to Access Other Target Systems,” on page 213](#)
- ◆ [Section 18.7.5, “NetStorage Authentication Is Not Persistent by Default,” on page 213](#)
- ◆ [Section 18.7.6, “NetStorage Maintenance,” on page 214](#)

18.7.1 About Automatic Access and Storage Locations

The inherent value of NetStorage lies in its ability to connect users with various servers and file systems. Some connections are created automatically depending on the OES platform where NetStorage is installed. Other connections must be created by the network administrator.

NetStorage provides automatic access to:

- ◆ NSS volumes on the same server that use the default mount point (/media/nss)
- ◆ User Home directories that are specified in eDirectory on NCP or NSS volumes.
- ◆ Drive mapping locations in login scripts of the user logging in (if the NCP Server for Linux is running on the server)

Administrators can create storage locations to storage on any of the target servers illustrated in [Figure 18-3 on page 189](#), including Dynamic Storage Technology (DST) volume pairs and Distributed File Services (DFS). For instructions on creating Storage Locations, see “[Creating a Storage Location Object](#)” in the *OES 2015 SP1: NetStorage Administration Guide for Linux*.

18.7.2 About SSH Storage Locations

If you plan to use SSH storage locations, be aware that by default any users who are enabled for Samba cannot access data stored at the SSH locations. Additional steps are required to grant simultaneous access to Samba and SSH. For more information, see [Section 11.4, “SSH Services on OES 2015 SP1,” on page 92](#).

18.7.3 Assigning User and Group Access Rights

Because NetStorage provides access to other file storage systems, the users and groups that access the other systems through NetStorage must be granted file and directory access on those systems.

For example:

- ♦ eDirectory users must exist in the eDirectory tree where the OES server resides and have access rights to the files and directories on the OES server.
- ♦ Windows users must exist on the Windows systems and have the required access rights to the files and directories on those systems.
- ♦ If your users will access Samba files on an OES server, they must be enabled for LUM and Samba access on the OES server. For more information, see [“OES Services That Require LUM-Enabled Access” on page 156](#).

IMPORTANT: The eDirectory usernames and passwords that are used to authenticate to the NetStorage (OES) server must match the usernames and passwords defined on the target systems.

18.7.4 Authenticating to Access Other Target Systems

The OES installation establishes a primary authentication domain (or context) for NetStorage. To access any storage location, users must exist somewhere in this primary domain. When it receives an authentication request, NetStorage searches for the username in the context you specified during OES installation and in all its subcontexts.

Authentication to other file systems is often controlled by other authentication domains. For example, you might create a storage location on the OES server that points to a legacy NetWare server that resides in a different eDirectory tree. To access this storage location, users must authenticate to the other tree.

This means that you must specify an additional context in the NetStorage configuration as a non-primary authentication domain.

When defining a non-primary authentication domain, you must

- ♦ Ensure that the username and password in the non-primary domain matches the username and password in the primary domain.
- ♦ Specify the exact context where User objects reside. In contrast to the way it searches in the primary authentication domain, NetStorage doesn't search the subcontexts of non-primary authentication domains.

For more information about managing NetStorage authentication domains, see [“Authentication Domains”](#) in the *OES 2015 SP1: NetStorage Administration Guide for Linux*.

18.7.5 NetStorage Authentication Is Not Persistent by Default

By default, users must reauthenticate each time they access NetStorage in a browser. This is true even if another browser window is open and authenticated on the same workstation.

The reason for this is that persistent cookies are not enabled by default.

This setting can be changed. For more information, see [“Persistent Cookies”](#) in the *OES 2015 SP1: NetStorage Administration Guide for Linux*.

18.7.6 NetStorage Maintenance

Your NetStorage installation can change as your network changes and evolves by providing access to new or consolidated storage locations. For information about the kinds of tasks you can perform to keep your NetStorage implementation current, see the [OES 2015 SP1: NetStorage Administration Guide for Linux](#).

18.8 Novell AFP Implementation and Maintenance

To use the Novell implementation of AFP file services on your OES 2015 SP1 server, you must install the service by using the instructions in the [OES 2015 SP1: Installation Guide](#) (for a new installation) or install it after the initial OES installation, as explained in “Installing AFP after OES 2015 SP1 Installation” in the [OES 2015 SP1: Novell AFP for Linux Administration Guide](#).

- ♦ [Section 18.8.1, “Implementing Novell AFP File Services,”](#) on page 214
- ♦ [Section 18.8.2, “Maintaining Novell AFP File Services,”](#) on page 214

18.8.1 Implementing Novell AFP File Services

All eDirectory users can access the AFP file services on an OES 2015 SP1 server as they would any Macintosh server.

18.8.2 Maintaining Novell AFP File Services

Information on maintaining your AFP installation is found in the [OES 2015 SP1: Novell AFP for Linux Administration Guide](#).

18.9 Novell CIFS Implementation and Maintenance

To use the Novell implementation of CIFS file services on your OES server, you must install the service by using the instructions in the [OES 2015 SP1: Installation Guide](#) (for a new installation) or install it after the initial OES installation, as explained in “Installing CIFS after the OES Installation” in the [OES 2015 SP1: Novell CIFS for Linux Administration Guide](#).

- ♦ [Section 18.9.1, “Implementing Novell CIFS File Services,”](#) on page 214
- ♦ [Section 18.9.2, “Maintaining Novell CIFS File Services,”](#) on page 215

18.9.1 Implementing Novell CIFS File Services

All eDirectory users can access the CIFS file services on an OES 2015 SP1 server as they would any Windows workgroup server.

Active Directory users can also be granted access through the NSS AD integration service, starting in OES 2015.

For instructions on implementing Novell CIFS, see “[Planning and Implementing CIFS](#)” in the [OES 2015 SP1: Novell CIFS for Linux Administration Guide](#).

18.9.2 Maintaining Novell CIFS File Services

Information on maintaining your CIFS installation is found in the [OES 2015 SP1: Novell CIFS for Linux Administration Guide](#).

18.10 Novell iFolder 3.9.2 Implementation and Maintenance

The following implementation pointers are provided only as introductory information. To begin using Novell iFolder, see the [Novell iFolder 3.9.2 Administration Guide](#).

- [Section 18.10.1, “Managing Novell iFolder 3.9.2,” on page 215](#)
- [Section 18.10.2, “Configuring Novell iFolder 3.9.2 Servers,” on page 215](#)
- [Section 18.10.3, “Creating and Enabling Novell iFolder 3.9.2 Users,” on page 215](#)
- [Section 18.10.4, “Novell iFolder 3.9.2 Maintenance,” on page 215](#)

18.10.1 Managing Novell iFolder 3.9.2

You manage Novell iFolder through the iFolder Management Console, which you can access directly or through iManager. For more information, see [“Installing and Configuring iFolder Services”](#) in the [Novell iFolder 3.9.2 Administration Guide](#).

18.10.2 Configuring Novell iFolder 3.9.2 Servers

Before you let users log in to the Novell iFolder 3.9.2 server, be sure you complete all the setup tasks in [“Installing and Configuring iFolder Services”](#) (including [“Configuring the iFolder Web Admin Server”](#) if applicable) in the [Novell iFolder 3.9.2 Administration Guide](#).

18.10.3 Creating and Enabling Novell iFolder 3.9.2 Users

To provide user access to Novell iFolder 3.9.2:

1. Provision eDirectory User objects for iFolder 3.9.2.
2. Enable the User Account Policies for iFolder access.
3. (Optional) Enable Account Quotas (space limits) for the user accounts.
4. Create iFolders for users.
5. Distribute the iFolder Client to users.

For more information, see [“Managing iFolder Users”](#) in the [Novell iFolder 3.9.2 Administration Guide](#).

18.10.4 Novell iFolder 3.9.2 Maintenance

As the Novell iFolder service load increases, you might need to increase the server capacity or add additional servers. For help, see [“Installing and Configuring iFolder Services”](#) in the [Novell iFolder 3.9.2 Administration Guide](#).

18.11 Samba Implementation and Maintenance

To use the Novell implementation of Samba file services on your OES server, you must install the service by using the instructions in the [OES 2015 SP1: Installation Guide](#) (for a new installation) or install it after the initial OES installation, as explained in “Installing Novell Samba for OES” in the [OES 2015 SP1: Novell Samba Administration Guide](#).

- ♦ [Section 18.11.1, “Implementing Samba File Services,”](#) on page 216
- ♦ [Section 18.11.2, “Maintaining Samba File Services,”](#) on page 216

18.11.1 Implementing Samba File Services

All users whose accounts have been enabled for Samba access can access the OES server as they would any Windows server.

For instructions on implementing Samba, see “Installing Novell Samba for OES” in the [OES 2015 SP1: Novell Samba Administration Guide](#).

18.11.2 Maintaining Samba File Services

Information on maintaining your Samba installation is found in the [OES 2015 SP1: Novell Samba Administration Guide](#).

19 Print Services

Open Enterprise Server 2015 SP1 includes Novell iPrint, a powerful and easy-to-implement printing solution that provides print-anywhere functionality to network users.

This section contains the following information:

- ◆ [Section 19.1, “Overview of Print Services,” on page 217](#)
- ◆ [Section 19.2, “Planning for Print Services,” on page 219](#)
- ◆ [Section 19.3, “Coexistence and Migration of Print Services,” on page 219](#)
- ◆ [Section 19.4, “Print Services Implementation Suggestions,” on page 220](#)
- ◆ [Section 19.5, “Print Services Maintenance Suggestions,” on page 221](#)

19.1 Overview of Print Services

Novell iPrint lets Linux, Macintosh, and Windows users

- ◆ Quickly locate network printers through a Web browser.
- ◆ Easily install and configure a located printer through a native printer installation method.
- ◆ Print to installed printers from any location (including the Web) through an IP connection.

The information in this section provides a high-level overview of Novell iPrint print services. It is designed to acquaint you with basic iPrint functionality so you understand the configuration steps you need to perform to provide iPrint print services, and understand how iPrint functions from the user’s perspective.

- ◆ [Section 19.1.1, “Using This Overview,” on page 217](#)
- ◆ [Section 19.1.2, “iPrint Components,” on page 217](#)
- ◆ [Section 19.1.3, “iPrint Functionality,” on page 218](#)

19.1.1 Using This Overview

If you already know that you want to provide OES print services for your users and you understand how iPrint works, skip the overviews and continue with [Section 19.2, “Planning for Print Services,” on page 219](#).

If you want to learn more about iPrint, continue with this overview section.

19.1.2 iPrint Components

A Novell iPrint installation consists of various components, most of which are represented by objects in your eDirectory tree:

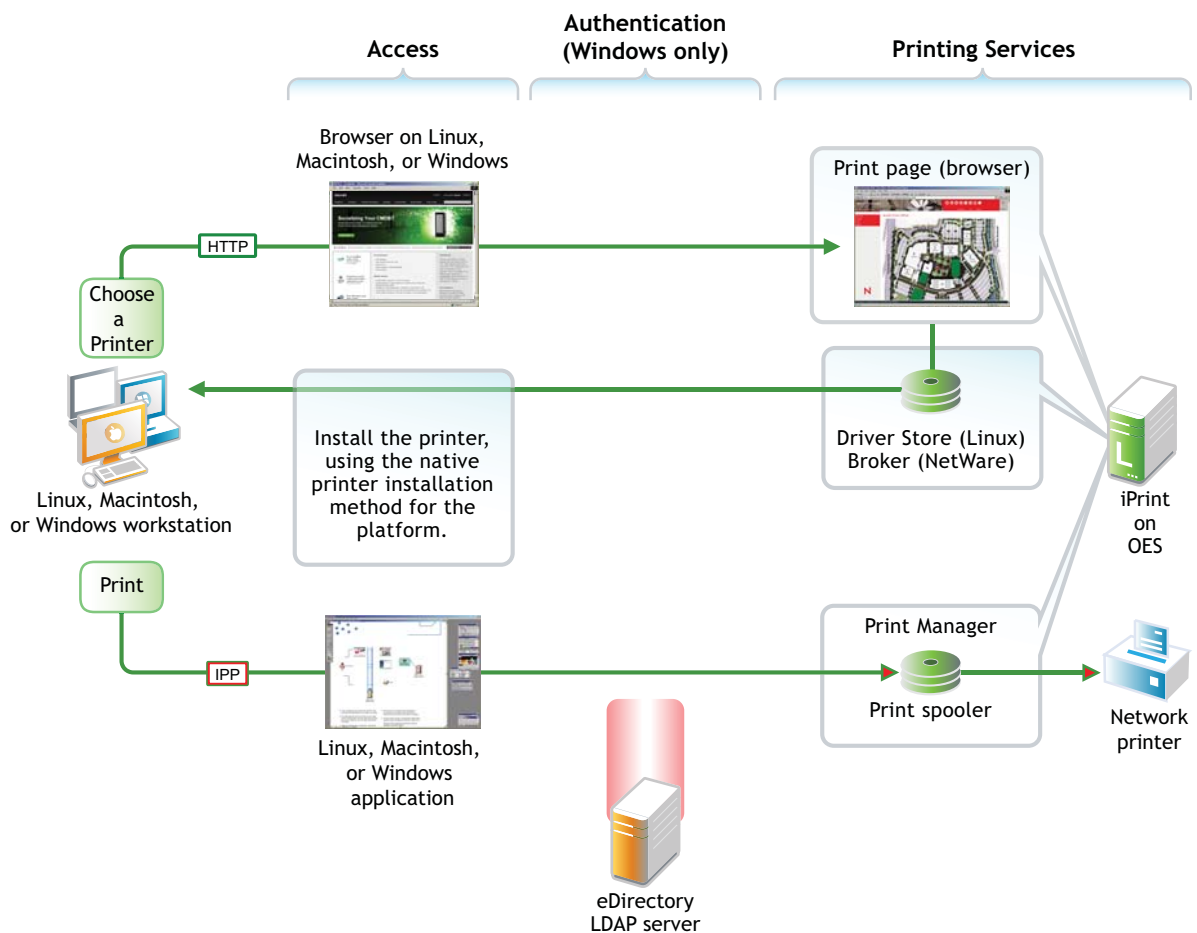
- ◆ **Print Driver Store:** This is a repository that stores the drivers on an OES server for your network printers. It is the first component you configure and is represented by an eDirectory object that you create. It corresponds to the Print Broker on NetWare.

- ♦ **Printer Drivers:** These are the platform-specific printer drivers and PostScript Printer Description (PPD) files that are stored in the Driver Store and are installed on workstations when users select a target printer. Printer drivers and PPD files exist as file structures within the Driver Store and are not represented by objects in eDirectory.
- ♦ **Printer Objects:** These are eDirectory objects you create that store information about the printers available through iPrint. The information stored in an object is used each time its associated printer is added to a workstation's list of available printers.
- ♦ **Print Manager:** This is a daemon that runs on OES. It receives print jobs from users and forwards them to the target printer when it is ready. It is represented by and controlled through an eDirectory object that you can configure.
- ♦ **iPrint Client:** This is a set of browser plug-ins. On Macintosh and Windows workstations it is automatically installed the first time it interacts with iPrint. On Linux workstations, it must be installed manually. The client is required on each platform to navigate through the iPrint Web pages, select a target printer, and install the print driver.

19.1.3 iPrint Functionality

Figure 19-1 describes how iPrint functions from a user workstation perspective.

Figure 19-1 How iPrint Works



The following table explains the information illustrated in Figure 19-1.

Table 19-1 iPrint Functionality

Access	Authentication	Printing Services
The iPrint Client must be installed on each workstation accessing iPrint services.	You can require authentication for Windows users if needed. The option to require authentication is not available for Linux and Macintosh users.	Users with the iPrint Client installed and access to the OES server can install printer drivers and print to iPrint printers.
A user needing to use a printer for the first time accesses the organization's print page on the Web.	Although shown separately, eDirectory could be installed on the OES server.	By default, iPrint generates a printer list for the printers hosted on the server.
When the user selects the target printer, its platform-specific driver is automatically installed and configured.		A customized Web page lets users browse to the target printer by using location lists and maps that you have previously created for the site where the printer is located.
After printer installation, users can print to the printer from any application.		

19.2 Planning for Print Services

We recommend that you record your decisions in planning notes for future reference.

Consider the following information as you plan your iPrint installation:

- ◆ iPrint has no additional RAM requirements.
- ◆ Most iPrint installations (even in large enterprises) do not require additional disk space for associated print job spooling.
However, if you anticipate very heavy print usage and want to plan for additional disk space in that regard, the iPrint spooler area is located in the `/var` partition or directory structure on OES servers.
- ◆ To finish planning your iPrint installation, refer to the information in “Novell iPrint” in the [OES 2015 SP1: Installation Guide](#)

19.3 Coexistence and Migration of Print Services

If you select iPrint during the OES server installation, the iPrint software components are automatically installed on the server. Although the Common UNIX Printing System (CUPS) software is installed with the SLES 11 packages, CUPS is disabled to avoid port 631 conflicts.

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 [NW 6.5 SP8: iPrint Administration Guide](#).

For more information on configuring iPrint on OES, see “Installing and Setting Up iPrint on Your Server” in the [OES 2015 SP1: iPrint Linux Administration Guide](#).

Migrating iPrint services from a NetWare server to an OES 2015 SP1 server is supported by the OES 2015 SP1 Migration Tool. For more information, see “Migrating iPrint to OES 2015 SP1” in the [OES 2015 SP1: Migration Tool Administration Guide](#).

19.4 Print Services Implementation Suggestions

This section provides only summary implementation information. For complete iPrint documentation, see the [OES 2015 SP1: iPrint Linux Administration Guide](#).

- ♦ [Section 19.4.1, “Initial Setup,” on page 220](#)
- ♦ [Section 19.4.2, “Implementation Caveats,” on page 221](#)
- ♦ [Section 19.4.3, “Other Implementation Tasks,” on page 221](#)

19.4.1 Initial Setup

After your OES server is installed, you must do the following to complete your iPrint installation:

- 1 Create a Driver Store to store the print drivers.

This eDirectory object stores the drivers for your network printers. Each Printer object you create for your network needs to reference a printer driver in Driver Store. When users subsequently install printers, the correct drivers for the platform running on their workstation are downloaded from the Driver Store and installed.

You create the Driver Store through iManager. For specific instructions, see “[Creating a Driver Store](#)” in the [OES 2015 SP1: iPrint Linux Administration Guide](#)

- 2 Add a printer driver to the Driver Store for each printer/platform combination needed.

For example, If you have Windows XP, Windows 7, and Novell Linux Desktop (NLD) workstations on your network and you have four different printer types, you need to add four printer drivers for each platform (a total of 12 printer drivers) to the Driver Store.

You add printer drivers to the store through iManager. For specific instructions, see “[Updating Printer Drivers](#)” in the [OES 2015 SP1: iPrint Linux Administration Guide](#)

- 3 Create a Print Manager object.

The Print Manager receives print jobs from users and forwards them to the target printer when it is ready. The Print Manager must be running for you to create Printer objects.

The Print Manager is an object you create in eDirectory and is usually started and stopped through iManager.

You create the Print Manager object through iManager. For specific instructions, see “[Creating a Print Manager](#)” in the [OES 2015 SP1: iPrint Linux Administration Guide](#)

- 4 Create Printer objects.

You must create a Printer object for each printer you want users to access through iPrint. These objects store information about the printer that is used each time the printer is installed on a workstation.

You create Printer objects through iManager. For specific instructions, see “[Creating a Printer](#)” in the [OES 2015 SP1: iPrint Linux Administration Guide](#)

- 5 (Optional) Create location-based, customized printing Web pages.

By default, each iPrint installation includes the creation of a Default Printer List Web page that users can access to install iPrint printers.

You have the option of enhancing the browsing experience by creating location-based printing Web pages that feature either lists of printers by location, maps of the buildings showing each printer, or a combination of both.

If your organization is located in a building with multiple floors or even at multiple sites, providing location-based print Web pages can greatly simplify printing for your users.

