

## File Systems Management Guide

# Novell® Open Enterprise Server

**2 SP1**

December 2008

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# About This Guide

This document describes how to create directories and files on a Novell® Open Enterprise Server 2 server, and to give users secure access to them. It discusses file system access control issues, such as file system trustees, trustee rights, inherited rights filters, and directory and file attributes for the Novell Storage Services (NSS) file system on Linux\* and NetWare®, NetWare Core Protocol™ (NCP™) volumes on Linux, and the NetWare Traditional file system on NetWare.

For information about managing Linux POSIX\* file systems and access control lists, see the [SUSE Linux Enterprise Server 10 Installation and Administration Guide](http://www.novell.com/documentation/sles10/sles_admin/data/sles_admin.html) ([http://www.novell.com/documentation/sles10/sles\\_admin/data/sles\\_admin.html](http://www.novell.com/documentation/sles10/sles_admin/data/sles_admin.html)).

This guide is divided into the following sections:

- ♦ Chapter 1, “File Systems Overview,” on page 11
- ♦ Chapter 2, “What’s New for File System Management and Access,” on page 15
- ♦ Chapter 3, “Coexistence and Migration Issues,” on page 19
- ♦ Chapter 4, “Management Tools for Files and Folders Management,” on page 25
- ♦ Chapter 5, “Understanding Directory Structures for the NSS and NetWare Traditional File Systems,” on page 33
- ♦ Chapter 6, “Planning Directory Structures for NetWare Servers,” on page 39
- ♦ Chapter 7, “Managing Folders and Files on NSS and NetWare Traditional Volumes,” on page 45
- ♦ Chapter 8, “Understanding File System Access Control Using Trustees,” on page 67
- ♦ Chapter 9, “Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes,” on page 83
- ♦ Chapter 10, “Understanding Directory Structures in Linux POSIX File Systems,” on page 109

## Audience

This guide is intended for network administrators and users.

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## Documentation Updates

For the most recent version of the *OES 2: File Systems Management Guide*, see the latest [Novell Open Enterprise Server 2 documentation Web site](http://www.novell.com/documentation/oes2) (<http://www.novell.com/documentation/oes2>)

## Additional Documentation

- ♦ *OES 2 SP1: NSS File System Administration Guide*

- ♦ *OES 2 SP1: NCP Server for Linux Administration Guide*
- ♦ *SUSE Linux Enterprise Server 10 Installation and Administration Guide* ([http://www.novell.com/documentation/sles10/sles\\_admin/data/sles\\_admin.html](http://www.novell.com/documentation/sles10/sles_admin/data/sles_admin.html))
- ♦ *OES 2 SP1: NetWare Traditional File System Administration Guide*
- ♦ *Novell Client 2.0 SP1 for Linux Administration Guide*
- ♦ *Novell Client SP1 for Windows Vista Administration Guide*
- ♦ *Novell Client 4.91 SP5 for Windows XP/2003 Installation and Administration Guide*
- ♦ *OES 2 SP1: AFP, CIFS, and NFS for NetWare (NFAP) Administration Guide*
- ♦ *OES 2 SP1: Novell AFP For Linux Administration Guide*
- ♦ *OES 2 SP1: Novell CIFS for Linux Administration Guide*
- ♦ *OES 2 SP1: Domain Services for Windows Administration Guide*
- ♦ *OES2 SP1: Samba Administration Guide*

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

# File Systems Overview

# 1

This section introduces the file systems supported in Novell® Open Enterprise Server 2.

For an overview of file access protocols, see “[File Services](#)” in the *OES 2 SP1: Planning and Implementation Guide*.

- ♦ [Section 1.1, “Novell Storage Services File System,” on page 11](#)
- ♦ [Section 1.2, “Linux POSIX File Systems,” on page 11](#)
- ♦ [Section 1.3, “NCP Volumes for Linux,” on page 12](#)
- ♦ [Section 1.4, “NetWare Traditional File System,” on page 12](#)
- ♦ [Section 1.5, “What’s Next,” on page 13](#)

## 1.1 Novell Storage Services File System

Novell Open Enterprise Server 2 provides the Novell Storage Services™ (NSS) file system for both the NetWare® and Linux platforms. Its many features and capabilities include visibility, a trustee access control model, multiple simultaneous names pace support, native Unicode\*, user and directory quotas, rich file attributes, multiple data stream support, event file lists, and a file salvage sub-system. These features can help you effectively manage your shared file storage for any size organization, scaling management of the system for even the largest of organizations with hundreds of thousands of employees.