Your iPrint installation contains the iPrint Map Designer to help you easily create location maps with clickable printer icons. For more information, see “[Setting Up Location-Based Printing](#)” in the *OES 2015 SP1: iPrint Linux Administration Guide*

- 6 Provide instructions to users for accessing iPrint printers.

After performing the steps above, your network is ready for iPrint functionality. You need only tell users how to access your printing Web pages; Novell iPrint does the rest.

19.4.2 Implementation Caveats

There are a few implementation caveats relating to iPrint on Linux. See “[iPrint](#)” on page 69.

19.4.3 Other Implementation Tasks

In addition to the tasks described in [Section 19.4.1, “Initial Setup,”](#) on page 220, there are additional tasks you might want or need to consider. To see a list of potential tasks, refer to the “[Print Services \(http://www.novell.com/documentation/oes11/index.html#cat_iprint\)](#)” links in the OES online documentation.

19.5 Print Services Maintenance Suggestions

As you add printers to your network or move them to different locations, be sure to update your iPrint installation to reflect these changes.

After your installation is completed and users are printing, you can monitor print performance by using the information located in “[Using the Print Manager Health Monitor](#)” in the *OES 2015 SP1: iPrint Linux Administration Guide*

For more information on iPrint and its functionality within OES, see the “[Print Services \(http://www.novell.com/documentation/oes11/index.html#cat_iprint\)](#)” links in the online documentation.

20 Web Services

The Web and application services in Open Enterprise Server 2015 SP1 support the creation and deployment of Web sites and Web applications that 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.

See the *OES 2015 SP1: Web Services and Applications Guide*.

Apache

OES 2015 SP1 includes Apache 2.2, the most popular Web server on the Internet.

For additional information, see the [Apache.org Web site \(http://httpd.apache.org/docs/2.2/\)](http://httpd.apache.org/docs/2.2/).

Tomcat

OES 2015 SP1 includes Tomcat 6.0, which is used to run basic Java servlet and JavaServer Pages (JSP) applications.

For information, see the [Apache Tomcat 6.0 Web site \(http://tomcat.apache.org/tomcat-6.0-doc/index.html\)](http://tomcat.apache.org/tomcat-6.0-doc/index.html).

21 Security

This section contains the following topics:

- ◆ Section 21.1, “Overview of OES Security Services,” on page 225
- ◆ Section 21.2, “Planning for Security,” on page 227
- ◆ Section 21.3, “Configuring and Administering Security,” on page 231
- ◆ Section 21.4, “OES 2015 SP1 and Security Scanners,” on page 231
- ◆ Section 21.5, “Links to Product Security Considerations,” on page 231
- ◆ Section 21.6, “Links to Anti-Virus Partners,” on page 232

21.1 Overview of OES Security Services

This section provides specific overview information for the following key OES components:

- ◆ Section 21.1.1, “Application Security (AppArmor),” on page 225
- ◆ Section 21.1.2, “NSS Auditing Engine,” on page 225
- ◆ Section 21.1.3, “Encryption (NICI),” on page 226
- ◆ Section 21.1.4, “General Security Issues,” on page 227

21.1.1 Application Security (AppArmor)

Novell AppArmor provides easy-to-use application security for both servers and workstations. You specify which files a program can read, write, and execute.

AppArmor enforces good application behavior without relying on attack signatures and prevents attacks even if they are exploiting previously unknown vulnerabilities.

For more information, see the [Novell AppArmor Documentation Web site \(http://www.novell.com/documentation/apparmor/index.html\)](http://www.novell.com/documentation/apparmor/index.html).

21.1.2 NSS Auditing Engine

OES includes the NSS Auditing Engine, which is installed by default with NSS.

The auditing engine provides an interface for auditing client applications, such as Novell Sentinel and various third-party products to access. Information about the auditing engine SDK is available on the [Novell Web site \(http://developer.novell.com/wiki/index.php/NSS_Auditing_SDK\)](http://developer.novell.com/wiki/index.php/NSS_Auditing_SDK).

Using the SDK, client applications can be developed to audit various NSS file system operations on files and directories, including:

- ◆ delete
- ◆ create
- ◆ open
- ◆ close

- ♦ rename
- ♦ link
- ♦ metadata modified
- ♦ trustee add/delete
- ♦ inherited rights modified

Novell Sentinel Server 90-Day Free Trial

Novell Sentinel Log Manager runs on a 64-bit SLES 11 host. You can download the suite from the [Novell Download Web site \(http://download.novell.com/Download?buildid=yDnJELwauAo~\)](http://download.novell.com/Download?buildid=yDnJELwauAo~). For installation and usage instructions, see the Novell Sentinel Readme and Release Notes included as a link on the download page.

Third-Party Partner Applications

For information about third-party partner applications that leverage the NSS Auditing Engine, see the [OES partners' page](#).

21.1.3 Encryption (NICI)

The Novell International Cryptography Infrastructure (NICI) is the cryptography service for NetIQ eDirectory, NetIQ Modular Authentication Services (NMAS), NetIQ Certificate Server, NetIQ SecretStore, and TLS/SSL.

Key Features

NICI includes the following key features:

- ♦ **Industry standards:** It implements the recognized industry standards.
- ♦ **Certified:** It is FIPS-140-1 certified on selected platforms.
- ♦ **Cross-platform support:** It is available on both OES platforms.
- ♦ **Governmental export and import compliance:** It has cryptographic interfaces that are exportable from the U.S. and importable into other countries with government-imposed constraints on the export, import, and use of products that contain embedded cryptographic mechanisms.
- ♦ **Secure and tamper-resistant architecture:** The architecture uses digital signatures to implement a self-verification process so that consuming services are assured that NICI has not been modified or tampered with when it is initialized.

Never Delete the NICI Configuration Files

In the early days of NICI development, some NICI problems could be solved only by deleting the NICI configuration files and starting over. The issues that required this were solved years ago, but as is often the case, the practice persists, and some administrators attempt to use this as a remedy when they encounter a NICI problem.

No one should ever delete the [NICI configuration files](#) unless they are directly told to do so by a member of the NICI development team. And in that rare case, they should be sure to [back up the files](#) before doing so. Failure to do this makes restoring NICI impossible.

More Information

For more information on how to use NICI, see the [Novell International Cryptographic Infrastructure \(NICI\) 2.7.6 Administration Guide](#).

21.1.4 General Security Issues

In addition to the information explained and referenced in this section, the OES online documentation contains links to “security issues” (http://www.novell.com/documentation/oes11/index.html#cat_security).

21.2 Planning for Security

This section discusses the following topics. For additional planning topics, see the [Security section in the OES online documentation](#) (http://www.novell.com/documentation/oes11/index.html#cat_security).

- ♦ [Section 21.2.1, “Comparing the Linux and the Novell Trustee File Security Models,”](#) on page 227
- ♦ [Section 21.2.2, “User Restrictions: Some OES Limitations,”](#) on page 229
- ♦ [Section 21.2.3, “Ports Used by OES 2015 SP1,”](#) on page 229

21.2.1 Comparing the Linux and the Novell Trustee File Security Models

The Novell Trustee and Linux (POSIX) security models are quite different, as presented in [Table 21-1](#).

Table 21-1 POSIX vs. NSS/NCP File Security Models

Feature	POSIX / Linux	Novell Trustee Model on OES
Administrative principles	<p>Permissions are individually controlled and managed for each file and subdirectory.</p> <p>Because of the nature of the POSIX security model, users usually have read rights to most of the system.</p> <p>To make directories and files private, permissions must be removed.</p> <p>For more information on making existing directories private, see Section 18.4.2, “Providing a Private Work Directory,” on page 201.</p>	<p>Trustee assignments are made to directories and files and flow down from directories to everything below unless specifically reassigned.</p>

Feature	POSIX / Linux	Novell Trustee Model on OES
Default accessibility	<p>Users have permissions to see most of the file system.</p> <p>The contents of a few directories, such as the <code>/root</code> home directory, can only be viewed by the <code>root</code> user.</p> <p>Some system configuration files can be read by everyone, but the most critical files, such as <code>/etc/fstab</code>, can only be read and modified by <code>root</code>.</p>	<p>Users can see only the directories and files for which they are trustees (or members of a group that is a trustee).</p>
Home directories—an example of default accessibility	<p>By default, all users can see the names of directories and files in home directories.</p> <p>During LUM installation, you can specify that newly created home directories will be private.</p> <p>For more information on making existing home directories private, see Section 18.4.2, “Providing a Private Work Directory,” on page 201.</p>	<p>By default, only the system administrator and the home directory owner can see a home directory. Files in the directory are secure.</p> <p>If users want to share files with others, they can grant trustee assignments to the individual files, or they can create a shared subdirectory and assign trustees to it.</p>
Inheritance from parents	<p>Nothing is inherited.</p> <p>Granting permission to a directory or file affects only the directory or file.</p>	<p>Rights are inherited in all child subdirectories and files unless specifically reassigned.</p> <p>A trustee assignment can potentially give a user rights to a large number of subdirectories and files.</p>
Privacy	<p>Because users have permissions to see most of the file system for reasons stated above, most directories and files are only private when you make them private.</p>	<p>Directories and files are private by default.</p>
Subdirectory and file visibility	<p>Permissions granted to a file or directory apply to only the file or directory. Users can't see parent directories along the path up to the root unless permissions are granted (by setting the UID, GID, and mode bits) for each parent.</p> <p>After permissions are granted, users can see the entire contents (subdirectories and files) of each directory in the path.</p>	<p>When users are given a trustee assignment to a file or directory, they can automatically see each parent directory along the path up to the root. However, users can't see the contents of those directories, just the path to where they have rights.</p>

When an NCP volume is created on a Linux POSIX or NSS volume, some of the behavior described above is modified. For more information, see the [OES 2015 SP1: NCP Server for Linux Administration Guide](#), particularly the “[NCP on Linux Security](#)” section.

21.2.2 User Restrictions: Some OES Limitations

Seasoned NetWare administrators are accustomed to being able to set the following access restrictions on users:

- ◆ Account balance restrictions
- ◆ Address restrictions
- ◆ Intruder lockout
- ◆ Login restrictions
- ◆ Password restrictions
- ◆ Time restrictions

Many of the management interfaces that set these restrictions (iManager, for example), might seem to imply that these restrictions apply to users who are accessing an OES server through any protocol.

This is generally true, with two important exceptions:

- ◆ Maximum number of concurrent connections in login restrictions
- ◆ Address restrictions

These two specific restrictions are enforced only for users who are accessing the server through NCP. Connections through other access protocols (for example, HTTP or CIFS) have no concurrent connection or address restrictions imposed.

For this reason, you probably want to consider not enabling services such as SSH and FTP for LUM when setting up Linux User Management. For more information on SSH and LUM, see [Section 11.4, “SSH Services on OES 2015 SP1,” on page 92](#).

For more information on Linux User Management, see [“Linux User Management: Access to Linux for eDirectory Users” on page 153](#). For more information on the services that can be PAM-enabled, see [Table 15-2 on page 157](#).

21.2.3 Ports Used by OES 2015 SP1

The ports used by OES 2015 SP1 services are listed in [Table 21-3](#).

Table 21-2 Open Enterprise Server Services and Ports

Service	Default Ports
Domain Services for Windows	<ul style="list-style-type: none"> ◆ 1636 (LDAPS) ◆ 1389 (LDAP) ◆ 88 (Kerberos TCP and UDP) ◆ 135 (RPC Endpoint Manager TCP and UDP) ◆ 1024 - 65535 (RPC Dynamic Assignments TCP) ◆ 3268 (Global Catalog LDAP TCP) ◆ 3269 (Global Catalog LDAP over SSL TCP) ◆ 123 (Network Time Protocol UDP) ◆ 137 (NetBIOS Name Service TCP and UDP) ◆ 138 (NetBIOS Datagram Service TCP and UDP) ◆ 139 (NetBIOS Session Service TCP and UDP) ◆ 8025 (Domain Service Daemon TCP) ◆ 445 (Microsoft-DS traffic TCP and UDP)
NetIQ eDirectory	<ul style="list-style-type: none"> ◆ 389 (LDAP) ◆ 636 (secure LDAP) <p>IMPORTANT: The scripts that manage the common proxy user require port 636 for secure LDAP communications.</p> <ul style="list-style-type: none"> ◆ 8028 (HTTP for iMonitor) ◆ 8030 (secure HTTP for iMonitor) ◆ 524 (NCP)
iManager	<ul style="list-style-type: none"> ◆ 80 (HTTP) ◆ 443 (secure HTTP)
iPrint	<ul style="list-style-type: none"> ◆ 80 (HTTP) ◆ 443 (secure HTTP) ◆ 631 (IPP)
Novell Identity Translator	<ul style="list-style-type: none"> ◆ 3268 ◆ 389
Novell AFP	<ul style="list-style-type: none"> ◆ 548
Novell CIFS	<ul style="list-style-type: none"> ◆ 139 (Netbios) ◆ 445 (Microsoft-ds)
Novell DHCP	<ul style="list-style-type: none"> ◆ 67
Novell DNS	<ul style="list-style-type: none"> ◆ 953 (secure HTTP) ◆ 53 (TCP) ◆ 53 (UDP)
Novell FTP	<ul style="list-style-type: none"> ◆ 21

Service	Default Ports
Novell Information Portal	<ul style="list-style-type: none"> ◆ 80 (HTTP) ◆ 443 (secure HTTP)
Novell NetWare Core Protocol (NCP)	<ul style="list-style-type: none"> ◆ 524
Novell Remote Manager	<ul style="list-style-type: none"> ◆ 8008 (HTTP) ◆ 8009 (secure HTTP)
NURM	<ul style="list-style-type: none"> ◆ 80 ◆ 443
SFCB	<ul style="list-style-type: none"> ◆ 5988 (HTTP) ◆ 5989 (secure HTTP)
Samba	<ul style="list-style-type: none"> ◆ 139 (Netbios) ◆ 445 (Microsoft-ds)
Secure Shell	<ul style="list-style-type: none"> ◆ 22
Storage Management Services (Backup)	<ul style="list-style-type: none"> ◆ 40193 (smdr daemon)
Time Synchronization	<ul style="list-style-type: none"> ◆ 123 (Network Time Protocol UDP)

21.3 Configuring and Administering Security

For a list of configuration and administration topics, see the [Security section in the OES online documentation \(http://www.novell.com/documentation/oes11/index.html#cat_security\)](http://www.novell.com/documentation/oes11/index.html#cat_security).

21.4 OES 2015 SP1 and Security Scanners

Novell software development processes include the performance of regular and rigorous security scans. All issues that are discovered as part of these scans are resolved prior to product releases.

As you perform security scans inside your organization, if you discover security issues that involve OES 2015 SP1 or other Novell products, and if you are unable to resolve them, please contact Novell Support for help.

21.5 Links to Product Security Considerations

The following product documentation contains additional security information:

Table 21-3 Security Consideration Links

Product/Technology	Security Considerations Section Link
AppArmor	Novell AppArmor Administration Guide (http://www.novell.com/documentation/apparmor/apparmor201_sp10_admin/data/book_apparmor_admin.html)

Product/Technology	Security Considerations Section Link
Domain Services for Windows	OES 2015 SP1: Novell Domain Services for Windows Security Guide
Dynamic Storage Technology	"Security Considerations" in the OES 2015 SP1: Dynamic Storage Technology Administration Guide
eDirectory	"Security Considerations" in the NetIQ eDirectory 8.8 SP8 Administration Guide
File Systems	OES 2015 SP1: File Systems Management Guide (information throughout the guide)
Identity Manager 4.0.2	"Security Best Practices" in the NetIQ Identity Manager Security Guide .
iPrint for OES	"Setting Up a Secure Printing Environment" in the OES 2015 SP1: iPrint Linux Administration Guide
Linux User Management	"Security Considerations" in the OES 2015 SP1: Linux User Management Administration Guide
Novell AFP	"Security Guidelines for AFP" in the OES 2015 SP1: Novell AFP for Linux Administration Guide
Novell CIFS	"Security Guidelines for CIFS" in the OES 2015 SP1: Novell CIFS for Linux Administration Guide .
Client for Open Enterprise Server	Security Considerations in the Client for Open Enterprise Server Administration Guide
Novell Remote Manager for OES	"Security Considerations" in the OES 2015 SP1: Novell Remote Manager Administration Guide
Novell Storage Services	"Securing Access to NSS Volumes, Directories, and Files" and "Security Considerations" in the OES 2015 SP1: NSS File System Administration Guide for Linux
Novell iFolder 3.9.2	Novell iFolder 3.9.2 Security Administration Guide
OES 2015 SP1 Installation	"Security Considerations" in the OES 2015 SP1: Installation Guide
OES 2015 SP1 Migration Tools	"Security Considerations for Data Migration" in the OES 2015 SP1: Migration Tool Administration Guide
SuSEfirewall2	"Masquerading and Firewalls" (http://www.suse.com/documentation/sles11/book_security/data/cha_security_firewall.html) in the SLES 11 SP4 Security Guide (http://www.suse.com/documentation/sles11/book_security/data/book_security.html)

21.6 Links to Anti-Virus Partners

See the [Partners and Communities](http://www.novell.com/products/openenterpriseserver/partners_communities.html) page on Novell.com (http://www.novell.com/products/openenterpriseserver/partners_communities.html).

22

Certificate Management

By default, all SUSE Linux Enterprise Server (SLES) servers include self-generated server certificates to secure data communications with the servers. These certificates are self-signed and do not comply with the X.509 RFCs. They are provided only as a stop-gap and should be replaced as soon as possible by a certificate from a trusted Certificate Authority.

Unfortunately, many organizations ignore the vulnerabilities to mischievous or even malicious attacks that are created by not replacing these temporary certificates. Some of the reasons for this are

- ♦ Administrators lack the knowledge required.
- ♦ Certificate maintenance can require a significant investment of time and effort.
- ♦ Obtaining third-party certificates for each server is expensive.

The problems are compounded by the fact that X.509 certificates are designed to expire regularly and should be replaced shortly before they do.

Open Enterprise Server 11 includes solutions that address each of these issues at no additional expense.

This section discusses the certificate management enhancements available in OES and how simple and straightforward it is to utilize them.

- ♦ [Section 22.1, “Overview,” on page 233](#)
- ♦ [Section 22.2, “Setting Up Certificate Management,” on page 235](#)
- ♦ [Section 22.3, “If You Don’t Want to Use eDirectory Certificates,” on page 238](#)

22.1 Overview

The following sections outline how OES lets you automate certificate management for OES and all HTTPS services:

- ♦ [Section 22.1.1, “SLES Default Certificates,” on page 233](#)
- ♦ [Section 22.1.2, “OES Certificate Management,” on page 234](#)
- ♦ [Section 22.1.3, “Multiple Trees Sharing a Common Root,” on page 235](#)

22.1.1 SLES Default Certificates

By default, HTTPS services on SLES 11 SP4 are configured to use two files that are located in `/etc/ssl/servercerts` and are protected so that only `root` and some specific groups can read them:

- ♦ **serverkey.pem:** This contains the server’s raw private key.
- ♦ **servercert.pem:** This contains the server’s certificates.

OES services, such as Apache, OpenWBEM, and Novell Remote Manager, are also configured to use these certificates.

22.1.2 OES Certificate Management

OES enhances certificate management as follows:

- ♦ [“Installation of eDirectory Certificates” on page 234](#)
- ♦ [“What Is Installed Where” on page 234](#)
- ♦ [“NetIQ Certificate Server” on page 235](#)
- ♦ [“Server Self-Provisioning” on page 235](#)
- ♦ [“PKI Health Check” on page 235](#)

Installation of eDirectory Certificates

As you install eDirectory and OES, by default all HTTPS services are configured to use eDirectory certificates. This means that eDirectory is established as the Certificate Authority for the tree you are installing into, and it will generate keys and certificates for the server and replace the installed SLES certificates with the eDirectory certificates.

What Is Installed Where

Key and certificate files are installed in the following locations:

Table 22-1 File Locations

Location	Details
<code>/etc/ssl/certs</code>	<p>This is the default location of trusted root certificates for clients on the server.</p> <p>Most of the applications on the server are configured to use this directory. For example, the LDAP client uses one or more of the trusted certificates in this directory when establishing a secure LDAP connection.</p> <p>The OES installation copies the eDirectory tree CA's certificate (<code>eDirCACert.pem</code>) here, thereby establishing the CA as a trusted root.</p> <p>Everyone (other) has rights to read the contents of this directory.</p>
<code>/etc/ssl/servercerts</code>	<p>The standard location for the server's raw private key (<code>serverkey.pem</code>) and certificates (<code>servercert.pem</code>).</p> <p>Applications on the server, including OES applications, are configured to point to the files in this directory.</p> <p>Only <code>root</code> and some specific groups can read the files in this directory.</p>
<code>/etc/opt/novell/certs</code>	<p>This directory contains the eDirectory CA certificate in both DER and PEM formats for use by applications that need them. The files are named <code>SSCert.der</code> and <code>SSCert.pem</code>, respectively.</p> <p>For example, when PKI Health Check runs, it installs the CA certificate in the Java Keystore in DER format if the certificate needs replacing.</p>

NetIQ Certificate Server

The component that generates eDirectory keys and certificates is the NetIQ Certificate Server.

This certificate server provides public key cryptography services that are natively integrated into NetIQ eDirectory. You can use the server to mint, issue, and manage both user and server certificates to protect confidential data transmissions over public communications channels such as the Internet.

For complete information on the NetIQ Certificate Server, see the [NetIQ Certificate Server Administration Guide](#).

Server Self-Provisioning

When activated, Server Self-Provisioning lets server objects in eDirectory create their own certificates. You must activate this option if you want PKI Health Check to automatically maintain your server certificates.

For more information on this feature, see “X.509 Certificate Self-Provisioning” in the [NetIQ Certificate Server Administration Guide](#).

PKI Health Check

The PKI health check runs whenever the certificate server starts.

If you have enabled Server Self-Provisioning, the health check routine automatically replaces server certificates when any of the following are detected:

- ♦ The certificates don't exist.
- ♦ The certificates have expired.
- ♦ The certificates are about to expire.
- ♦ The IP or DNS information on the certificates doesn't match the server configuration.
- ♦ The Certificate Authority (CA) that issued the certificate is different from the CA currently configured.

For more information on this feature, see “PKI Health Check” in the [NetIQ Certificate Server Administration Guide](#).

22.1.3 Multiple Trees Sharing a Common Root

The Organizational CA can be configured to act as a sub-CA. This lets multiple trees share a common root certificate. The root certificate can be stored in a physically protected tree. It can also integrate with a third-party PKI. For more information, see “Subordinate Certificate Authority” in the [NetIQ Certificate Server Administration Guide](#).

22.2 Setting Up Certificate Management

Use the information in the following sections to help you set up certificate management as you install OES.

- ♦ [Section 22.2.1, “Setting Up Automatic Certificate Maintenance,” on page 236](#)
- ♦ [Section 22.2.2, “Eliminating Browser Certificate Errors,” on page 236](#)

22.2.1 Setting Up Automatic Certificate Maintenance

To set up your server so that HTTPS services use eDirectory certificates, you must specify the **Use eDirectory Certificates for HTTP Services** option while installing or upgrading eDirectory.

This installs eDirectory keys and certificates on the server, but it does not configure the server to automatically replace the certificates when they expire. Automatic maintenance requires that Server Self-Provisioning be enabled as follows:

- 1 On the server you are configuring, in iManager > Roles and Tasks, click the **NetIQ Certificate Server > Configure Certificate Authority** option.
- 2 Click **Enable server self-provisioning**.

This causes automatic certificate replacement for the conditions described in [“PKI Health Check” on page 235](#).

IMPORTANT: If you enable Server Self-Provisioning in an OES tree and you have created a CRL configuration object but not yet configured any CRL distribution points, the PKI Health Check might replace the default certificates every time it runs.

To avoid this, you can either

- ♦ Finish configuring the CA's CRL capability by creating one or more CRL Distribution Points by using iManager's **Configure Certificate Authority** task.
- or
- ♦ Delete any CRL Configuration objects, for example CN=One - Configuration.CN=CRL Container.CN=Security.

-
- 3 If you also want the CA certificate to be replaced if it changes or expires, click the **Health Check - Force default certificate creation/update on CA change** option.

22.2.2 Eliminating Browser Certificate Errors

Because the Internet Explorer and Mozilla Firefox browsers don't trust eDirectory certificate authorities by default, attempts to establish a secure connection with OES servers often generate certificate errors or warnings.

These are eliminated by importing the eDirectory tree CA's self-signed certificate into the browsers.

Complete the instructions in the following sections as applicable to your network.

- ♦ [“Exporting the CA's Self-Signed Certificate” on page 236](#)
- ♦ [“Importing the CA Certificate into Mozilla Firefox on Linux” on page 237](#)
- ♦ [“Importing the CA Certificate into Mozilla Firefox on Windows” on page 237](#)
- ♦ [“Importing the CA Certificate into Internet Explorer” on page 237](#)

Exporting the CA's Self-Signed Certificate

- 1 Launch Novell iManager.
- 2 Log into the eDirectory tree as the Admin user.
- 3 Select the **Roles and Tasks** menu, then click **NetIQ Certificate Server > Configure Certificate Authority**.
- 4 Click the **Certificates** tab, then select the self-signed certificate.

- 5 Click **Export**.
- 6 Deselect **Export Private Key**.
The **Export Format** changes to DER.
- 7 Click **Next**.
- 8 Click **Save the Exported Certificate** and save the file to the local disk, noting the filename and location if they are indicated.
- 9 Click **Close > OK**.
- 10 Find the file you just saved. By default it is usually on the desktop.
- 11 Complete the instructions in the follow sections that apply to your browsers.

Importing the CA Certificate into Mozilla Firefox on Linux

- 1 Launch Firefox.
- 2 Click **Edit > Preferences > Advanced**.
- 3 Select the **Encryption** tab.
- 4 Click **View Certificates**.
- 5 Select the **Authorities** tab, then click **Import**.
- 6 Browse to the certificate file you downloaded in [“Exporting the CA’s Self-Signed Certificate” on page 236](#) and click **Open**.
- 7 Select **Trust this CA to identify Web sites**, then click **OK > OK > Close**.
Firefox now trusts certificates from the servers in the tree.

Importing the CA Certificate into Mozilla Firefox on Windows

- 1 Launch Firefox.
- 2 Click **Tools > Options > Advanced**.
- 3 Select the **Encryption** tab.
- 4 Click **View Certificates**.
- 5 Select the **Authorities** tab, then click **Import**.
- 6 Browse to the certificate file you downloaded in [“Exporting the CA’s Self-Signed Certificate” on page 236](#) and click **Open**.
- 7 Select **Trust this CA to identify Web sites**, then click **OK > OK > OK**.
Firefox now trusts certificates from the servers in the tree.

Importing the CA Certificate into Internet Explorer

- 1 Launch Internet Explorer.
- 2 Click **Tools > Internet Options**.
- 3 Select the **Content** tab.
- 4 Click **Certificates**.
- 5 Click **Import**.
The Certificate Import Wizard launches.
- 6 Click **Next**.

- 7 Click **Browse**,
- 8 In the **Files of Type** drop-down list, select **All Files(*.*)**, browse to the file you downloaded in [“Exporting the CA’s Self-Signed Certificate”](#) on page 236, then click **Open**.
- 9 Click **Next**.
- 10 Click **Next**.
Choose the default, **Automatically select the certificate store based on the type of certificate**.
- 11 Click **Finish > Yes > OK**.
Internet Explorer now trusts certificates from the servers in the tree.

22.3 If You Don’t Want to Use eDirectory Certificates

For most organizations, the eDirectory certificate solution in OES is an ideal way to eliminate the security vulnerabilities mentioned at the beginning of this chapter. However, some administrators, such as those who have third-party keys installed on their servers, probably want to keep their installed certificates in place.

You can prevent the use of eDirectory certificates for HTTPS services by making sure that the option to use them is not selected on the first eDirectory configuration page.

A

Adding Services to OES Servers

You can add services to OES servers after they are installed.

OES is a set of services that can be either added to an existing server or installed at the same time as SUSE Linux Enterprise Server. After OES services are added, we refer to the server as an OES server.

To add OES services to an OES 2015 SP1 server, follow the instructions in “[Installing or Configuring OES 2015 SP1 on an Existing Server](#)” in the *OES 2015 SP1: Installation Guide*.

B Changing an OES 2015 SP1 Server's IP Address

The instructions in this section let you change the IP address assigned to an OES 2015 SP1 server and the services it hosts.

- ◆ [Section B.1, "Caveats and Disclaimers," on page 241](#)
- ◆ [Section B.2, "Prerequisites," on page 241](#)
- ◆ [Section B.3, "Changing the Server's Address Configuration," on page 242](#)
- ◆ [Section B.4, "Reconfiguring the OES Services," on page 242](#)
- ◆ [Section B.5, "Repairing the eDirectory Certificates," on page 243](#)
- ◆ [Section B.6, "Completing the Server Reconfiguration," on page 243](#)
- ◆ [Section B.7, "Modifying a Cluster," on page 244](#)
- ◆ [Section B.8, "Reconfiguring Services on Other Servers That Point to This Server," on page 244](#)

B.1 Caveats and Disclaimers

The instructions in this section assume that only the IP address of the server is changing. They do not cover changing the DNS hostname of the server.

B.2 Prerequisites

- ◆ [Section B.2.1, "General," on page 241](#)
- ◆ [Section B.2.2, "iPrint," on page 242](#)
- ◆ [Section B.2.3, "Clustering," on page 242](#)

B.2.1 General

Before starting the process, be sure you know the following:

- Old IP Address:** The server's IP address you are changing.
- New IP Address:** The IP address the server will use after the change.
- Old Master Server Address:** The IP address of the eDirectory™ server specified when the server was installed.
By default this is also the LDAP server address for OES services installed on the server.
- New Master Server Address:** The IP address of the eDirectory server that the server should point to after the change. The old and new addresses might be the same, but you will be required to enter both.
- Address of the Subnet for the New IP Address:** This is a subnet address, not the subnet mask. For example, 192.168.2.0, not 255.255.255.0.

B.2.2 iPrint

If your network users connect to their printers through the print manager on this server, you might want to consider setting up iPrint Client Management (ICM) prior to the change. ICM lets you centrally configure the iPrint configuration for your users. For more information, see “Using iPrint Client Management” in the [OES 2015 SP1: iPrint Linux Administration Guide](#).

B.2.3 Clustering

If the server is running Novell Cluster Services:

- 1 Check your plans against the prerequisites for clusters in “IP Address Requirements” in the [OES 2015 SP1: Novell Cluster Services for Linux Administration Guide](#).
- 2 Follow the instructions in “Changing the IP Addresses of Cluster Resources” in the same guide.

B.3 Changing the Server’s Address Configuration

- 1 Log into the server you are reconfiguring as the `root` user.
- 2 Copy the `ipchange.sh` script file found in `/opt/novell/migration/sbin/serveridswap/scripts/ipchange/nonplugin/` on any OES 2015 SP1 server, to the `root (/)` partition of the OES 2015 SP1 server you are reconfiguring.
- 3 Open the YaST Control Center.
- 4 In **Network Devices** select **Network Card**.
- 5 Confirm that the Old IP address you listed in [Section B.2.1, “General,” on page 241](#) is in fact the IP address currently configured for the network card. You need this later in the process.
- 6 Using the various dialog boxes associated with the network card configuration, change the card configuration to the new IP address settings you listed in [Section B.2.1, “General,” on page 241](#), changing each of the following as necessary:
 - ♦ IP Address
 - ♦ Subnet Mask
 - ♦ Router (Gateway)
- 7 Close YaST, then continue with [Section B.4, “Reconfiguring the OES Services,” on page 242](#).

B.4 Reconfiguring the OES Services

- 1 Open a terminal prompt.
- 2 At the terminal prompt, change to the root (`/`) directory, make the script executable, then run the script by entering the following commands:

```
cd /  
chmod 744 ipchange.sh  
./ipchange.sh oldip newip oldmasterip newmasterip yes
```

where *oldip* is the old IP address, *newip* is the new IP address, *oldmasterip* is the IP address of the eDirectory server specified when the server was installed, and *newmasterip* is the IP address of the new eDirectory server identified in [Prerequisites](#) above.

The *oldmasterip* and the *newmasterip* can be the same IP address, but they must both be included in the command. In the script these are referred to as Remote edir/ldap addresses.

IMPORTANT: By default, the master eDirectory address (the eDirectory server specified at installation) is also the LDAP server address for OES services installed on the server.

All services that are configured with the old master address as their LDAP address are reconfigured to use the new master address. On the other hand, if you specified a different LDAP server address for any of the installed services, and if that LDAP server's address is also changing, you need to manually reconfigure the services.

To see the IP addresses that your services were originally configured to use, use a text editor to open the files in `/etc/sysconfig/novell/`.

As the script runs, it changes all of the OES configuration files and does everything else that can be done automatically to change the IP address for all OES services.

- 3 Type the Admin password when prompted.

You might need to wait a few minutes for the LDAP server to restart.

- 4 When the script finishes, restart the server by entering the following command at the terminal prompt:

```
shutdown -r now
```

B.5 Repairing the eDirectory Certificates

- 1 Start iManager and click through the warnings about a DNS name mismatch.
- 2 In the Login dialog box, type the Admin username and password, type the newmasterip address in the **Tree** field, then click **Login**.
- 3 Click **NetIQ Certificate Server > Repair Default Certificates**.
- 4 In **Create Server Certificate > Step 1 of 3**, browse to and select the server object for the server you are changing.
- 5 Click **OK > Next**.
- 6 In **Step 2 of 3**, click **Next**.
- 7 Click **Finish**, then close the dialog box.

B.6 Completing the Server Reconfiguration

Some OES services require reconfiguration steps to be done manually.

Complete the steps in the following sections as they apply to the server you are changing.

- ♦ [Section B.6.1, "DHCP," on page 243](#)
- ♦ [Section B.6.2, "iFolder," on page 244](#)
- ♦ [Section B.6.3, "iPrint," on page 244](#)
- ♦ [Section B.6.4, "NetStorage," on page 244](#)

B.6.1 DHCP

- 1 Make sure the DHCP configuration in eDirectory has a subnet declared for the new IP address. For instructions, see "[Administering and Managing DHCP](#)" in the *OES 2015 SP1: DNS/DHCP Services for Linux Administration Guide*.

B.6.2 iFolder

See “[Changing The IP Address For iFolder Services](#)” in the *Novell iFolder 3.9.2 Administration Guide*.

B.6.3 iPrint

- 1 Using your favorite text editor, open the following configuration file:

```
/etc/opt/novell/iprint/conf/DN_of_PSMipsmd.conf.
```

where *DN_of_PSM* is the name of the Print Manager in eDirectory.

- 2 Change any entries that list the old IP address to the new IP address.
- 3 Restart the Print Manager by entering the following command at a terminal prompt:

```
rcnovell-ipsmd restart
```

IMPORTANT: Users that have accessed printers through the modified Print Manager will lose access to their printers.

If you have set up iPrint Client Management on the server, you can automate the reconfiguration process. If not, users must reinstall the printers.

For more information on iPrint Client Management, see “[Using iPrint Client Management](#)” in the *OES 2015 SP1: iPrint Linux Administration Guide*.

B.6.4 NetStorage

- 1 At a terminal prompt, enter the following commands:

```
/opt/novell/xtier/bin/xsrvcfg -D
```

```
/opt/novell/xtier/bin/xsrvcfg -d newip -c AuthenticationContext
```

where *newip* is the new IP address used throughout this section and *AuthenticationContext* is the eDirectory context for NetStorage users. NetStorage searches the eDirectory tree down from this container. If you want NetStorage to search the entire eDirectory tree, specify the root context.

```
rcnovell-xregd restart
```

```
rcnovell-xsrvd restart
```

```
rcapache2 restart
```

B.7 Modifying a Cluster

If the server is running Novell Cluster Services™, complete the instructions in “[Modifying the Cluster Configuration Information](#)” in the *OES 2015 SP1: Novell Cluster Services for Linux Administration Guide*.

B.8 Reconfiguring Services on Other Servers That Point to This Server

If you have services on other servers that point to the old IP address for this server, be sure to reconfigure those services to point to the new IP address.

C Updating/Patching OES 2015 SP1 Servers

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

For instructions on setting up the update channel for each OES 2015 SP1 server and running the patch process, see ["Updating \(Patching\) an OES 2015 SP1 Server"](#) in the *OES 2015 SP1: Installation Guide*.

D

Quick Reference to OES User Services

Use [Table D-1](#) as a quick reference for providing your network users with instructions for accessing each OES service.

Table D-1 OES User Services Quick Reference

services	Access Method or URL	Notes
iPrint	http://server_ip_address_or_dns_name/ipp https://server_ip_address_or_dns_name:443/ipp	
NetStorage	For browser access, use: http: or https://server_ip_or_dns/netstorage For WebDAV access, use: http: or https://server_ip_or_dns/oneNet/NetStorage	The WebDAV URL is case sensitive.
Novell Client	<ol style="list-style-type: none">1. Install the Novell Client on a supported Windows or Linux workstation. For Macintosh support, see Novell Kanaka for Mac.2. Log in to eDirectory.3. Access NCP volumes on NetWare or Linux that you have the appropriate file trustee rights to.	
Novell AFP	In the Chooser, click Go and browse to the server.	
Novell CIFS	Map a network drive in Windows, Linux, or Mac Finder. Create a Web Folder in Internet Explorer. For more information, see the OES 2015 SP1: Novell CIFS for Linux Administration Guide .	
Novell iFolder 3.x Web Access server	https://server_ip_address_or_dns_name/ifolder	“ifolder” is the default name, but this can be customized by the administrator.
Novell Remote Manager	http://server_ip_address_or_dns_name:8008	Any LUM-enabled user can see their directories and files on OES servers.
Samba	Map a network drive in Windows Explorer. Create a Web Folder in Internet Explorer. For more information, see the OES 2015 SP1: Novell Samba Administration Guide .	



OES 2015 SP1 Browser Support

As a general rule, Open Enterprise Server 2015 SP1 management tools support the following browsers as they are available on the workstation platforms listed in [“Client/Workstation OS Support” on page 251](#):

- ◆ Mozilla Firefox 64-bit (latest 32- and 64-bit versions) on Windows, Macintosh, and Linux
- ◆ Microsoft Internet Explorer 11 on windows 8.1
- ◆ Microsoft Internet Explorer 11 (Win7sp1)
- ◆ Microsoft Internet Explorer 10 (Win7sp1)
- ◆ Apple Safari latest version on MAC 10.9
- ◆ Google Chrome 21 or latest version on windows 7 Sp1

[Table E-1](#) provides service-specific links and information about browser support in OES.