NSS volumes are cross-compatible between OES 2 platforms. You can migrate your existing NSS volumes from NetWare to OES 2 Linux. For information, see “[Cross-Platform Issues for NSS Volumes](#)” in the *OES 2 SP1: NSS File System Administration Guide*.

Mixed-platform clusters are supported for temporary scenarios where you are converting a cluster from NetWare to Linux. In a mixed-platform cluster, NSS volumes that were created on NetWare can fail over between kernels, allowing for full data and file system feature preservation when converting clusters to Linux. However, you cannot SAN boot cross-platform. For information, see “[Converting NetWare 6.5 Clusters to OES 2 Linux](#)” in the *OES 2 SP1: Novell Cluster Services 1.8.5 for Linux Administration Guide*.

You can manage all storage management functions in the Web-based Novell iManager utility and the console-based NSS Management utility. NSS also supports third-party tools on both kernels for advanced data protection and management, virus scanning, and traditional archive and backup solutions.

For information, see the *OES 2 SP1: NSS File System Administration Guide*

## 1.2 Linux POSIX File Systems

The OES 2 Linux platform supports a variety of Linux POSIX file systems. It requires a Linux POSIX file system, such as Ext3, XFS, or Reiser, for its system volume. The upper level of the kernel deals equally with these file systems through an abstract layer, the virtual file system (VFS). Some typical Linux POSIX file systems are described in [Table 1-1](#):

**Table 1-1** *Linux POSIX File Systems*

Linux POSIX File System	Description
Second Extended File System (Ext2)	Ext2 is a legacy file system with a solid reputation. It uses less memory than other options and is sometimes faster. Ext2 does not maintain a journal so it is not desirable to use it for any server that needs high availability.
Third Extended File System (Ext3)	Ext3 is a journaling file system that has the same data format and metadata format with its predecessor, Ext2. You can move from Ext2 to Ext3, and vice versa, without rebuilding your file system. It also offers options to coordinate its metadata journaling with data writes.
Reiser File System (Reiser)	Reiser supports metadata journaling, but does not include data journaling or ordered writes. Its disk space utilization, disk access performance, and crash recovery are better than Ext2.
Journaled File System (JFS)	JFS was developed by IBM <sup>®</sup> to support high throughput server environments where performance is the ultimate goal. Because it is a full 64-bit file system, JFS supports both large files and partitions. It supports group commit of log entries for multiple concurrent operations, which improves journaling performance. It supports different directory organization for small and large directories and uses space efficiently.
Extended File System (XFS)	XFS is a high-performance 64-bit journaling file system. It is good at manipulating large files and performs well on high-end hardware. XFS takes great care of metadata integrity. It supports independent allocation groups that can be addressed concurrently by the system kernel, which suits the needs of multiprocessor systems. It preallocates free space on the device to reduce file system fragmentation. However, delayed writes can result in data loss if the system crashes.

For more information, see “*File Systems in Linux*” ([http://www.novell.com/documentation/sles10/sles\\_admin/data/cha\\_filesystems.html](http://www.novell.com/documentation/sles10/sles_admin/data/cha_filesystems.html)) in the *SUSE Linux Enterprise Server 10 Administration Guide* ([http://www.novell.com/documentation/sles10/sles\\_admin/data/sles\\_admin.html](http://www.novell.com/documentation/sles10/sles_admin/data/sles_admin.html)).

*File System Primer* ([http://wiki.novell.com/index.php/File\\_System\\_Primer](http://wiki.novell.com/index.php/File_System_Primer)) describes the variety of file systems available on Linux and which ones are the best to use for which workloads and data.

## 1.3 NCP Volumes for Linux

NCP™ Server for Linux enables you to create NCP volumes on top of Linux POSIX file systems such as Ext3 or Reiser file systems. This allows you to use the same method of file system trustees and trustee rights to control access to data on Linux POSIX file systems as you use on NSS volumes and NetWare Traditional volumes.

For information, see *OES 2 SP1: NCP Server for Linux Administration Guide*.

## 1.4 NetWare Traditional File System

The NetWare Traditional file system provides legacy storage and file system management for Novell Open Enterprise Server 2 NetWare (same as NetWare 6.5 Support Pack 7).

You can optionally use NetWare Traditional volumes in combination with NSS volumes on NetWare when you are using the NCP protocol. However, if you are planning to implement Apple\* Filing Protocol\* (AFP), Network File System (NFS), or Common Internet File System (CIFS) for your NetWare server, you must use NSS for your system volume and for any data volumes that use any protocols other than NCP. For information, see the *OES 2 SP1: AFP, CIFS, and NFS for NetWare (NFAP) Administration Guide*.

For information, see the *OES 2 SP1: NetWare Traditional File System Administration Guide*.

## 1.5 What's Next

Continue with [Chapter 3, “Coexistence and Migration Issues,”](#) on page 19.



# What's New for File System Management and Access

# 2

This section describes enhancements and additions for user file access services for Novell® Open Enterprise Server 2.

- ♦ [Section 2.1, “What’s New \(OES 2 SP1, NetWare 6.5 SP8\),” on page 15](#)
- ♦ [Section 2.2, “What’s New \(OES 2, NetWare 6.5 SP7\),” on page 15](#)

## 2.1 What’s New (OES 2 SP1, NetWare 6.5 SP8)

The enhancements and changes described in this section were made to file systems management features for OES 2 SP1.

- ♦ [Section 2.1.1, “Novell AFP for Linux,” on page 15](#)
- ♦ [Section 2.1.2, “Novell CIFS for Linux,” on page 15](#)
- ♦ [Section 2.1.3, “Novell Domain Services for Windows,” on page 15](#)

### 2.1.1 Novell AFP for Linux

Novell AFP for Linux is available for accessing files on NSS volumes on OES 2 SP1 Linux. For information, see the [OES 2 SP1: Novell AFP For Linux Administration Guide](#).

### 2.1.2 Novell CIFS for Linux

Novell CIFS for Linux is available for accessing files on NSS volumes on OES 2 SP1 Linux. For information, see the [OES 2 SP1: Novell CIFS for Linux Administration Guide](#).

### 2.1.3 Novell Domain Services for Windows

Novell Domain Services for Windows is available for accessing files on NSS volumes on OES 2 SP1 Linux using the CIFS protocol. For information about installing and managing Domain Services for Windows, see the [OES 2 SP1: Domain Services for Windows Administration Guide](#).

## 2.2 What’s New (OES 2, NetWare 6.5 SP7)

The enhancements and changes described in this section were made to file system management features for the initial release of OES 2.

- ♦ [Section 2.2.1, “Files and Folders Plug-In to Novell iManager 2.7,” on page 16](#)
- ♦ [Section 2.2.2, “Novell Client,” on page 16](#)
- ♦ [Section 2.2.3, “Samba Plug-In to Novell iManager 2.7,” on page 17](#)

- ♦ [Section 2.2.4, “Novell Distributed File Services,” on page 17](#)
- ♦ [Section 2.2.5, “Extended Attributes Support for Backing Up Trustee Information for NSS Volumes on Linux,” on page 17](#)

## 2.2.1 Files and Folders Plug-In to Novell iManager 2.7

The Files and Folders plug-in to Novell iManager 2.7 provides folder (directory) and file management tasks for administrators and users. Selecting the *View Objects* icon in the iManager toolbar presents a file system tree-browsing view of volumes that have Volume objects in Novell eDirectory™. The *Files and Folders* role in the *Roles and Tasks* view provides a tasked-based view of file and folder management. The plug-in can be used to manage Novell Storage Services™ (NSS) volumes on OES 2 Linux and NetWare®, NSS and NetWare Traditional volumes on NetWare 6.5 SP7, and NCP volumes on OES 2 Linux.

The following tasks are available from either view (tree-browse or role-tasks). Features that apply only to a given file system are noted.