Table E-1 Browser Support in OES

Management Tool	Supported Browser Information Link
iManager 2.7	<ul style="list-style-type: none"> ◆ “Using a Supported Web Browser” in the <i>NetIQ® iManager Administration Guide</i> <p>There are rendering differences for some iManager plug-ins between Internet Explorer and Mozilla-based browsers. For example, options that are accessed through tabs in IE are sometimes accessed through drop-down lists in Firefox.</p> <p>Also, iManager plug-ins might not work properly if the highest priority Language setting for your Web browser is set to a language other than one of iManager’s support languages.</p> <p>To avoid problems, set the first language preference to a supported language.</p>
iMonitor	<ul style="list-style-type: none"> ◆ “System Requirements” in “Using NetIQ iMonitor” in the <i>NetIQ eDirectory 8.8 SP8 Administration Guide</i>
IP Address Manager (NetWare)	Same as Novell Remote Manager
iPrint	<ul style="list-style-type: none"> ◆ “Supported Browsers for iPrint” in the <i>OES 2015 SP1: iPrint Linux Administration Guide</i>
Novell iFolder 3.9.2	<ul style="list-style-type: none"> ◆ “Web Browser” in the <i>Novell iFolder 3.9.2 Administration Guide</i>
Novell Remote Manager	<ul style="list-style-type: none"> ◆ “System Requirements” in the <i>OES 2015 SP1: Novell Remote Manager Administration Guide</i> ◆ “System Requirements” in the <i>NW 6.5 SP8: Novell Remote Manager Administration Guide</i>
OpenSSH Manager (NetWare)	<ul style="list-style-type: none"> ◆ “Added Functionality” in the <i>NW 6.5 SP8: OpenSSH Administration Guide</i>
TCP/IP Configuration (NetWare)	Same as Novell Remote Manager

F Client/Workstation OS Support

As a general rule, Open Enterprise Server 2015 or later services can be accessed and administered from workstations running the following operating systems:

- ♦ SUSE Linux Enterprise Desktop 12
- ♦ SUSE Linux Enterprise Desktop 11 SP3 and SP4
- ♦ Windows 8.1
- ♦ Macintosh 10.8, 10.9, and 10.10

For specific information on a given service, consult the service documentation.



OES 2015 SP1 Service Scripts

Novell Open Enterprise Server 2015 SP1 services rely on specific service scripts located in `/etc/init.d`. The scripts used by OES 2015 SP1, some of which are standard Linux scripts, are listed in [Table G-1](#).

IMPORTANT: For managing OES 2015 SP1 services, we strongly recommend using the browser-based tools outlined in [Section 11.1, “Overview of Management Interfaces and Services,”](#) on [page 89](#). The browser-based tools provide error checking not available at the service-script level, and they ensure that management steps happen in the sequence required to maintain service integrity.

Table G-1 OES Service Scripts in /etc/init.d

Services Associated with Scripts	Script Name	Notes
Apache Web server	apache2	The rcapache2 symbolic link, which is by default part of the path, can be used to start, stop, and restart the Apache Web Server, rather than referencing the init script directly.
CASA	micasad	This is the CASA daemon.
Distributed File Services	novell-dfs	This lets you start and stop the VLDB service.
DNS (NetIQ eDirectory enhanced)	novell-named	This works in connection with <code>named</code> to provide NetIQ eDirectory DNS services.
DNS (SUSE Linux Enterprise Server 11 base)	named	This is the SLES 11 DNS service daemon.
Domain services Daemon	xadsd	
Dynamic Storage Technology	novell-shadowfs	This script starts and stops the shadowfs daemon and the kernel module fuse.
eDirectory	ndsd	This lets you start and stop eDirectory. It executes the <code>/usr/sbin/ndsd</code> binary.
eDirectory SNMP support	ndssnmppsa	This lets you start and stop the NDS subagent.
eDirectory LDAP support	nldap	This lets you load and unload the LDAP library that NetIQ eDirectory uses to provide LDAP support. It is not actually a service.
FTP	pure-ftpd	This is used by the Novell FTP Pattern.

Services Associated with Scripts	Script Name	Notes
iPrint	cups	These scripts are required by iPrint
	novell-idsd	<p>cups lets you to start and stop the cupsd daemon that provides spooling and printing functionality for local and remote printers and is always required, even if printers are broadcasted ("Browsing") into (sub)nets.</p> <p>novell-ipsmd lets you to start and stop the ipsmd daemon that manages printers that are assigned under a Print Manager.</p> <p>novell-idsd lets you to start and stop the idsd daemon that manages drivers that are assigned under a Driver Store.</p>
	novell-ipsmd	
Kerberos KDC Service	xad-krb5kdc	
Kerberos Password Change Server	xad-kpasswdd	
Linux User Management	namcd	<p>These daemons are required by Linux User Management and work together to ensure good performance.</p> <p>The namcd daemon caches user and group names and IDs from eDirectory, speeding subsequent lookups of cached users and groups.</p> <p>The nscd daemon caches host names and addresses.</p>
	nscd	
Logging	syslog	This is used for logging by many OES services.
Name Service Cache Daemon	nsdc	
Novell AFP	novell-afptcpd	This script starts and stops the afptcpd daemon, which is the Novell AFP service daemon
Novell AFP	avahi-daemon	This is used by AFPtcpd to advertise itself.
Novell CIFS	novell-cifs	This script starts and stops the cifsd daemon, which is the Novell CIFS service daemon
Novell DHCP	dhcpd	
NetStorage (actually XTier)	novell-xregd	<p>NetStorage runs inside the novell-xsrvd XTier Web Services daemon, and also utilizes Tomcat services for certain other functions.</p> <p>novell-xregd is the init script for starting and stopping XTier's registry daemon. It is part of the novell-xtier-base RPM and is enabled by default for run levels 2, 3, and 5.</p> <p>novell-xsrvd is the init script for starting and stopping XTier's Web services daemon. It is also part of the novell-xtier-web RPM and is enabled for run levels 2, 3, and 5.</p>
	novell-xsrvd	

Services Associated with Scripts	Script Name	Notes
Novell Cluster Services (NCS)	adminfs	This is used for NCS through iManager and the command line interface.
Novell Cluster Services (NCS)	novell-ncs	<p>NCS uses some shell scripts and utilities that come with the heartbeat package. For example, NCS uses a binary called <code>send_arp</code> to send out ARP packets when a secondary address is bound.</p> <p>NCS never runs the heartbeat daemons. In fact, NCS and heartbeat are mutually exclusive when it comes to execution, and heartbeat must always be configured to not run (<code>chkconfig heartbeat off</code>) when NCS is loaded on the server.</p>
Novell Identity Translator	novell-nit	<p>This script runs by default on every OES 2015 SP1 and later server with NSS volumes and provides user IDs (UIDs) for NSS file access.</p> <p>Use <code>rcnovell-nit</code> followed by <code>start</code>, <code>stop</code>, <code>restart</code>, or <code>status</code> to view or alter the run state as needed.</p>
Novell Remote Manager	novell-httpstkd	<p>This script runs by default on every OES server and enables access to NRM for Linux through a browser.</p> <p>Use this script followed by the <code>status</code> option to view current status. Or use <code>stop</code>, <code>start</code>, or <code>restart</code> options to alter the run state of the NRM daemon as needed.</p>
Novell Storage Services	novell-nss	<p>This script runs by default on every OES server with NSS volumes and enables access to the NSS runtime environment.</p> <p>To see if the NSS kernel modules and NSS admin volume are running, enter <code>service novell-nss status</code>, <code>/etc/init.d/novell-nss status</code>, or <code>rcnovell-nss status</code> at a command prompt. If they are not running, use the <code>start</code> option to start them. You cannot stop NSS.</p>
Novell Remote Manager e-mail notifications	postfix	Novell Remote Manager uses this to send notifications as configured.
NSS Auditing	novell-vigil	This is the NSS auditing daemon.
NTP	ntp	This is the SLES 11 Network Time Protocol daemon.
Patching	novell-zmd	This is the GUI patch updater daemon.
RPC Daemon	rpcd	
rsync daemon	rsyncd	DSfW depends on this
Samba	nmb	This is the Samba NetBIOS naming daemon.
Samba CIFS support	smb	This script runs the Samba daemon.

Services Associated with Scripts	Script Name	Notes
Samba WINBIND daemon	winbind	
SFCB CIMOM	sfcbd	This is used to start the SFCB CIMOM daemon, which is an integral part of the iManager plug-ins for LUM, Samba, NSS, SMS, and NCS. AFP, CIFS, iPrint, and NRM also use SFCB. Novell Remote Manager on OES gets its server health information from CIMOM.
SLP support	slpd	This lets you start and stop OpenSLP, which is a key component for eDirectory and certain other services and clients.
sshd service	sshd	DSfW depends on this
Storage Management Services	novell-smdrd	This lets you start and stop the SMDR daemon process. It also loads and unloads the NSS zapi kernel module used by SMS to back up the NSS volumes.
Tomcat	novell-tomcat6	This script sets up the Tomcat included with SLES 11 specifically for OES services, such as the Welcome pages.
Zypper	zypper	This is the Zypper command line daemon.



System User and Group Management in OES 2015 SP1

This section discusses the users and groups that are used by Open Enterprise Server. Administrative users are discussed in [Appendix I, “Administrative Users and Groups in OES 2015 SP1,”](#) on page 283.

- ♦ [Section H.1, “About System Users and Groups,”](#) on page 257
- ♦ [Section H.2, “Understanding Proxy Users,”](#) on page 259
- ♦ [Section H.3, “Common Proxy User,”](#) on page 264
- ♦ [Section H.4, “Planning Your Proxy Users,”](#) on page 268
- ♦ [Section H.5, “Implementing Your Proxy User Plan,”](#) on page 277
- ♦ [Section H.6, “Proxy Users and Domain Services for Windows,”](#) on page 278
- ♦ [Section H.7, “System Users,”](#) on page 278
- ♦ [Section H.8, “System Groups,”](#) on page 279
- ♦ [Section H.9, “Auditing System Users,”](#) on page 280

H.1 About System Users and Groups

“Regular” network users rely on network services. System users and groups support those services.

Some NetWare administrators are concerned about the number of system users and groups on an OES server. They wonder what functions system users perform, why there are “so many” of them, and how they impact licensing and network security.

The answers to these and other questions are found in the sections that follow.

- ♦ [Section H.1.1, “Types of OES System Users and Groups,”](#) on page 257
- ♦ [Section H.1.2, “OES System Users and Groups by Name,”](#) on page 258

H.1.1 Types of OES System Users and Groups

The users and groups that support OES services can be grouped into the three types shown in [Table H-1](#).

Table H-1 Types of System Users and Groups with Examples

System User or Group Type	Purpose	Examples
Proxy User	Perform very specific service-related functions, such as <ul style="list-style-type: none"> ◆ Retrieving passwords and service attributes ◆ Writing Service information in eDirectory. ◆ Providing a user ID (uid) that the associated service daemon uses to run. 	<ul style="list-style-type: none"> ◆ <i>cifsProxyUser-servername</i> ◆ <i>LUM_Proxy_user</i>
System Group	<ul style="list-style-type: none"> ◆ Facilitate the management of system users ◆ Provide access rights to service data on the server or in the eDirectory tree. 	<ul style="list-style-type: none"> ◆ DHCP ◆ DNSDHCP
System User	The daemons associated with the respective services run as these users.	<ul style="list-style-type: none"> ◆ <i>wwwrun</i> ◆ <i>iprint</i>

H.1.2 OES System Users and Groups by Name

Table H-2 lists the users and groups that OES services depend on and use.

Table H-2 System User and Groups Listing

System User or Group	Object Type	Associated Service
<i>AfpProxyUser-servername</i>	Proxy User	AFP
<i>CifsProxyUser-servername</i>	Proxy User	CIFS
<i>cluster_name_MGT_GRP.context</i>	System Group	NCS
<i>DHCP LDAP Proxy</i>	Proxy User	DHCP
<i>dhcpd</i>	System User	DHCP
<i>DHCPGroup</i>	System Group	DHCP
<i>DNS Proxy</i>	Proxy User	DNS
<i>DNSDHCP-GROUP</i>	System Group	DNS
<i>iFolderProxy</i>	Proxy User	iFolder 3
<i>iprint</i>	System User	iPrint
<i>iprint (POSIX)</i>	System Group	iPrint
<i>iprintgrp (eDirectory)</i>		

System User or Group	Object Type	Associated Service
<i>LUM proxy</i> (optional)	Proxy User	Linux User Management
named	System User	DNS
<i>NetStorage Proxy</i>	Proxy User	NetStorage
novell_nobody	System User	CIMOM
novell_nogroup	System Group	CIMOM
novlxregd	System User	XTier
novlxsvd	System User	XTier
novlxtier	System Group	XTier
OESCommonProxy_ <i>hostname</i>	System User	AFP, CIFS, DNS, DHCP, iFolder, NetStorage, Clustering (NCS), Linux User Management (optional)
<i>server_name</i> -SambaProxy	Proxy User	Samba (Novell)
<i>server_name</i> -W-SambaUserGroup	System Group	Samba (Novell)
<i>server_name</i> admin	Proxy User	NSS
www	System Group	Apache Tomcat
wwwrun	System User	Apache

H.2 Understanding Proxy Users

The subject of OES proxy users is somewhat complex. Therefore, it's a good idea to understand the basics before planning your implementation strategy.

IMPORTANT: The information in the following sections only answers security questions and provides general information. It is not intended to be used for the manual configuration of proxy users.

- ◆ [Section H.2.1, “What Are Proxy Users?,” on page 259](#)
- ◆ [Section H.2.2, “Why Are Proxy Users Needed on OES?,” on page 260](#)
- ◆ [Section H.2.3, “Which Services Require Proxy Users and Why?,” on page 260](#)
- ◆ [Section H.2.4, “What Rights Do Proxy Users Have?,” on page 261](#)

H.2.1 What Are Proxy Users?

As the name implies, proxy users are user objects that perform functions on behalf of OES services.

Proxy user accounts do not represent people, rather they are eDirectory objects that provide very specific and limited functionality to OES services. Generally, this includes only retrieving service-related information, such as user passwords and service attributes, but sometimes proxy users also write service information in eDirectory.

Many but not all OES services rely on proxy users to run on Linux (see [“Which Services Require Proxy Users and Why?”](#) on page 260). Proxy user creation and/or configuration is therefore an integral part of configuring OES.

None of the OES services require that you specify proxy user information during the OES installation, but some, such as AFP, DNS/DHCP, CIFS, and iFolder, give you the option to do so. Others, such as NCS and NSS create proxy users without user input.

H.2.2 Why Are Proxy Users Needed on OES?

OES provides the Novell services that were previously only available on NetWare.

To make its services available on Linux, Novell had to accommodate a fundamental difference between the way services run on NetWare and the way they run on Linux.

- ♦ **NetWare Services:** The NetWare operating system and eDirectory are tightly integrated. This allows the services (NLMs) on NetWare to assume the identity of a server object in eDirectory, thus gaining access to the other objects and information in eDirectory that are needed for the services to run.
- ♦ **OES Services:** eDirectory also runs very well on OES, and it provides the infrastructure on which OES services rely, but it is not integrated with the Linux operating system.

On Linux servers there is no concept of a service, such as Apache or iFolder running as a server object. Instead, each service runs using a User ID (uid) and a Group ID (gid) that the Linux server recognizes as being valid.

H.2.3 Which Services Require Proxy Users and Why?

The following services utilize a proxy user.

Table H-3 Proxy Users Functions Listed by Service

Associated Service	Example Proxy User Name	Services That the User Provides
AFP	OESCommonProxy_ <i>hostname</i> Or AfpProxyUser- <i>servername</i>	Retrieves AFP user information.
CIFS	OESCommonProxy_ <i>hostname</i> Or CifsProxyUser- <i>servername</i>	Retrieves CIFS user information.
Clustering (NCS)	OESCommonProxy_ <i>hostname</i> Or installing admin user	The clustering administrator and the proxy user can be two separate users. For more information, see “OES Common Proxy User” in the OES 2015 SP1: Novell Cluster Services for Linux Administration Guide .
DHCP	OESCommonProxy_ <i>hostname</i> Or DHCP_LDAP_Proxy	Lets the service access DHCP objects in eDirectory.

Associated Service	Example Proxy User Name	Services That the User Provides
DNS	OESCommonProxy_ <i>hostname</i> Or DNS_Proxy	Lets the service access DNS objects in eDirectory.
iFolder 3	OESCommonProxy_ <i>hostname</i> Or iFolderProxy IMPORTANT: The Common Proxy user cannot be used if iFolder is running on a cluster node.	Connects to the eDirectory server and retrieves the following information: <ul style="list-style-type: none"> ◆ modifytimestamp ◆ cn ◆ mail ◆ sn ◆ GUID ◆ givenName ◆ member
Linux User Management	OESCommonProxy_ <i>hostname</i> Or <i>LUM_proxy</i>	Searches the tree for LUM users.
NetStorage	OESCommonProxy_ <i>hostname</i> Or <i>NetStorage_Proxy</i>	Performs LDAP searches for users logging into NetStorage.
NSS	<i>server_name</i> admin	Reads user objects and maintains the volume, pool, and other storage system objects. This user performs some of the same functions as proxy users do for other services. However, unlike other OES services that can share proxy users, NSS requires a unique proxy user for each server.
Samba (Novell)	<i>server_name</i> -SambaProxy	Searches the LDAP tree (eDirectory) for Samba users.

H.2.4 What Rights Do Proxy Users Have?

Each OES service's YaST installation automatically adds the required rights to the proxy user specified for the service.

Unless otherwise specified, each of the following users has the standard set of user rights in eDirectory:

- ◆ **Self:**

Login Script:

Read Write, Not inheritable

Print Job Configuration:

Read Write, Not inheritable

[All Attribute Rights]:

Read, Inheritable

♦ **[Public]**

Message Server:

Read, Not inheritable

♦ **[Root]**

Group Membership

Read, Not inheritable

Network Address

Read, Not inheritable

In addition, each proxy user is granted additional rights as summarized in [Table H-4](#).

Table H-4 Proxy Users Rights

Associated Service	Example Proxy User Name	Default Rights Granted
AFP	AfpProxyUser- <i>servername</i>	♦ This proxy user has Compare and Read rights to the specified AFP user search context.
CIFS	CifsProxyUser- <i>servername</i>	♦ This proxy user has Compare and Read rights to the specified CIFS user search context.
Clustering (NCS)	OESCommonProxy_ <i>hostname</i> Or installing admin user	♦ The proxy user has rights (granted through membership in the NCS_Management group) to communicate with eDirectory on behalf of the clustering service.
DHCP	DHCP_LDAP_Proxy	♦ No rights are assigned directly, but membership in the DHCPGroup, which does have assigned rights, provides the rights it needs.
DNS	DNS_Proxy	♦ No rights are assigned directly, but membership in the DNS-DHCPGroup, which does have assigned rights, provides the rights it needs.

Associated Service	Example Proxy User Name	Default Rights Granted
iFolder 3	iFolderProxy	<ul style="list-style-type: none"> Additional eDirectory rights include: <p>[Entry Rights]</p> <p>Browse</p> <p>LDAP ACL representation:</p> <p>1#subtree#iFolderProxy#</p> <p>[All Attributes Rights]</p> <p>Read, Compare</p> <p>LDAP ACL representation:</p> <p>3#subtree#iFolderProxy#</p>
Linux User Management	LUM_proxy	<ul style="list-style-type: none"> If created, this proxy user has Search rights on Unix Config & Unix Workstation Objects.
NetStorage	NetStorage_Proxy	<ul style="list-style-type: none"> Additional eDirectory rights: <p>[Entry Rights]</p> <p>Browse</p> <p>LDAP ACL representation:</p> <p>1#subtree#NetStorage_Proxy#</p> <p>[All Attributes Rights]</p> <p>Read, Compare</p> <p>LDAP ACL representation:</p> <p>3#subtree#NetStorage_Proxy#</p>
NSS	server_nameadmin	<ul style="list-style-type: none"> Additional eDirectory rights: <p>Supervisor right to the container it was created in.</p>
Samba (Novell)	server_name-SambaProxy	<ul style="list-style-type: none"> The Universal Password policy associated with the Samba users grants this proxy user the right to retrieve user passwords. Additional eDirectory rights: <ul style="list-style-type: none"> Rights to itself – Supervisor attribute right Rights to the OU where it is located All Attribute rights – Read Write Entry rights – Browse Create samba* – Create Read Write

H.3 Common Proxy User

- ◆ [Section H.3.1, “Common Proxy User FAQ,” on page 264](#)
- ◆ [Section H.3.2, “Managing Common Proxy Users,” on page 266](#)

H.3.1 Common Proxy User FAQ

- ◆ [“Why Would I Want to Specify Common Proxy Users?” on page 264](#)
- ◆ [“Why Was a Proxy User Added to Novell Cluster Services?” on page 264](#)
- ◆ [“Which Services Can and Cannot Leverage the Common Proxy User?” on page 265](#)
- ◆ [“Can a Common Proxy User Service Multiple Servers?” on page 265](#)
- ◆ [“Can I Change the Common Proxy User Name and Context?” on page 266](#)
- ◆ [“Can I Assign the Common Proxy User After Services Are Installed?” on page 266](#)
- ◆ [“What About Upgraded Servers Using a Common Proxy?” on page 266](#)
- ◆ [“Are There Important Limitations to Keep in Mind?” on page 266](#)

Why Would I Want to Specify Common Proxy Users?