- ♦ Properties management for files and folders
  - ♦ Trustees
  - ♦ Trustee rights
  - ♦ Inherited rights filters (IRF)
  - ♦ View effective rights for a given trustee for a file, and view inherited rights filters along its full path
  - ♦ File system attributes (only NSS volumes)
  - ♦ Directory quotas (only for NSS volumes where the volume’s Directory Quotas attribute is enabled)
  - ♦ File ownership
- ♦ Create and delete folders
- ♦ Upload and download files
- ♦ Salvage and purge deleted files and directories (only for NSS volumes where the volume’s Salvage attribute is enabled)

## 2.2.2 Novell Client

See the following resources for the latest release of the Novell Client™, which provides NetWare Core Protocol™ (NCP™) access for users on Linux and Windows\*.

- ♦ [Novell Client 2.0 for Linux documentation Web site \(http://www.novell.com/documentation/linux\\_client/index.html\)](http://www.novell.com/documentation/linux_client/index.html)
- ♦ [Novell Client for Windows Vista documentation Web site \(http://www.novell.com/documentation/vista\\_client/index.html\)](http://www.novell.com/documentation/vista_client/index.html)
- ♦ [Novell Client 4.91 SP4 for Windows XP/2003 documentation Web site \(http://www.novell.com/documentation/noclienu/index.html\)](http://www.novell.com/documentation/noclienu/index.html)



### 2.2.3 Samba Plug-In to Novell iManager 2.7

The Samba for Linux plug-in for Novell iManager 2.7 has been revamped to provide a more intuitive setup for Samba/CIFS users on your OES 2 Linux server. For information, see *OES2 SPI: Samba Administration Guide*.

### 2.2.4 Novell Distributed File Services

For the OES 2 release, Novell Distributed File Services is now supported on OES 2 Linux in addition to NetWare. Replica sites for the DFS management context can run on Linux or NetWare, and can be clustered. You can create DFS junctions on NSS volumes on either platform and point the junction to target locations on NSS volumes and NCP volumes.

The Distributed File Services plug-in for Novell iManager 2.7 is available to manage management contexts, replica sites, and junctions. You can set rights on junctions and on junction targets, and copy explicitly set trustees, trustee rights, and inherited rights filters between them. Inheritance of rights occurs independently for junction and the junction target locations, each relative to its own location.

For information, see the *OES 2: Novell Distributed File Services Administration Guide*.

### 2.2.5 Extended Attributes Support for Backing Up Trustee Information for NSS Volumes on Linux

Extended Attributes (XAttr) support was added for backing up trustee information for NSS volumes on Linux. For information, see “*Extended Attributes (XAttr) Commands (Linux)*” in the *OES 2 SPI: NSS File System Administration Guide*.



# Coexistence and Migration Issues

# 3

This section discusses the issues involved in the coexistence and migration of file systems in Novell® Open Enterprise Server 2.

- ♦ [Section 3.1, “Comparison of NSS to Other File Systems,” on page 19](#)
- ♦ [Section 3.2, “Compatibility Issues for File System Rights on Linux,” on page 19](#)
- ♦ [Section 3.3, “NCP Server Directory and File-System Trustee Rights and Attributes,” on page 22](#)
- ♦ [Section 3.4, “Acquiring eDirectory Security Equivalence Vectors for NSS Users,” on page 23](#)
- ♦ [Section 3.5, “Security Guidelines,” on page 23](#)
- ♦ [Section 3.6, “Migrating NetWare Traditional Volumes to Linux,” on page 23](#)

## 3.1 Comparison of NSS to Other File Systems

The following table lists sections in the *OES 2 SPI: NSS File System Administration Guide* that contain comparisons of the Novell Storage Services™ file system to other file systems in OES:

Comparison	NSS on NetWare®	NSS on Linux	Linux POSIX File Systems with NCP	NetWare Traditional File System
<a href="#">“Comparison of NSS on NetWare and NSS on Linux”</a>	X	X		
<a href="#">“Comparison of NSS on Linux and NCP Volumes on Linux POSIX File Systems”</a>		X	X	
<a href="#">“Comparison of NSS on NetWare and the NetWare Traditional File System”</a>	X			X

## 3.2 Compatibility Issues for File System Rights on Linux

This section discusses the following issues for controlling access to files on Linux:

- ♦ [Section 3.2.1, “Enforcing File System Rights on Linux,” on page 20](#)
- ♦ [Section 3.2.2, “Assigning File System Rights on Linux,” on page 21](#)
- ♦ [Section 3.2.3, “Key Considerations,” on page 22](#)