The implementation of a common proxy user in OES 2015 SP1 addresses the following administrative needs:

- ◆ **Limit the Number of Proxy Users:** By default, the number of proxy users in an eDirectory tree can quickly become quite large. And even though proxy users don't consume user license connections, many administrators are disconcerted by the sheer number of objects to manage and track.

Common proxy users reduce the default number of proxy users from one per service to basically one per OES 2015 SP1 server.

- ◆ **Accommodate Password Security Policies:** Many organizations have security policies that require periodic password changes. Some administrators are overwhelmed by having to manually track all proxy users, change their passwords, and restart the affected services after every change.

Common proxy users have their passwords automatically generated by default and changed at whatever interval is required. Services are restarted as needed with no manual intervention required.

- ◆ **Prevent Password Expiration:** When proxy user passwords expire, OES 2015 SP1 services are interrupted, leading to network user frustration and administrator headaches.

Automatic password management for common proxy users ensures that services are never disrupted because of an expired password.

Why Was a Proxy User Added to Novell Cluster Services?

In OES 2 SP3 and later, the eDirectory communication functionality that was previously performed by the designated NCS administrator, has been separated out so that it can now be performed by a system user if so desired.

This aligns NCS functionality with other OES services that use proxy (system) users for similar functions. For more information, see [“OES Common Proxy User”](#) in the *OES 2015 SP1: Novell Cluster Services for Linux Administration Guide*.

Which Services Can and Cannot Leverage the Common Proxy User?

- ◆ [“Services That Can Leverage the Common Proxy User” on page 265](#)
- ◆ [“Services That Cannot Leverage the Common Proxy User” on page 265](#)

Services That Can Leverage the Common Proxy User

The following OES services are automatically configured at install time by default to use your Common Proxy User (if specified):

- ◆ Novell AFP
- ◆ Novell CIFS
- ◆ Novell Cluster Services
- ◆ Novell DNS
- ◆ Novell DHCP
- ◆ Novell iFolder
- ◆ Novell NetStorage

The following OES service can be configured at install time to use your Common Proxy User (if specified):

- ◆ Linux User Management (having a proxy user is optional)

Services That Cannot Leverage the Common Proxy User

The following services that use proxy users do not leverage the Common Proxy user for the reasons listed:

Service	Reason
Novell Samba	Samba proxy password requirements are not a good fit with the Common Proxy user. The user's credentials are written in the CASA/password files or databases.
Novell Storage Services	This requires full rights to administer NSS and continues to require a system-named user with a system-generated password.

Can a Common Proxy User Service Multiple Servers?

No.

The common proxy user is designed and configured to be the common proxy for the OES services on a single server. Each subsequent new server needs a separate and distinct common proxy created for its services.

Can I Change the Common Proxy User Name and Context?

The Common Proxy User Name cannot be changed at install time and should not be manually changed later. Best practices dictate that each proxy user name reflect the name of the server it is associated with.

The context can be changed at install time. However, eDirectory best practices suggest that object locations within the tree reflect the object purpose and scope of influence or function. For this reason, the OES install proposes the same context that you specify for the server, for its associated common proxy as well.

Can I Assign the Common Proxy User After Services Are Installed?

Yes. See [“Assigning the Common Proxy to Existing Services” on page 267](#).

What About Upgraded Servers Using a Common Proxy?

You can change the services running on an upgraded OES 2015 SP1 server to leverage a Common Proxy user. See [“Assigning the Common Proxy to Existing Services” on page 267](#).

Are There Important Limitations to Keep in Mind?

Yes.

iFolder must not be configured to use a Common Proxy on a cluster node.

H.3.2 Managing Common Proxy Users

Common proxy users are eDirectory objects and can therefore be managed via iManager. However, after the initial setup is complete, there should generally be no reason for OES administrators to directly manage Common Proxy users.

Use the information in the following sections to understand and implement common proxy user management.

- ♦ [“Always Use LDAP Port 636 to Communicate with eDirectory” on page 266](#)
- ♦ [“Assigning the Common Proxy to Existing Services” on page 267](#)
- ♦ [“Changing Proxy Passwords Automatically” on page 267](#)

Always Use LDAP Port 636 to Communicate with eDirectory

The Common Proxy user management scripts communicate with eDirectory using port 636 only. See the instructions in [“Installing OES 2015 SP1 as a New Installation”](#) in the [OES 2015 SP1: Installation Guide](#)).

Assigning the Common Proxy to Existing Services

You can assign the common proxy user to any of the services listed in [“Services That Can Leverage the Common Proxy User” on page 265](#) using the `move_to_common_proxy.sh` script on your OES 2015 SP1 server. In fact, if you have upgraded from SP2 and the server doesn't have a common proxy user associated with it, simply running the script will create and configure the proxy user and assign the services you specify.

- 1 In the `/opt/novell/proxymgmt/bin` folder, run the following command:

```
./move_to_common_proxy.sh service1,service2
```

where the service entries are OES service names: `novell-cifs`, `novell-dns`, `novell-dhcp`, `novell-iFolder`, `novell-netstorage`, `novell-lum`, and/or `novell-nc`.

Example scenario:

- ◆ You have upgraded server `myserver`, which is located in `o=novell` and uses IP address `10.10.10.1`, from OES 2 SP3 to OES 2015 SP1.
- ◆ The secure LDAP port for the server is `636`.
- ◆ Your eDirectory Admin user FQDN is `cn=admin,o=novell`.
- ◆ Your Admin password is `123abc`.
- ◆ You want to create a common proxy user and assign it as the common proxy for the Novell DNS and DHCP services running on the server.
- ◆ Therefore, you enter the following commands:

```
cd /opt/novell/proxymgmt/bin
```

```
./move_to_common_proxy.sh -d cn=admin,o=novell -w 123abc -i 10.10.10.1 -p 636 -s novell-dhcp,novell-dns
```

User `cn=OESCommonProxy_myserver,o=novell` is created with a system-generated password and assigned the Common Proxy Policy password policy. The DNS and DHCP services are configured to be serviced by the Common Proxy user.

Changing Proxy Passwords Automatically

You can configure your server so that your proxy users are regularly assigned new system-generated passwords by doing the following:

- 1 Open the file `/etc/opt/novell/proxymgmt/proxy_users.conf` in a text editor.
- 2 List the FQDN of each proxy user on the server that you want to automatic password management set up for.

For example you might insert the following entries:

```
cn=OESCommonProxyUser_myserver,o=novell
cn=myproxy,o=novell
```

IMPORTANT: Users listed here must not be listed in the `proxy_users.conf` file on any other servers in the tree.

- 3 Save the file.
- 4 Enter the following commands:

```
cd /opt/novell/proxymgmt/bin
```

```
change_proxy_pwd.sh -A Yes
```

By default, the crontab job will run every 30 days.

H.4 Planning Your Proxy Users

Because of the prominent role played by the proxy users on your OES network, it is important that you understand your implementation options and the implications for each option. You can then plan an overall proxy user implementation strategy.

- ◆ [Section H.4.1, “About Proxy User Creation,” on page 268](#)
- ◆ [Section H.4.2, “There Are No Proxy User Impacts on User Connection Licenses,” on page 272](#)
- ◆ [Section H.4.3, “Limiting the Number of Proxy Users in Your Tree,” on page 272](#)
- ◆ [Section H.4.4, “Password Management and Proxy Users,” on page 274](#)

H.4.1 About Proxy User Creation

The first step in planning your proxy user implementation strategy is understanding the do’s and don’ts of proxy user creation.

- ◆ [“Creation Options” on page 268](#)
- ◆ [“Do Not Manually Configure Proxy Users” on page 271](#)
- ◆ [“Avoid Assigning an Admin User As a Proxy User” on page 272](#)

Creation Options

[Table H-2](#) presents information about the creation options for each OES proxy user.

Table H-5 Proxy User Creation Options

Associated Service	Service Proxy User Name if Applicable	Creation Information
AFP	OESCommonProxy_ <i>hostname</i> Or AfpProxyUser- <i>servername</i>	<ul style="list-style-type: none">◆ Common Proxy User: If a Common Proxy User is specified, AFP will be automatically configured to use it by default, but you have the option to change this.◆ No Common Proxy User: If a Common Proxy User is not specified, the AFP YaST install automatically does the following:<ul style="list-style-type: none">◆ Creates a proxy user named AfpProxyUser-<i>servername</i> in the same context as the server.◆ Generates a password, and stores it in CASA.Alternatively, you can modify any of the defaults, including the password. Or if you have already created a proxy user, you can specify that as well.

Associated Service	Service Proxy User Name if Applicable	Creation Information
CIFS	OESCommonProxy_ <i>hostname</i> Or CifsProxyUser- <i>servername</i>	<ul style="list-style-type: none"> ◆ Common Proxy User: If a Common Proxy User is specified, CIFS will be automatically configured to use it by default, but you have the option to change this. ◆ No Common Proxy User: If a Common Proxy User is not specified, the CIFS YaST install automatically does the following: <ul style="list-style-type: none"> ◆ Creates a proxy user named cifsProxyUser-<i>servername</i> in the same context as the server. ◆ Generates a password, and stores it in either CASA or in an encrypted file on the server, depending on which option you select. <p>Alternatively, you can modify any of the defaults, including the password. Or if you have already created a proxy user, you can specify that as well.</p>
Clustering (NCS)	OESCommonProxy_ <i>hostname</i> Or installing admin user	<ul style="list-style-type: none"> ◆ Common Proxy User: If the Common Proxy User is specified, it is granted membership in the NCS_Management group, which enables it to communicate with eDirectory on behalf of the clustering service. ◆ No Common Proxy User: If a Common Proxy User is not specified, the system automatically uses the installing administrator, which is granted membership in the NCS_Management group, which enables it to communicate with eDirectory on behalf of the clustering service.
DHCP	OESCommonProxy_ <i>hostname</i> Or installing administrator	<ul style="list-style-type: none"> ◆ Common Proxy User: If a Common Proxy User is specified, DHCP will be automatically configured to use it by default, but you have the option to change this. ◆ No Common Proxy User: If a Common Proxy User is not specified, the admin account that installs the server is assigned as the DHCP proxy user. If you want to assign an alternate user account, it must already exist in the tree and be able to access the DHCP server object.
DNS	OESCommonProxy_ <i>hostname</i> Or installing administrator	<ul style="list-style-type: none"> ◆ Common Proxy User: If a Common Proxy User is specified, DNS will be automatically configured to use it by default, but you have the option to change this. ◆ No Common Proxy User: If a Common Proxy User is not specified, the admin account that installs the server is assigned as the DNS proxy user. If you want to assign an alternate user account, it must already exist in the tree and have Read, Write, and Browse rights in the contexts where the DNS Locator, Root Server, and Group Object are created.

Associated Service	Service Proxy User Name if Applicable	Creation Information
Domain Services for Windows (DSfW)	OESCommonProxy_ <i>hostname</i> Or DNS	<ul style="list-style-type: none"> ♦ Common Proxy User: If a Common Proxy User is specified, DSfW will be automatically configured to use it by default, but you have the option to change this. ♦ No Common Proxy User: If a Common Proxy User is not specified, the admin account that installs the server is assigned as the DNS proxy user. Alternatively, you can modify any of the defaults, including the password, or if you have already created a proxy user, you can specify that as well. The user must have the Read right to the LDAP service.
iFolder 3	OESCommonProxy_ <i>hostname</i> Or iFolderProxy IMPORTANT: The Common Proxy user cannot be used if iFolder is running on a cluster node.	<ul style="list-style-type: none"> ♦ Common Proxy User: If a Common Proxy User is specified, iFolder will be automatically configured to use it by default, but you have the option to change this. ♦ No Common Proxy User: If a Common Proxy User is not specified, the system automatically creates a proxy user named iFolderProxy. Alternatively, you can modify any of the defaults, including the password, or if you have already created a proxy user, you can specify that as well. The user must have the Read right to the LDAP service.
Linux User Management	OESCommonProxy_ <i>hostname</i> Or <i>LUM_proxy</i> (optional)	<p>By default, no LUM proxy user is created.</p> <ul style="list-style-type: none"> ♦ Common Proxy User: If a Common Proxy User is specified, you have the option of specifying that it be used as the LUM proxy user. If you do this, LUM is automatically configured to use it. ♦ No Common Proxy User: If you create a proxy user for LUM, it will be assigned rights to search the LDAP tree for LUM objects. If you assign a previously created user as the LUM proxy user, it must have the Read right to the LDAP service.
NetStorage	OESCommonProxy_ <i>hostname</i> Or Installing administrator	<ul style="list-style-type: none"> ♦ Common Proxy User: If the Common Proxy User is specified, NetStorage will be configured to use it by default, but you have the option to change this. You must manually configure the proxy user with the rights specified in NetStorage in Table H-4 on page 262. For more information, see “Changing the NetStorage Default Configuration” in the <i>OES 2015 SP1: NetStorage Administration Guide for Linux</i>. ♦ No Common Proxy User: If a Common Proxy User is not specified, the system automatically uses the installing administrator. Alternatively, you can modify any of the defaults, including the password, or if you have already created a different proxy user, you can specify that as well. The user must have the Read right to the LDAP service.

Associated Service	Service Proxy User Name if Applicable	Creation Information
NSS	<i>server_name</i> admin	This admin account must have full rights to administer NSS and must be unique to each server. The Common Proxy User does not apply to NSS.
Samba (Novell)	<i>server_name</i> -SambaProxy	<p>By default, the Samba proxy user is created in the container specified as the Base Context for Samba Users and is named <i>servername</i>-sambaProxyUser.</p> <p>A password is automatically generated for the default proxy user, or you specify a different password for this user when you configure Novell Samba.</p> <p>You can specify another eDirectory user as the Samba proxy user. If you do, be aware of the following:</p> <ul style="list-style-type: none"> ◆ If you specify a user that doesn't already exist in eDirectory, the user account is created and granted the necessary rights. You must also specify a password for the new user. ◆ If you specify an existing eDirectory user, it is assumed that you have already created the user account with the necessary rights and no modifications are made to the existing user. ◆ If you specify an existing eDirectory user but enter a new password, you are prompted to change the password for that user. <p>Because of the Samba proxy password requirements, the Common Proxy User cannot be used with Novell Samba.</p>

Do Not Manually Configure Proxy Users

Best practices for most OES installation scenarios dictate that either the Common Proxy user be used or that proxy users be created in eDirectory prior to installing OES. For more information, see [“Common Proxy User” on page 264](#) and [“Limiting the Number of Proxy Users in Your Tree” on page 272](#).

IMPORTANT: The information in the preceding and following sections only answers security questions and provides general information. It is not intended to be used for the manual configuration of proxy users.

Manually created proxy users must be configured for OES-rootservice use only by the YaST based install, not manually.

Avoid Assigning an Admin User As a Proxy User

We recommend that you always use the special-purpose proxy user accounts described in this and the accompanying sections rather than specifying admin users as proxy users. Best practice dictates that proxy users have strictly limited functionality that supports only their specific system-level responsibilities. Proxy users should not be used for any other purposes.

Although specifying an admin user as the proxy user appears to be an easy way of setting up OES services (and is the install default in some cases if the Common Proxy user option isn't selected), there are potential problems. Mixing actual users with system-level functionality always creates some risk.

The following is a real-life example of risks that can occur when admin users are assigned as proxy users:

Novell Support received a call from an administrator who was getting locked out due to intruder detection after changing the administrator password. The lockout happened several times each day and seemed to be coming from the OES servers. The support technician checked LUM and all of the services he could think of, and didn't see the admin credentials anywhere.

Further investigation revealed that the administrator credentials had been used as the proxy user credentials for some of the OES service installations. Consequently, the credentials were stored in CASA for use when the OES services came up.

Because the Admin password had changed, the CASA credentials had expired and service authentication requests were failing, resulting in the intruder detection lockout.

H.4.2 There Are No Proxy User Impacts on User Connection Licenses

Novell policy dictates that proxy users that function only as proxy users, are simply system users. Therefore, proxy users do not consume user connection licenses.

H.4.3 Limiting the Number of Proxy Users in Your Tree

The main purposes of the common proxy users are to reduce the number of proxy users in a tree and simplify proxy user management. Therefore, the common proxy user is the default in all applicable scenarios.

[Table H-6](#) outlines various alternative options for limiting the number of proxy users in your tree and summarizes the security and manageability considerations of each approach.

Table H-6 Options for Limiting the Number of Proxy Users

Approach	Security Considerations	Manageability Considerations
Per Service per Server	<p>For CIFS, iFolder 3, and Samba this is the most secure option. By default, the passwords for these are system-generated and not known by anyone.</p> <p>For LUM there is no option to have a system-generated password.</p> <p>For DNS, DHCP, and NetStorage, the install admin's credentials are used by default. This has separate security implications as outlined in "Avoid Assigning an Admin User As a Proxy User" on page 272.</p>	<p>This approach requires no proxy user planning.</p> <p>Services are installed at the same time as the OES server.</p> <p>This is a good option for small organizations or installations where only a few services are used.</p> <p>This is not a good option if security policies dictate that all passwords must be reset periodically.</p>
Per Server	<p>This confines any security vulnerabilities to individual servers and is the scenario for which the Common Proxy User was developed.</p>	<p>This requires that a proxy user for the server is created before the server is installed.</p> <p>If the Common Proxy User is not leveraged, then for the first server in the tree, eDirectory and iManager must be installed with the server. After the server installation finishes, a proxy user can be created. And finally the services can be installed and configured to use the proxy user for the server.</p> <p>This approach is useful when each OES server is managed by a separate administrator, or for enterprises where branch users access a server in the branch office.</p> <p>Knowing the proxy user password is not required unless additional services will be installed or password policies require periodic changing, in which cases the install admin must know the proxy user's password.</p>
Per Partition	<p>This confines any security vulnerabilities to individual partitions.</p>	<p>This is useful when users are co-located with the OES servers in a single partition, and cross-partition access of users to services is rare.</p> <p>This is a good approach for organizations where eDirectory administration is done at a partition level.</p> <p>This requires that a proxy user for the first server in the partition is created before services are installed in the partition.</p> <p>The install admin must know the proxy user's password.</p>

Approach	Security Considerations	Manageability Considerations
Per Service	<p>This confines any security vulnerabilities to individual services.</p> <p>It also ensures that proxy user rights are not overloaded but are distributed so that there is a single proxy user for each type of service</p>	<p>For example, you might have one proxy user for CIFS, one for DNS/DHCP, one for iFolder, one for iPrint etc.</p> <p>This is useful in trees where the users and servers are not co-located, and different services are administered by different administrators.</p> <p>This requires that a proxy user for the service is created before the service is installed in the tree.</p> <p>The install admin must know the proxy user's password.</p>
Per Tree	<p>This exposes all OES services and servers in the tree to any security vulnerabilities.</p>	<p>A proxy user for the tree must be created before any OES services are installed in the tree.</p> <p>This is suitable for organizations that have</p> <ul style="list-style-type: none"> ◆ Centralized eDirectory administration ◆ Users that are not confined to the partition or subtree where the OES servers reside, but instead access different OES servers from all over the tree. <p>The install admin must know the proxy user's password.</p>

H.4.4 Password Management and Proxy Users

Proxy user passwords must be stored on the individual OES servers where the services are installed because proxy users must be able to log in to eDirectory to perform their required functions.

- ◆ [“Auto-Generated vs. Manually Specified Passwords” on page 274](#)
- ◆ [“Passwords Are Stored on the Server” on page 274](#)
- ◆ [“Avoid Password Expiration Problems” on page 275](#)
- ◆ [“Changing Proxy Passwords Automatically” on page 276](#)
- ◆ [“Changing Proxy Passwords Manually” on page 276](#)

Auto-Generated vs. Manually Specified Passwords

- ◆ **Auto-Generated Passwords:** These offer the highest security because the passwords are known only to the system.

The Common Proxy User, CIFS Proxy User, iFolder Proxy User (YaST calls this the **LDAP proxy user**), and Samba Proxy User all use auto-generated passwords by default.

- ◆ **Manually Specified Passwords:** Although you can change the auto-generated passwords for the various proxy users, this is not recommended because it is less secure and requires that someone keep track of the passwords. Also, manually specified passwords can easily lead to problems, such as service disruption. For a related example of the problems this can cause, see [“Avoid Assigning an Admin User As a Proxy User” on page 272](#).

Passwords Are Stored on the Server

Of course all proxy user passwords are stored in eDirectory. [Table H-7](#) explains where they are stored on the server and how they can be reset if needed.

Table H-7 Password Storage Locations

Associated Service	Where the Password Is Stored Locally	How the Password Can Be Reset
AFP	If the service-specific proxy user is used, the password is stored in either CASA or in an encrypted file, depending on the configuration option specified during service installation.	You can reset the password using iManager or the CASACli tool.
CIFS	If the service-specific proxy user is used, the password is stored in either CASA or in an encrypted file, depending on the configuration option specified during service installation.	You can use iManager to reset the password in CASA or in the encrypted file, or the CASACli tool if it is stored in CASA.
Common Proxy User	This password is stored in CASA.	We recommend that you only use the <code>change_proxy_pwd.sh</code> script to manage Common Proxy User passwords.
DHCP	The service-specific password is stored in CASA.	You can set the password using the CASACli tool.
DNS	If the service-specific proxy user is used, the service-specific password is stored in CASA if it is available. If CASA is not available, it is stored in an encrypted file.	
iFolder 3	If the service-specific proxy user is used, the service-specific password is stored in the iFolder store with PKI cryptography.	It can be changed either from a terminal prompt using the iFolder command line utilities or through the iFolder Admin Console.
Linux User Management	If the service-specific proxy user is used, the service-specific is stored in CASA.	This can be changed in iManager through the Linux User Management plug-in.
NetStorage	If the service-specific proxy user is used, the service-specific password is stored in the XTier registry.	This can be changed in iManager through the NetStorage plug-in.
NSS		This password is system-generated at install time and cannot be reset.
Samba (Novell)	The service-specific password is stored in Samba.	You can change the password by using the <code>smbpasswd</code> command.

IMPORTANT: Although the YaST based install can sometimes be used successfully to reconfigure some OES services, Novell neither recommends nor supports that practice.

Avoid Password Expiration Problems

Many organizations require that all network users have password policies to enforce regular password expiration and change.

Such policies create complications for the proxy user design. Proxy user passwords are stored on the local system to enable the OES services to log in to eDirectory. Every time a password change is forced in eDirectory, services stop working until the password is synchronized on the server.

These problems can be avoided by:

- ◆ Not assigning proxy users a password policy that enforces password expiration.
- ◆ Not using real user credentials for proxy users. See [“Avoid Assigning an Admin User As a Proxy User” on page 272](#).

If password expiration policies cannot be avoided, or a security policy dictates that proxy user passwords must be changed periodically, we strongly urge you to implement an automatic password change routine as explained in [“Changing Proxy Passwords Automatically” on page 276](#).

Otherwise you should probably do the following.

- ◆ Ensure that the responsible administrator knows or has a record of each proxy user’s password and is aware of when each password expires.
- ◆ Before passwords expire, change them in eDirectory and reset them on the server. See the information in [Table H-7](#).

Changing Proxy Passwords Automatically

You can configure your server so that your proxy users are regularly assigned new system-generated passwords by doing the following:

- 1 Open the file `/etc/opt/novell/proxymgmt/proxy_users.conf` in a text editor.
- 2 List the FQDN of each proxy user on the server that you want to automatic password management set up for.

For example you might insert the following entries:

```
cn=OESCommonProxyUser_myserver.o=novell
cn=myproxy.o=novell
```

IMPORTANT: Users listed here must not be listed in the `proxy_users.conf` file on any other servers in the tree.

- 3 Save the file.
- 4 Enter the following commands:

```
cd /opt/novell/proxymgmt/bin
change_proxy_pwd.sh -A Yes
```

By default, the crontab job will run on the fifteenth (15th) day of each month.

Changing Proxy Passwords Manually

The `change_proxy_pwd.sh` command can also be used to enter a proxy user password.

IMPORTANT: If you enter a password by using the `change_proxy_pwd.sh` command, the password cannot contain special shell variables (`$$`, `$_`, or `#?`). These characters are interpreted by the shell while processing service scripts.

The workaround is to enter the password within single quotes. For example, you can enter the password `novell$$` as `'novell$$'`. The shell doesn’t interpret content within single quotes.

H.5 Implementing Your Proxy User Plan

The proxy users in OES can be configured at different levels within eDirectory, depending on your needs.

IMPORTANT: If you plan to use the Common Proxy User, you can ignore this note.

The brief instructions that follow assume that you are installing into an existing tree and not leveraging the Common Proxy User.

For new trees, you will need to install and configure eDirectory on the first server without configuring any other OES services.

After the server is installed and you have created the required proxy users and passwords, then you can install the OES services and configure them to use the proxy users you have created.

The exception to this is installing all services without changing the default configuration settings (see [Table H-5 on page 268](#)). In most cases a default configuration assigns the install admin as the proxy user for the service.

- ♦ [Section H.5.1, “Tree-Wide Proxy Users,” on page 277](#)
- ♦ [Section H.5.2, “Service-Specific Proxy Users,” on page 277](#)
- ♦ [Section H.5.3, “Partition-Wide Proxy Users,” on page 278](#)
- ♦ [Section H.5.4, “Server-Wide Proxy User,” on page 278](#)
- ♦ [Section H.5.5, “Individual Proxy User Per-Server-Per-Service,” on page 278](#)

H.5.1 Tree-Wide Proxy Users

Do the following:

1. Create a proxy user in the eDirectory tree where the OES servers will be installed, and set the password.

Consider naming the user to reflect its purpose. For example, name the proxy user `oes_service_proxy_user`.

2. Use this proxy user and password while configuring the services on all of the OES servers in that tree.

H.5.2 Service-Specific Proxy Users

Do the following:

1. Create a proxy user in the eDirectory tree for each type of OES service and set the passwords.

Consider naming the user to reflect its purpose. For example, name the CIFS proxy user, `cifs_proxy_user`.

2. Use these proxy users and passwords appropriately for each of the OES services on all OES servers.

H.5.3 Partition-Wide Proxy Users

Do the following:

1. Create one proxy user object per eDirectory partition in the OES tree, and set the password.

Consider naming the user to reflect its purpose. For example, name the proxy user for the London regional office, `london_office_proxy_user`.

2. Use this proxy user and password for configuring all of the OES services on all the OES servers in that partition.

H.5.4 Server-Wide Proxy User

NOTE: The Common Proxy User is specifically designed as the default for this scenario.

Do the following:

1. Create one proxy user object per OES server (preferably in the same container as the server) and set the password.
2. Use this proxy user and password as the proxy user for all the services on that particular OES server.

H.5.5 Individual Proxy User Per-Server-Per-Service

This is the installation default if the Common Proxy User is not utilized as explained in [Table H-6, "Options for Limiting the Number of Proxy Users,"](#) on page 273.

H.6 Proxy Users and Domain Services for Windows

Proxy users are not used in DSfW.

The Services part of the Trusted Computer Base has the rights to read users' supplemental credentials for authentication. A separate Kerberos process reads user passwords and performs the authentication. Another event handler in eDirectory creates the supplemental credentials for the user whenever the password is changed for that user.

However, the DNS Proxy User is closely associated with DSfW and can leverage the Common Proxy User.

H.7 System Users

SLES and OES create system users on the local Linux system to provide user IDs (uids) to service processes. These users have rights to local files, such as configuration files.

The services that rely on system users do not have passwords because they don't need to log in. They simply use their associated user IDs.

When NSS is installed, some of these users are moved to eDirectory and LUM enabled. This is done to provide access to NSS data, to keep the user IDs the same across multiple servers, and to facilitate clustering and shared volumes.

[Table H-2](#) lists the various system users that are used by OES services.

Table H-8 System User Purposes

System User or Group Name	Associated Service	Purpose
dhcpcd	DHCP	DHCP accesses local resources through this or an alternatively specified user. If the DHCP lease and configuration files are stored on NSS, the user must be moved to eDirectory and LUM enabled. dhcpcd is used by default, but any local user can be used.
iprint	iPrint	The iPrint daemons run as this user. If iPrint is moved to NSS, this user is created in eDirectory and the local user is removed.
named	DNS	This system user lets DNS access local resources. In case of clusters, DNS data is on NSS volume, and so the user has to be created in eDirectory as well. named is used by default, but any local user can be used.
novell_nobody	CIMOM	This user is created by CIMOM but is not currently used.
novlxregd	XTier	The XTier Registry Daemon (novell-xregd) runs as this user. When NSS is installed on the Linux server, this user is removed from the local system and created as LUM-enabled user in eDirectory. This is required because it must have access to NSS data, and all NSS access is controlled through eDirectory.
novlxsvrd	XTier	The XTier Server Daemon (novell-xsvrd) runs as this user. When NSS is installed on the Linux server, this user is removed from the local system and created as LUM-enabled user in eDirectory. This is required because it must have access to NSS data, and all NSS access is controlled through eDirectory.
wwwrun	Apache	The Apache daemon runs as this user. When NSS is installed on the Linux server, this user is removed from the local system and created as LUM-enabled user in eDirectory. This is required because it must have access to NSS data, and all NSS access is controlled through eDirectory.

H.8 System Groups

These are groups in the local Linux system that provide a group ID (gid) to an OES process.

When NSS is installed, some of these groups are moved to eDirectory and LUM enabled. This is done to provide access to NSS data and to keep group IDs the same across multiple servers.

[Table H-2](#) lists the system groups that are used by OES services.

Table H-9 System Group Purposes

System User or Group Name	Associated Service	Purpose
lprint (POSIX) iprintgrp (eDirectory)	iPrint	The iPrint daemons use the group ID (gid) of this group to run. If iPrint is moved to NSS, the iprintgrp group is created in eDirectory.
ncsgroup	NCS	<code>ncsclient</code> is a member of this group.
novell_nogroup	CIMOM	This group is created by CIMOM but is not currently used.
novlxtier	XTier	The XTier daemons use the group id (gid) of this group to run. Apache (<code>wwwrun</code>) is a group member because it needs XTier socket access. When NSS is installed on the Linux server, this group is removed from the local system and created in eDirectory. This is required because members of this group must have access to NSS data, and all NSS access is controlled through eDirectory.
<code>server_name-W-SambaUserGroup</code>	Samba (Novell)	All users granted Samba access are originally assigned to this group, which disables SSH access for them on the server. For more information, see “The Samba connection:” on page 93 .
www	Apache Tomcat	Apache (<code>wwwrun</code>) and tomcat (<code>novlwww</code>) use the group ID (gid) of this group to run. User <code>novlxsrvd</code> is in the group because it needs access to an Apache domain socket. When NSS is installed on the Linux server, this group is removed from the local system and created in eDirectory. This is required because members of this group must have access to NSS data, and all NSS access is controlled through eDirectory.

H.9 Auditing System Users

It is the nature of the Linux operating system and the POSIX security model that the `root` user has access to all system information stored on the local server. Due to this fact, some organizations choose to monitor the activities of privileged users.

If you are interested in monitoring such activities, two Novell products can assist you.

- ♦ **Novell Sentinel:** Universal Password events can be monitored using Novell Sentinel. You enable this by modifying the NMAS Login Policy Object. For instructions, see [“Auditing NMAS Events.”](#) Then refer to the [Novell Sentinel Documentation \(http://www.novell.com/documentation/sentinel6/\)](http://www.novell.com/documentation/sentinel6/) for further instructions.

- ♦ **Privileged User Manager:** This product lets you monitor root user activities on the OES server by collecting data, analyzing keystrokes, and creating indelible audit trails. For more information, see the [Novell Privileged User Manager Documentation \(http://www.novell.com/documentation/privilegedusermanager22/index.html\)](http://www.novell.com/documentation/privilegedusermanager22/index.html).

Administrative Users and Groups in OES 2015 SP1

I.1 eDirectory Administrative Users and Groups

Every OES network requires at least one administrative-level user to manage regular network users and system users.

Table I-1 Administrative Users and Groups

Administrative User or Group	Associated Service	Object Type	Purpose
Admin	eDirectory	Admin User	The eDirectory administrator that has all rights to manage the Tree. The default is Admin.
<i>Container Admin</i>	eDirectory	Admin User	These administrators are usually responsible for administering within a partition or subtree. They might be assigned only enough rights to install servers, or they might be assigned to specific roles in iManager.
admingroup	eDirectory	Admin Group	Provides LUM-enabling for the eDirectory administrator.
iFolderAdmin	iFolder 3	Service Admin	This is the default iFolder service administrator account. By default, the Tree Admin is specified.

TIP: The iManager Role-based-services (RBS) feature lets you delegate administrative responsibilities based on administrative roles. For more information, see [“Role-Based Services”](#) in the *NetIQ® iManager Administration Guide*.

I.2 Active Directory Administrative Users and Groups

Administrative access to NSS AD service components is controlled by the AD users and groups summarized in [Table I-2](#).

Table I-2 Administrative Users and Groups

Administrative Group	Associated Service	Object Type	Purpose
Administrator	Active Directory	Admin user	The Active directory administrator that has all rights to manage the Active Directory Domain
Delegated Administrator	Active Directory	Admin user	<p>These administrators are usually responsible for administering within a specific OU. They might be assigned only enough rights to install servers or they might be assigned to specific roles.</p> <p>These are similar to eDirectory Container Administrators.</p>
Domain Admins	NSS AD	AD Group	<p>Members of this group in the domain the OES server has joined, have Supervisor rights on the AD-enabled volumes associated with those servers.</p> <p>A different group can be designated through the <code>nitconfig</code> utility or by manually editing the <code>nitd.conf</code> file.</p>
OESAccessGrp	NSS AD	AD Group	<p>Members of this group have rights to manage trustee assignments, file attributes, and so forth on AD-enabled NSS volumes as their trustee assignments allow.</p> <p>If the group doesn't exist, all AD users with the required trustee assignments can perform management tasks on AD-enabled volumes.</p>

J Coordinating Password Policies Among Multiple File Services

- ◆ [Section J.1, “Overview,” on page 285](#)
- ◆ [Section J.2, “Concepts and Prerequisites,” on page 285](#)
- ◆ [Section J.3, “Examples,” on page 286](#)
- ◆ [Section J.4, “Deployment Guidelines for Different Servers and Deployment Scenarios,” on page 289](#)

J.1 Overview

OES 2015 SP1 includes native file services for Windows and Macintosh workstations:

Macintosh Workstations	Windows Workstations
<ul style="list-style-type: none">◆ Novell AFP◆ Novell CIFS	<ul style="list-style-type: none">◆ Novell CIFS◆ Novell Samba◆ Domain Services for Windows (DSfW) <p>DSfW is not classified as a file service, but it includes a customized version of Samba that is different from Novell Samba.</p>

Each of these services requires that users who access them have Password policies that meet specific requirements. Users can be governed by only one Password policy at a time, so if any of your network users require access to more than one of the file services, you need to coordinate the Password policies that govern the users to ensure that they can access the different file services.

J.2 Concepts and Prerequisites

Prerequisites for AFP, CIFS, and Samba access are explained in the following sections:

- ◆ [Section J.2.1, “Prerequisites for File Service Access,” on page 285](#)
- ◆ [Section J.2.2, “eDirectory contexts,” on page 286](#)
- ◆ [Section J.2.3, “Password Policies and Assignments,” on page 286](#)

J.2.1 Prerequisites for File Service Access

The following are the prerequisites for user access to AFP, CIFS, and Samba services:

- ◆ The eDirectory context under which users are searched for must be configured during service configuration.
- ◆ The users need to be governed by Password policies that enable Universal Password for them.

- ◆ There must be at least one writable replica of NMAS version 3.2 or later having the user object trying to access the AFP or CIFS server. NMAS 3.2 is already present on OES 2 servers, and NMAS 3.2 is installed on servers running eDirectory 8.8.2. On NetWare servers with a lone writable replica of a AFP or CIFS user, NMAS should be upgraded by upgrading to the Novell Security Services 2.0.6 on eDirectory 8.7.3 SP10 or eDirectory 8.8.2.
- ◆ The file access services will provide access/visibility to the users as per the trustee rights they have on the volumes and files.

In addition, Samba (on both DSFW and non-DSFW servers) has the following additional requirements:

- ◆ The users must be LUM-enabled on the server.
- ◆ The users must be members of a LUM-enabled group on the server holding the volumes.
- ◆ Samba users must be created in a container or partition that has a Samba-qualified password policy assigned to it.

J.2.2 eDirectory contexts

- ◆ **AFP:** These are the contexts under which the user objects will be searched for during an authentication. In a name-mapped (existing tree) install, if the context resides in a DSfW domain, the context can be specified either in the domain name format (Active Directory format) or in the X.509 format.
- ◆ **CIFS:** The eDirectory contexts of users can be specified either in the domain name format (Active Directory format) or in the X.509 format.
- ◆ **Samba:** Depends on LUM to search for the user in eDirectory and therefore doesn't require an eDirectory context.

J.2.3 Password Policies and Assignments

- ◆ **Samba:** Creates a default password policy, but does not attach this policy to any user.
- ◆ **DSFW:** The password policy in a DSfW environment is modeled after Active Directory Password policies. There is a single Password policy at the domain level, and it is configured during provisioning. eDirectory allows you to set policies at the user or container level. However, this is not recommended in a DSfW environment.

J.3 Examples

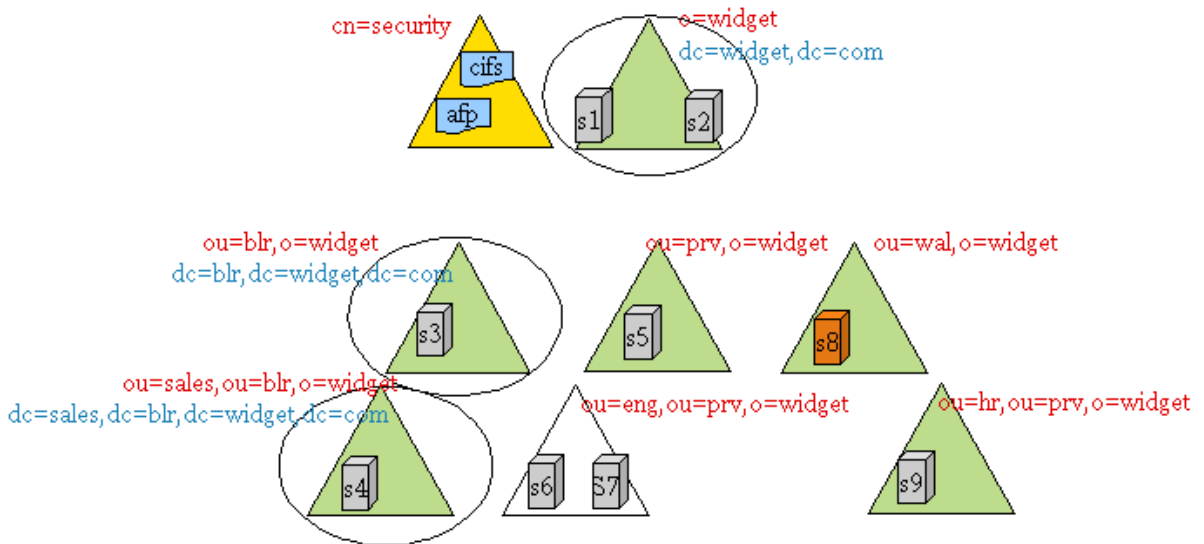
- ◆ [Section J.3.1, "Example 1: Complex Mixed Tree with a Mix of File Access Services and Users from across the Tree," on page 286](#)
- ◆ [Section J.3.2, "Example 2: Mutually Exclusive Users," on page 288](#)

J.3.1 Example 1: Complex Mixed Tree with a Mix of File Access Services and Users from across the Tree

- ◆ ["Tree Setup" on page 287](#)
- ◆ ["OES/NetWare Servers" on page 287](#)
- ◆ ["File Services" on page 287](#)

- ♦ “User Access to Services” on page 288
- ♦ “Rights Required for Installation and Administration” on page 288

Figure J-1 Example 1



Tree Setup

The WIDGETS_INC tree has the following configuration:

- ♦ o=widget, ou=blr, o=widget, and ou=sales, ou=blr, o=widget are eDir partitions as well as name mapped domains.
- ♦ ou=prv, o=widget, ou=wal, o=widget, ou=hr, ou=prv, o=widget are partitions (but not domains)
- ♦ ou=end, ou=prv, o=widget refers to the top of a subtree but not a partition. It is a container under the ou=prv, o=widget partition.