### 3.2.1 Enforcing File System Rights on Linux

File and directory access rights are enforced on Linux systems in different ways, depending on the following:

- ♦ User identity, such as Novell eDirectory™ users, Linux-enabled eDirectory users, and local-only users
- ♦ Access method, such as NCP™ Server, other protocols, or core Linux utilities.  
For information about core Linux utilities, see [“Core Linux Utilities” on page 21](#).
- ♦ File system access control, such as NSS file and directory attributes

#### Novell eDirectory Users

The following table describes how file system access rights are enforced on Linux systems for eDirectory users:

File System	Access via NCP Server for Linux	Access via Linux Protocols (such as NFS or Samba)	Access via Core Linux Utilities
NSS on Linux	NCP and NSS enforce access.  For security reasons, soft links are not supported by NCP Server. Soft links are not accessible from NCP clients; users cannot see or access them.	NCP and NSS enforce access.  eDirectory users must be Linux-enabled with Linux User Management.	NCP and NSS enforce access.  eDirectory users must be Linux-enabled with Linux User Management.  Linux services need to be enabled for pluggable authentication modules (PAM) when you configure Linux User Management.
NCP volumes on Linux POSIX file systems	NCP enforces access.  For security reasons, soft links are not supported by NCP Server. Soft links are not accessible from NCP clients; users cannot see or access them.	NCP enforces access.  eDirectory users must be Linux-enabled with Linux User Management.	NCP enforces access.  eDirectory users must be Linux-enabled with Linux User Management.  Linux services need to be enabled for pluggable authentication modules (PAM) when you configure Linux User Management.
Linux POSIX file systems	eDirectory users have no access to files via NCP.	Linux ACLs and POSIX permissions are used to enforce access.	Linux ACLs and POSIX permissions are used to enforce access.

## Local-Only Users

The following table describes how file system access rights are enforced on Linux systems for locally defined users:

File System	Access via NCP Server for Linux	Access via Other Protocols (such as NFS or Samba)	Access via Core Linux Utilities
NSS on Linux	Restricted to the <code>root</code> user.	Restricted to the <code>root</code> user.	Restricted to the <code>root</code> user.
NCP volumes on Linux POSIX	Restricted to the <code>root</code> user.	Restricted to the <code>root</code> user.	Restricted to the <code>root</code> user.
Linux POSIX file systems	Local users have no access to files via NCP.  Linux ACLs and POSIX permissions are used to enforce access.	Linux ACLs and POSIX permissions are used to enforce access.	Linux ACLs and POSIX permissions are used to enforce access.

## Core Linux Utilities

Core Linux utilities are standard file services used to access files.

**IMPORTANT:** To enable users of NSS volumes and NCP volumes to use the core Linux utilities, you must PAM-enable the utility with Linux User Management (LUM) and Linux-enable the users with LUM. For information, see *OES 2 SP1: Novell Linux User Management Technology Guide*.

Core Linux utilities include the following:

- ♦ Shell login
- ♦ Samba server
- ♦ File transfer protocol (`ftp`)
- ♦ Secure shell (`ssh`)
- ♦ Substitute user (`su`), which opens runs a shell as root (or superuser)
- ♦ Remote shell (`rsh`)
- ♦ Remote login (`rlogin`)
- ♦ X display manager (`xdm`)
- ♦ Open Web-based enterprise management (`openwbem`)

### 3.2.2 Assigning File System Rights on Linux

The following table identifies the management tools to use to assign Novell trustee-based file system rights on Linux.