OES/NetWare Servers

- ♦ S1-S6 and S9 are OES servers
- ♦ S7 and S8 are NetWare servers

File Services

- ♦ S1, S2, S3, and S4 are DSfW servers and serve volumes over Samba and NCP
- ♦ S5 serves its volumes over AFP and NCP
- ♦ S6 serves its volumes over CIFS and NCP
- ♦ S7 serves its volumes over AFP, CIFS, and NCP
- ♦ S8 serves its volumes over NetWare CIFS, NetWare AFP, and NCP
- ♦ S9 serves its volumes over AFP, Samba, and NCP

NOTE: Although Novell CIFS and Samba can both be installed on the same machine, they cannot run together because of a port conflict. The administrator can configure either Samba or Novell CIFS on a single machine, but not both.

User Access to Services

Users from all over the tree can access services running on S1-S9. In order for users to be able to access AFP/CIFS services, the search contexts (eDirectory contexts) for these services should be configured to the subtrees under which those users can be found.

Rights Required for Installation and Administration

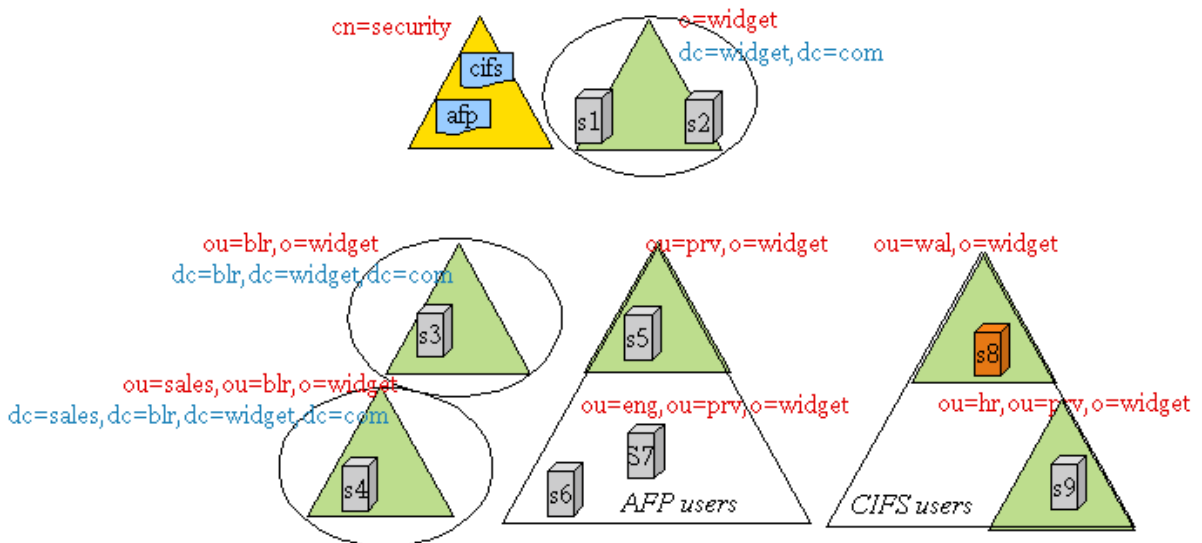
Installation and configuration in iManager must be done by an OES administrator. This is typically a container administrator in eDirectory who has supervisory privileges over the container where the server is being installed. This need not be the tree administrator.

J.3.2 Example 2: Mutually Exclusive Users

- ♦ “File Services” on page 288
- ♦ “Users” on page 289

In this scenario, the setup of the tree and file services is similar to that in [Example 1](#), but the users are local to the context where a particular service is installed.

Figure J-2 Example 2



File Services

- ♦ S1, S2, S3, and S4 are DSfW servers and serve their volumes over Samba and NCP
- ♦ S5, S6, and S7 serve their volumes over AFP and NCP
- ♦ S8 and S9 serve their volumes over CIFS and NCP

Users

For example, u1 is a user under the container ou=prv,o=widget and is expected to access AFP services on S5, S6, and S7. Similarly, u2 is a user under the container ou=val,o=widget and is expected to access CIFS services on S8 and S9.

J.4 Deployment Guidelines for Different Servers and Deployment Scenarios

- ◆ [Section J.4.1, “Deployment Scenario 1: Complex Mixed Scenario with a Mix of File Access Services,” on page 289](#)
- ◆ [Section J.4.2, “Deployment Scenario 2: Mutually /Exclusive Users,” on page 291](#)
- ◆ [Section J.4.3, “Deployment Scenario 3: Simple deployments,” on page 291](#)
- ◆ [Section J.4.4, “Modifying User Password Policies after Samba/DSfW Is Installed,” on page 291](#)
- ◆ [Section J.4.5, “Adding New User eDirectory Contexts to AFP/CIFS after AFP/CIFS/Samba/DSfW Is Installed.,” on page 291](#)
- ◆ [Section J.4.6, “Enabling File Access for DSfW Servers Across Domains,” on page 292](#)

J.4.1 Deployment Scenario 1: Complex Mixed Scenario with a Mix of File Access Services

- ◆ [“First Server in a New Tree \(Example1\)” on page 289](#)
- ◆ [“Subsequent Servers in a Tree \(Example 1\)” on page 290](#)

First Server in a New Tree (Example1)

- ◆ [“Not recommended—non-name-mapped \(new tree\) S1 \(DSfW\) server” on page 289](#)
- ◆ [“Non-DSFW Server” on page 290](#)

Not recommended—non-name-mapped (new tree) S1 (DSfW) server

Installation is the same as for the Forest Root Domain (FRD). The tree is named as per domain naming standards. Samba is installed as part of DSFW installation. Neither AFP nor Novell CIFS can be installed/configured on this server because they are not compatible with the DSFW server.

In order for users to access NSS volumes on this server through Samba, the users need to fit the following constraints:

- ◆ They must be LUM-enabled
- ◆ Cross domain access is necessary for users from outside of the DSFW domain corresponding to this server to access the volumes on this server. This can be achieved by adding those contexts to the LUM context for the LUM workstation object that represents the domain controller.
- ◆ Winbind translates user principles to UIDs for non-NSS volumes. LUM enabling is not required for non-NSS volume access.

Non-DSFW Server

If the first server in the tree is a non-DSFW server, then any combination of AFP, Novell CIFS, or Samba can be installed on this server. Because the tree is being newly created, the users, the proxy users (system users), and the Password policies will not be present. Use the following procedure for installation:

- 1 Install and configure the server with eDirectory, NSS, and other core services, but without selecting file access services.
- 2 Use auto-created common proxy user in eDirectory configuration for the OES services.
- 3 Use iManager to create a system user (proxy user) to be used for the OES services.
- 4 Use the Yast install to configure the Novell AFP and Novell CIFS services as follows:
 - 4a Use an auto-generated common proxy user for all the services.
 - 4b Specify the contexts under which to search for the AFP or CIFS users.
- 5 If the AFP/CIFS/Samba user objects are present on NetWare servers, upgrade Novell Security Services version 2.0.6 in order to upgrade to NMAS 3.2 on NetWare.

Subsequent Servers in a Tree (Example 1)

- ♦ “S2, S3, S4” on page 290
- ♦ “S5” on page 290
- ♦ “S6” on page 290
- ♦ “S7” on page 290
- ♦ “S8” on page 290
- ♦ “S9” on page 291

S2, S3, S4

Administrators need to decide whether these servers should be installed on a new domain or as additional domain controllers during capacity planning and deployment design. Follow the [OES 2015 SP1: Domain Services for Windows Administration Guide](#) to deploy S3 and S4 in the tree.

S5

- 1 Use an auto-generated common proxy user for all the services.

S6

Use the same procedure as for S5.

S7

Use the same procedure as for S5 and S6.

S8

- ♦ AFP and CIFS on NetWare don't require proxy users or password policies for service access.

- ♦ NMAS needs to be upgraded to 3.2+, if this server hosts the only writable replica for a partition with AFP or CIFS users.
- ♦ If this NetWare box is migrated to OES2015, AFP and CIFS users should be enabled for Universal Password by having a password policy configured. CIFS users need to log in through NCP (Novell Client) to synchronize their NDS passwords to the Universal Password.

S9

- ♦ Use the same procedure as for S5.
- ♦ Either use a common proxy user for all the services (AFP), or allow auto-generation of the proxy user/password for each AFP.

J.4.2 Deployment Scenario 2: Mutually /Exclusive Users

In some trees, AFP, CIFS, and Samba might be employed, but the users are partitioned in such a way that each user has access to AFP, to CIFS or to Samba, but not to all of them.

S1, S2, S3, S4

DSfW servers with Samba. All the users are under `dc=blr,dc=widgets,dc=com`.

- ♦ You can use the default Password policy provided by Domain Services for Windows for all the users in this subtree.
- ♦ You can create and use a single proxy user/password under `dc=blr,dc=widgets,dc=com` for all the servers providing Samba.

J.4.3 Deployment Scenario 3: Simple deployments

Simple deployments require very little planning.

One auto-generated common proxy user per server for all services configured on the server is a good choice.

J.4.4 Modifying User Password Policies after Samba/DSfW Is Installed

After a new password policy is assigned to a Samba or DSfW user, rerun the YaST-based configuration and select the new Password policies.

J.4.5 Adding New User eDirectory Contexts to AFP/CIFS after AFP/CIFS/Samba/DSfW Is Installed.

If users from additional or different eDirectory contexts need to be allowed to access CIFS or AFP, rerun the YaST-based configuration and modify or add the required edirectory user contexts.

J.4.6 Enabling File Access for DSfW Servers Across Domains

DSfW requires that users be LUM-enabled to access NSS file services through Samba. For a user to access a DSfW server in a different domain, the user needs to be a LUM-enabled user on the other server. DSfW provisioning establishes shortcut trust between domains. Users from other domains in the forest can access non-NSS volumes as long as they have rights on the resources.

To achieve this, the context of the partition root for the user object should be added as a search context for LUM. This needs to be done in addition to the trustee rights provided to the user (or the user's group) as part of file system rights.

K Configuration and Log Files

- ◆ Section K.1, “AFP,” on page 293
- ◆ Section K.2, “CIFS,” on page 294
- ◆ Section K.3, “Common Proxy,” on page 294
- ◆ Section K.4, “DFS,” on page 295
- ◆ Section K.5, “DHCP,” on page 295
- ◆ Section K.6, “DNS,” on page 295
- ◆ Section K.7, “Domain Services for Windows,” on page 296
- ◆ Section K.8, “Install,” on page 297
- ◆ Section K.9, “iFolder Server,” on page 298
- ◆ Section K.10, “iPrint,” on page 299
- ◆ Section K.11, “Linux User Management,” on page 300
- ◆ Section K.12, “Migration Tool,” on page 301
- ◆ Section K.13, “NetStorage,” on page 302
- ◆ Section K.14, “Novell Cluster Services,” on page 303
- ◆ Section K.15, “Novell File Access Rights Management (NFARM),” on page 303
- ◆ Section K.16, “Novell Identity Translator (NIT),” on page 303
- ◆ Section K.17, “Novell Linux Volume Manager,” on page 304
- ◆ Section K.18, “Novell Storage Services,” on page 304
- ◆ Section K.19, “Novell Samba,” on page 305
- ◆ Section K.20, “novell-ad-util,” on page 305
- ◆ Section K.21, “NCP,” on page 305
- ◆ Section K.22, “SMS,” on page 306
- ◆ Section K.23, “Vigil,” on page 307

K.1 AFP

Table K-1 AFP Configuration Files

Path	Description
/etc/opt/novell/afptcpd/afpdirctx.conf	List of eDirectory contexts having AFP users
/etc/opt/novell/afptcpd/afptcpd.conf	AFP server
/etc/opt/novell/afptcpd/afpvols.conf	List of NSS volumes to export through AFP server
/opt/novell/afptcpd/lsm/afplinlsmconfig.txt	Used by installation of AFP NMAS method into eDirectory tree.

Table K-2 AFP Log Files

Path	Description
/var/opt/novell/log/afptcp.log	AFP server run-time

K.2 CIFS

Table K-3 CIFS Configuration Files

Path	Description
/etc/opt/novell/cifs/cifs.conf	CIFS server
/etc/opt/novell/cifs/cifsctxs.conf	List of eDirectory contexts having CIFS users
/etc/opt/novell/cifs/cifslogrotate.conf	Hourly rotation of CIFS log file
/etc/opt/novell/cifs/logrotate.d/novell-cifs-hourly	Customized hourly rotation of CIFS log file
/opt/novell/cifs/share/nmasmthd/ntlm/config.txt	Used by installation of CIFS NMAS method into eDirectory tree.

Table K-4 CIFS Log Files

Path	Description
/var/opt/novell/log/cifs.log	CIFS server run-time

K.3 Common Proxy

Table K-5 Common Proxy Configuration Files

Path	Description
/etc/opt/novell/proxymgmt/proxy_users.conf	List of proxy users on local systems whose password is changed automatically

Table K-6 Common Proxy Log Files

Path	Description
/var/opt/novell/log/proxymgmt/pxylist.txt	List of proxy users used by services on local systems. Created when /opt/novell/proxymgmt/bin/retrieve_proxy_list.sh is run.
/var/opt/novell/log/proxymgmt/pxymgmt.log	

K.4 DFS

Table K-7 DFS Log Files

Path	Description
/var/log/messages	DFS Logs
/var/opt/novell/tomcat6/logs/catalina.out	iManager Logs
/var/opt/novell/log/dfs/vlrpr.log	VLDB Repair Logs

K.5 DHCP

Table K-8 DHCP Configuration Files

Path	Description
/etc/dhcpd.conf	

Table K-9 DHCP Log Files

Path	Description
/var/log/dhcp-ldap-startup.log	
/var/log/dhcpd.log	
/var/log/rc.dhcpd.log	DHCP server failure during startup

K.6 DNS

Table K-10 DNS Configuration Files

Path	Description
/etc/opt/novell/named/named.conf	configuration file loaded from e-directory

Table K-11 DNS Log Files

Path	Description
/var/opt/novell/log/named_zones.info	
/var/opt/novell/log/named.run	

K.7 Domain Services for Windows

Table K-12 DSfW Configuration Files

Path	Description
/etc/krb5.conf	kerberos configuration for DSfW.
/etc/krb5.keytab	Kerberos related link used by samba service.
/etc/nsswitch.conf	Configuration of Name service switch used by DSfW.
/etc/ntp.conf	ntp server Configuration for DSfW.
/etc/opt/novell/eDirectory/conf/nds.conf	The eDirectory configuration file.
/etc/opt/novell/eDirectory/conf/ndsmodule.conf	This file describes the modules to be loaded at boot-up into ndsd address space. Specific to DSfW it includes samspm.
/etc/opt/novell/named/named.conf	DNS configuration file.
/etc/opt/novell/xad/gss/mech	gssapi configuration information.
/etc/opt/novell/xad/openldap/ldap.conf	Defaults used by LDAP.
/etc/opt/novell/xad/xad.ini	DSfW related information (domain name,Admin details, IP address, DNS context etc).
/etc/opt/novell/xad/xadss.conf	Domain Services for Windows RPC server configuration.
/etc/resolv.conf	Configuration of DNS client for accessing DNS server.
/etc/rsyncd.conf	Configuration file for adding directories to be synchronized during sysvolsync.
/etc/smb.conf	Samba Configuration for DSfW.
/etc/ssh/ssh_config	Used to enable gssapi authentication during installation.
/etc/ssh/sshd_config	Used to enable gssapi authentication during installation.
/etc/sysconfig/novell/xad2_oes11	File containing parameters specified during YaST configuration of DSfW. Used by other components like LU

Table K-13 DSfW Log Files

Path	Description
/var/log/messages	For DSfW the keywords which are of importance are "xadsd", "smbd", and "winbind".
/var/log/samba/log.nmbd	Logs related to nmbd process ("smbcontrol nmbd debug 10" can be used to set the log level to maximum.).

Path	Description
/var/log/samba/log.smbd	Logs related to smbd process (“smbcontrol smbd debug 10” can be used to set the log level to maximum.).
/var/log/samba/log.wb-<DOMAIN>	domain specific winbindd logs. The DOMAIN refers to domain names which winbind is aware of.
/var/log/samba/log.winbindd	Logs related to winbindd process (“smbcontrol winbindd debug 10” can be used to set the log level to maximum.).
/var/log/samba/log.winbindd-idmap	Winbind id mapping related logs, that is SID to UID/GID and vice versa.
/var/log/YaST2/y2log	Logging done during YaST configuration and Installation of DSfW.
/var/opt/novell/log/named.run	DNS logs (Activated using command “rndctrace 10”).
/var/opt/novell/xad/log/domaincntrl.log	Logs related to domaincntrl tool operations.
/var/opt/novell/xad/log/healthCheck.log	Log of server pre-check operations done during Installation and Provisioning.(Replica status, DNS status, remote server connectivity, purger, removing bad address cache etc.).
/var/opt/novell/xad/log/kdc.log	Kerberos (xad-krb5kdc) related logs.
/var/opt/novell/xad/log/kpasswd.log	Kerberos password server (xad-kpasswd) related logs.
/var/opt/novell/xad/log/ndsdcinit.log	More detailed log related to Installation and Provisioning of DSfW.
/var/opt/novell/xad/log/provisioning.log	Logging done during Provisioning phases of DSfW.
/var/opt/novell/xad/log/sysvolsync.log	Log about the sysvol synchronization details.
/var/opt/novell/xad/run/rpcd.log	Logs related to rpcd daemon.

K.8 Install

Table K-14 *Install Framework Configuration Files*

Path	Description
/etc/sysconfig/novell/afp_oes2015	
/etc/sysconfig/novell/arkman_oes2015	
/etc/sysconfig/novell/cmmn_oes2015	
/etc/sysconfig/novell/edir_oes2015	
/etc/sysconfig/novell/ifldr3__oes2015	
/etc/sysconfig/novell/iman_oes2015	

Path	Description
/etc/sysconfig/novell/iprnt_oes2015	
/etc/sysconfig/novell/ldap_servers	
/etc/sysconfig/novell/lum_oes2015	
/etc/sysconfig/novell/ncpsrvr_oes2015	
/etc/sysconfig/novell/ncs_oes2015	
/etc/sysconfig/novell/netstore_oes2015	
/etc/sysconfig/novell/nss_oes2015	
/etc/sysconfig/novell/NvCifs_oes2015	
/etc/sysconfig/novell/NvDhcp_oes2015	
/etc/sysconfig/novell/NvDns_oes2015	
/etc/sysconfig/novell/nvlsamba_oes2015	
/etc/sysconfig/novell/oes-ldap	
/etc/sysconfig/novell/quickfndr_oes2015	
/etc/sysconfig/novell/schematool	
/etc/sysconfig/novell/sms_oes2015	
/etc/sysconfig/novell/xad_oes2015	

Table K-15 *Install Framework Log Files*

Path	Description
/var/opt/novell/eDirectory/log/oes_schema.log	

K.9 iFolder Server

Table K-16 *iFolder Server Configuration Files*

Path	Description
/opt/novell/ifolder3/bin/SimiasServerSetup.exe.config	
/opt/novell/ifolder3/bin/iFolderAdminSetup.exe.config	
/opt/novell/ifolder3/bin/iFolderWebSetup.exe.config	
/opt/novell/ifolder3/etc/novell-ifolder3.conf	
/opt/novell/ifolder3/etc/simias/Simias.config	
/opt/novell/ifolder3/etc/simias/Simias.log4net	
/opt/novell/ifolder3/etc/simias/apache/default/ifolder_admin.conf	
/opt/novell/ifolder3/etc/simias/apache/default/ifolder_webaccess.conf	

Path	Description
/opt/novell/ifolder3/etc/simias/apache/default/simias_server.conf	
/opt/novell/ifolder3/etc/simias/apache/example.com/ifolder_admin.conf	
/opt/novell/ifolder3/etc/simias/apache/example.com/ifolder_webaccess.conf	
/opt/novell/ifolder3/etc/simias/apache/example.com/simias_server.conf	
/opt/novell/ifolder3/etc/simias/apache/ifolder_apache.conf	
/opt/novell/ifolder3/etc/simias/bill/Simias.config	
/opt/novell/ifolder3/etc/simias/bill/modules/Simias.Server.conf	
/opt/novell/ifolder3/etc/simias/defaults.config	
/opt/novell/ifolder3/lib64/simias/web/update/unix/unix-version.config	
/opt/novell/ifolder3/lib64/simias/web/update/windows/version.config	
/opt/novell/ifolder3/lib64/simias/web/update/mac/mac-version.config	
/etc/apache2/conf.d/ifolder_admin.conf	
/etc/apache2/conf.d/ifolder_web.conf	
/etc/apache2/conf.d/simias.conf	
/opt/novell/ifolder3/lib64/simias/admin/Web.config	
/opt/novell/ifolder3/lib64/simias/web/web.config	
/opt/novell/ifolder3/lib64/simias/webaccess/Web.config	

Table K-17 iFolder Server Log Files

Path	Description
/var/opt/novell/log/oes/ifolder/adminweb.log	

K.10 iPrint

Table K-18 iPrint Configuration Files

Path	Description
/etc/ld.so.conf.d/iprint.conf	
/etc/opt/novell/httpd/conf.d/iprint_g.conf	iPrint configuration file for apache server
/etc/opt/novell/httpd/conf.d/iprint_ssl.conf	iPrint configuration file for apache server
/etc/opt/novell/iprint/conf/idsd-template.conf	iPrint Driver Store Daemon template configuration file
/etc/opt/novell/iprint/conf/ipsmd-template.conf	iPrint Print Manager Daemon template configuration file
/var/opt/novell/iprint/htdocs/iprint.ini	Configuration file for iPrint Windows Client

Table K-19 *iPrint Log Files*

Path	Description
/opt/novell/iprintmgmt/lib/Logger.properties	Logging other configurations file (java.util.logging.config.file).
/var/log/apache2/	Contains log files for Apache activities
/var/opt/novell/iManager/nps/WEB-INF/logs/debug.html	Debug information of iPrint plug-in for iManager
/var/opt/novell/log/iprintmgmt/IPrintManLogger0.log	iprintman log file.
/var/opt/novell/log/oes/iprint/idsd.log	Contains log messages of iPrint driverstore
/var/opt/novell/log/oes/iprint/iprint_nss_relocate.log	Contains logs of iPrint nss relocation script.
/var/opt/novell/log/oes/iprint/iprint_nss_relocate.log	Contains log messages of iPrint relocation script
/var/opt/novell/log/oes/iprint/iprintgw.log	Contains log messages of iPrint gateway process
/var/opt/novell/log/oes/iprint/ipsmd.log	Contains log messages of iPrint manager
/var/opt/novell/tomcat6/logs/catalina.out	Log file for iManager activities

K.11 Linux User Management

Table K-20 *LUM Configuration Files*

Path	Description
/etc/nam.conf	Configuration parameters for lum.
/etc/nsswitch.conf	LUM puts in 'nam' against 'passwd' and 'group' entries for the nsswitch plugin.

Table K-21 *LUM Log Files*

Path	Description
/var/lib/novell-lum/nam.log	Logging when LUM is configured.
/var/log/messages	Logging when namcd is running. This is the default location. It can also be configured to a different file by setting log-file-location in nam.conf and can change the level of logging by using log-level in nam.conf.
/var/log/YaST2/y2log*	Logging when LUM is configured.

K.12 Migration Tool

Table K-22 Migration Tool Configuration Files

Path	Description
<project_folder>/config.txt	The source NetWare server configuration file. This is used to verify nlm versions, code page and other details.

Table K-23 Migration Tool Log Files

Path	Description
<project_folder>/data.log	The output and errors encountered during execution of migatedir command.
<project_folder>/mignds.log	The log file created during edirectory dib copy
<project_folder>/migndschek.log	The log file created for nds time sync check
<project_folder>/log/afp.log	This stores the information about the command sequence and errors encountered during AFP migration.
<project_folder>/log/av.log	This stores the information about the command sequence and errors encountered during AV migration.
<project_folder>/log/cifs.log	This stores the information about the command sequence and errors encountered during CIFS migration.
<project_folder>/log/debug.log	This is the developer debug log which stores information on the user inputs, outputs, command sequence, errors and success of the entire migration.
<project_folder>/log/dhcp.log	This stores the information about the command sequence and errors encountered during DHCP migration.
<project_folder>/log/filesystem.log	This stores the information about the command sequence and errors encountered during File System migration.
<project_folder>/log/filesystem.delete.log	This stores list of files deleted from the target server because they were not available on the source server when performing the migration. This log file is updated with list of deleted files if you have selected the option Delete Files Not On Source in the File Options tab.
<project_folder>/log/filesystem.success.log	This stores the list of all successfully migrated files during File System migration.
<project_folder>/log/ftp.log	This stores the information about the command sequence and errors encountered during FTP migration.

Path	Description
<project_folder>/log/ifolder.log	This stores the information about the command sequence and errors encountered during iFolder migration.
<project_folder>/log/iprint.log	This stores the information about the command sequence and errors encountered during iPrint migration.
<project_folder>/log/migration.log	This stores the information about the command sequence and errors encountered during iFolder migration.
<project_folder>/log/ntp.log	This stores the information about the command sequence and errors encountered during NTP migration.
<project_folder>/log/serveridswap.log	This stores the information about the command sequence, errors encountered and success states during identity migration.
/var/opt/novell/log/migration/migfiles.log	migfiles debug log
/var/opt/novell/log/migration/mls.log	mls debug log
/var/opt/novell/log/migration/migmatchup.log	migmatchup debug log
/var/opt/novell/log/migration/maptrustees.log	maptrustees debug log
/var/opt/novell/log/migration/migtrustees.log	migtrustees debug log
/var/opt/novell/log/migration/maprights.log	maprights debug logs
/var/opt/novell/log/migration/migrights.log	migrights debug log
/var/opt/novell/log/migration/volmount.log vol	mount debug log

K.13 NetStorage

Table K-24 NetStorage Configuration Files

Path	Description
/etc/opt/novell/netstorage/netstorage.conf	Apache config file
/opt/novell/netstorage/webapp/WEB-INF/classes/Settings.properties	Config file for ssh enabling, zip encoding, mail configuration changes.
/opt/novell/netstorage/webapp/WEB-INF/classes/Settings_*.properties	Same as Settings.properties but language specific.

Table K-25 NetStorage Log Files

Path	Description
/var/log/messages	Log file for NetStorage/Xtier
/var/opt/novell/netstorage/cifsdav.log	Log file for CIFS access.

K.14 Novell Cluster Services

Table K-26 NCS Configuration Files

Path	Description
/etc/opt/novell/ncs/clstrlib.conf	Cluster configuration file
/etc/opt/novell/ncs/<nodename>	Cluster configuration for a specific cluster node

Table K-27 NCS Log Files

Path	Description
/var/log/messages	Cluster event log. Events are viewable in Novell iManager by going to Clusters > My Clusters, select the cluster, then click Event Log.
/var/log/YaST2/y2log	Cluster Services configuration log
/var/opt/novell/install/ncslog	Cluster Services installation log
/var/opt/novell/log/ncs/ <resource_name>.<load unload monitor>.out	Cluster resource runtime messages that are output from the load, unload, or monitor scripts
/var/opt/novell/log/ncs/repair.log	Repair option messages (new in OES 2015)

K.15 Novell File Access Rights Management (NFARM)

This is a Windows shell extension. There is no configuration file involved.

Table K-28 NFARM Log Files

Path	Description
C:\Users\<Logged_in_user>\AppData\Roaming\NFARM\nfarm_all.log	All NFARM transactions log
C:\Users\<Logged_in_user>\AppData\Roaming\NFARM\nfarm_error.log	NFARM error log

K.16 Novell Identity Translator (NIT)

Table K-29 NIT Configuration Files

Path	Description
/etc/opt/novell/nit/nitd.conf	NIT configuration file

Table K-30 NIT Log Files

Path	Description
/var/log/messages	Default path to NIT daemon log Can be changed through nitconfig utility
/var/opt/novell/log/nit/nitconfig.log	nitconfig utility log

K.17 Novell Linux Volume Manager

Table K-31 NLVM Configuration Files

Path	Description
/etc/opt/novell/nss/nlvm.conf	Config file for nlvm.
/var/run/novell-nss/nlvm.lock	Local lock file for nlvm.

Table K-32 NLVM Log Files

Path	Description
/opt/novell/nss/nlvm/	Directory for nlvm storage configuration database files.
/var/opt/novell/log/nss/debug/	Directory for debug files when debug is enabled.

K.18 Novell Storage Services

Table K-33 NSS Configuration Files

Path	Description
/etc/opt/novell/nss/nlvm.conf	NLVM configuration file
/etc/opt/novell/nss/nssstart.cfg	NSS configuration file
/etc/opt/novell/nss/trustees.xml	

Table K-34 NSS Log Files

Path	Description
/var/log/messages	All Syslogs from NSS.
/var/opt/novell/log/nss/debug/*	Debug files for NLVM etc.
/var/opt/novell/log/nss/rav/*	Debug file for Rebuild and Verify.

K.19 Novell Samba

Table K-35 Novell Samba Configuration Files

Path	Description
/etc/samba/smb.conf	Service configuration

Table K-36 Novell Samba Log Files

Path	Description
path: /var/log/samba/novell-samba-config.log	Log file generated during execution of novell-samba-config.sh script

K.20 novell-ad-util

Table K-37 Configuration Files Associated with novell-ad-util

Path	Description
novell-ad-util doesn't have configuration files. However, when an OES 2015 or later server join an AD domain as required by the NSS AD integration service, the following files are updated.	
/etc/krb5.conf	The OES server's Kerberos configuration
/etc/krb5.keytab	The default keytab file that contains the Service Principals of the OES server and the OES cluster resource if the server is functioning as a cluster node.

Table K-38 novell-ad-util Log Files

Path	Description
/var/opt/novell/log/oes/novell-ad-util/novell-ad-util.log	
/var/log/novell-ad-util/novell-ad-util.log	

K.21 NCP

Table K-39 NCP Configuration Files

Path	Description of Configuration File
/etc/opt/novell/ncp/ncp2nss.audit.conf	Rotation of ncp2nss audit log files (/var/opt/novell/log/oes/ncp/ncp2nss.audit.log)
/etc/opt/novell/ncp/ncp2nss.log.conf	Rotation of NCP2NSS run-time log files (/var/opt/novell/log/oes/ncp/ncp2nss.log)

Path	Description of Configuration File
/etc/opt/novell/ncp/ncpserv.audit.conf	Rotation of NCP server audit log files (/var/opt/novell/log/oes/ncp/ncpserv.audit.log) of NCP Server
/etc/opt/novell/ncp/ncpserv.log.conf	Rotation of NCP server run-time log files (/var/opt/novell/log/oes/ncp/ncpserv.log)
/etc/opt/novell/ncp2nss.conf	NCP2NSS
/etc/opt/novell/ncpserv.conf	NCP server

Table K-40 NCP Log Files

Path	Description of Log File
/var/opt/novell/log/libnrm2ncp.log	Communication between NRM (Novell Remote Manager) and NCP Server
/var/opt/novell/log/ncp2nss.audit.log	NCP2NSS Audit
/var/opt/novell/log/ncp2nss.log	Communication between NCP server and NSS
/var/opt/novell/log/ncpcon.err	
/var/opt/novell/log/ncpcon.log	
/var/opt/novell/log/ncpserv.audit.log	NCP Server Audit
/var/opt/novell/log/ncpserv.log	NCP server

K.22 SMS

Table K-41 SMS Configuration Files

Path	Description of Configuration File
/etc/opt/novell/sms/smdrd.conf	Configuration of SMDRD daemon
/etc/opt/novell/sms/tsafs.conf	Configuration of TSAFS

Table K-42 SMS Log Files

Path	Description of Log File
/var/log/messages	Default path
/var/opt/novell/log/sms/smdrd_debug_MYPID.log	When debug is enabled, logs for SMDRD calls (related to PID)
/var/opt/novell/log/sms/tsafs_debug_MYPID.log	When debug is enabled, logs of TSAFS calls (related to PID)

K.23 Vigil

Table K-43 Vigil Configuration Files

Path	Description
/etc/ld.so.conf.d/novell-libvigil.conf	Path to libvigil shared object
/usr/share/omc/svcinfo.d/novell-vigil.xml	Description XML for NSS auditing engine

Table K-44 Vigil Log Files

Path	Description of Log File
/var/log/audit/vlog/<clientName>/	Log files represent the auditing data stream between the NSS Auditing Engine and vlog



Small Footprint CIM Broker (SFCB)

- ◆ Section L.1, “Overview,” on page 309
- ◆ Section L.2, “OES CIM Providers,” on page 310
- ◆ Section L.3, “SFCB Is Automatically Installed with OES 2015 SP1,” on page 310
- ◆ Section L.4, “Coexistence with NRM and iManager in Earlier Releases,” on page 311
- ◆ Section L.5, “SFCB and Linux User Management (LUM),” on page 311
- ◆ Section L.6, “Links to More Information about WBEM and SFCB,” on page 311

L.1 Overview

OES 2015 SP1 services are managed using Web-Based Enterprise Management (WBEM) as proposed by the [Distributed Management Task Force \(DMTF\)](http://www.dmtf.org/home) (<http://www.dmtf.org/home>).

The following information describes a few of the components proposed by the DMTF standards.

- ◆ **Web-Based Enterprise Management (WBEM):** Is a set of management and Internet standard technologies developed to unify the management of enterprise computing environments. WBEM provides the ability for the industry to deliver a well integrated set of standards-based management tools leveraging emerging Web technologies. The DMTF has developed a core set of standards that make up WBEM:
 - ◆ A data model: the Common Information Model (CIM) standard
 - ◆ An encoding specification: CIM-XML Encoding Specification
 - ◆ A transport mechanism: CIM Operations over HTTP
- ◆ **The Common Information Model (CIM):** Is a conceptual information model for describing management that is not bound to a particular implementation. This allows for the interchange of management information between management systems and applications. This can be either agent-to-manager or manager-to-manager communications that provide for distributed system management. There are two parts to CIM: the CIM Specification and the CIM Schema.
 - ◆ The CIM Specification describes the language, naming, and meta schema. The meta schema is a formal definition of the model. It defines the terms used to express the model and their usage and semantics. The elements of the meta schema are Classes, Properties, and Methods. The meta schema also supports Indications and Associations as types of Classes, and References as types of Properties.
 - ◆ The CIM Schema provides the actual model descriptions. The CIM Schema supplies a set of classes with properties and associations that provide a well understood conceptual framework within which it is possible to organize the available information about the managed environment.
- ◆ **The Common Information Model Object Manager (CIMOM)** is a CIM object manager or, more specifically, an application that manages objects according to the CIM standard.
- ◆ **CIMOM Providers:** Are software that performs specific tasks within the CIMOM that are requested by client applications. Each provider instruments one or more aspects of the CIMOM's schema.

The packages contained in the Web-based Enterprise Management pattern in the Primary Functions category include a set of basic Novell providers, including some sample providers, and a base set of accompanying Novell schemas.

SLES 11 provides SFCB as default CIMOM and CIM clients. OES 2015 SP1 uses these because they are part of the base OS.

L.2 OES CIM Providers

Package (RPM)	Description
novell-afp-providers	Used by the Novell AFP iManager plug-in (novell-plugin-afptcpd) to read and edit configuration parameters in the <code>afptcpd.conf</code> , <code>afpvols.conf</code> and <code>afpdirctx.conf</code> files, and to start or stop the AFP server.
novell-hms-providers	Used by Novell Remote Manager (NRM) HMS (Health Monitoring Services) in conjunction with the <code>sblim-mpi-base</code> providers to obtain data and status for CPU utilization, process count, physical memory, swap memory, virtual memory, and LAN collisions.
novell-lum-providers	Used by the Linux User Management iManager plug-in (novell-usermanagement-imanager-plugin) to read lum configuration from <code>/etc/nam.conf</code> and lum enabled services information from <code>/etc/pam.d</code>
novell-nss-admin-session-sfcb-provider	A set of Linux Instrumentation for Enterprise (LIFE) providers that the Storage iManager plug-in uses to access OES storage subsystem through the SFCB CIMOM. The Storage plug-in is common to NSS and CIFS.
novell-sms-mpi-provider	Reads and modifies the SMS configuration files and is also used for administration of NSS, CIFS, NCS, and DFS. The providers are compiled and located in the <code>/opt/novell/lib64/sfcb/mpi</code> folder.
Novell-samba-cim	Used by the Samba iManager plug-in (novell-plugin-samba) to read and modify the Samba configuration file (<code>smb.conf</code>) when shares are created, deleted, or modified.

L.3 SFCB Is Automatically Installed with OES 2015 SP1

When you install any OES components that depend on WBEM, SFCB and all of its corresponding packages are installed with the components.

L.4 Coexistence with NRM and iManager in Earlier Releases

The SFCB-based CIM providers in OES 2015 SP1 provide the same functionality and management capabilities as the WBEM-based CIM providers in earlier NetWare and OES releases.

iManager plugins and NRM running on NetWare and OES (all versions) work seamlessly with services running on NetWare and OES (all versions).

L.5 SFCB and Linux User Management (LUM)

SFCB is automatically PAM-enabled for LUM as part of OES 2015 SP1 installation. Users not enabled for LUM cannot use the CIM providers to manage OES.

L.6 Links to More Information about WBEM and SFCB

For more information about WBEM, CIM, and SFCB, see the following:

- ♦ “Web Based Enterprise Management” (http://www.suse.com/documentation/sles11/book_sle_admin/data/cha_wbem.html) in the SLES 11 documentation (<http://www.suse.com/documentation/sles11/index.html>).
- ♦ Web-Based Enterprise Management (WBEM) standard (<http://www.dmtf.org/standards/wbem>) Web site.
- ♦ Common Information Model (CIM) (<http://www.dmtf.org/standards/cim>) Web site.
- ♦ Small Footprint CIM Broker (SFCB) (<http://sblim.sourceforge.net/wiki/index.php/Sfcb>) Web site.



Documentation Updates

This guide has been updated for the initial release of Novell Open Enterprise Server 2015 and includes information about new OES 2015 SP1 features and services.