**IMPORTANT:** Only eDirectory users are eligible for file-system trustee rights.

Management Tool	NSS File System on Linux			Linux POSIX File Systems		
	NCP	NFS or Samba	Core Linux Utilities	NCP	NFS or Samba	Core Linux Utilities
NSS <i>rights</i> utility	Yes	Yes	Yes	Yes	Not applicable	Not applicable
Novell NetStorage	Yes	Yes	Yes, for NetStorage with SSH support	Not supported by NetStorage	Not applicable	Not applicable
Novell Client™ for Windows XP/2003 and for Windows Vista	Yes	Not applicable	Not applicable	Yes	Not applicable	Not applicable
Novell Client for Linux	Yes	Not applicable	Not applicable	Yes	Not applicable	Not applicable
ConsoleOne®	Yes	No	No	Yes	Not applicable	Not applicable

### 3.2.3 Key Considerations

If you use core Linux utilities—with, or instead of, NCP Server for Linux—to control file access for eDirectory users on Linux:

- ♦ Make sure the core Linux utilities are PAM-enabled during Linux User Management (LUM) configuration.
- ♦ eDirectory users must be Linux-enabled to use the core Linux utilities. A Linux-enabled user is defined as a local user and as an eDirectory user. (Linux-enabled is also referred to as LUM-enabled.)

Although NCP and NSS keep file system rights information separately, the information is synchronized between them.

## 3.3 NCP Server Directory and File-System Trustee Rights and Attributes

NCP Server for Linux provides the same file-system trustee rights for both NSS and Linux POSIX file systems. These are the same rights that exist for NSS and NetWare Traditional file systems on NetWare. The trustee rights include:

- ♦ Read
- ♦ Write
- ♦ Create
- ♦ Erase
- ♦ Modify
- ♦ File Scan

- ♦ Access Control
- ♦ Supervisor

For information, see [Section 8.2, “File-System Trustee Rights,”](#) on page 68.

NCP Server supports all NSS file system attributes. For information about attributes, see [Section 8.6, “Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes,”](#) on page 75.

NCP volumes created on Linux POSIX file systems (such as Reiser, JFS, Ext3) support only the Read Only, Hidden, and Shareable attributes.

## 3.4 Acquiring eDirectory Security Equivalence Vectors for NSS Users

The Security Equivalence Vector (SEV) is calculated for each NSS user based on information in the user’s profile in Novell eDirectory. NSS validates the user’s SEV against the trustee rights of the directory and file the user is attempting to access. In OES, SEVs are acquired differently for NSS on NetWare and NSS on Linux.

For NSS on NetWare, whenever a user connects to the NSS file system, NetWare retrieves the user’s SEV from eDirectory and maintains it as part of the connection structure for the user’s session. NSS automatically retrieves the user’s SEV from the connection structure.

For NSS on Linux, whenever a user first connects to the NSS file system after reboot, NSS caches the SEV locally in the server memory, where it remains until the server is rebooted or unless the user is deleted from eDirectory. NSS polls eDirectory at a specified interval for updates to the SEVs that are in cache. Command line switches are available in the NSS Console utility (`nsscon`) to enable or disable the update, to set the update interval (5 minutes to 90 days), and to force an immediate update of security equivalence vectors. For information, see [“Security Equivalence Vector Update Commands \(Linux\)”](#) in the *OES 2 SP1: NSS File System Administration Guide*.

## 3.5 Security Guidelines

To install applications on your NSS or NetWare Traditional file system, you must be logged in as a trustee with the Create right of the directory where you will be installing the application. The Supervisor user of the server automatically has the Create right.

## 3.6 Migrating NetWare Traditional Volumes to Linux

For the initial release of OES Linux, you can migrate a NetWare Traditional File System volume from your NetWare server to a Linux server by first upgrading it to an NSS volume on OES NetWare, then moving the volume cross-platform to OES Linux. However, for OES SP1 and later, NSS volumes on NetWare have a format that is not supported cross-platform. For information, see [“Upgrading the NSS Media Format”](#) in the *OES 2 SP1: NSS File System Administration Guide*.

To upgrade Traditional volumes for your OES NetWare server, see [“Upgrading Legacy NSS and NetWare Traditional Volumes”](#) in the *OES 2 SP1: NSS File System Administration Guide*.

For information about using NSS volumes cross-platform, see the following topics in the *OES 2 SP1: NSS File System Administration Guide*:

- ♦ “Cross-Platform Issues for NSS Volumes”
- ♦ “Moving Non-Clustered Devices From NetWare Servers to OES 2 Linux Servers”
- ♦ “Moving Clustered Devices with NSS Volumes Cross-Platform”



# Management Tools for Files and Folders Management

# 4

This section identifies the various tools for managing files and folders Novell® Open Enterprise Server 2 system.

- ♦ [Section 4.1, “Novell iManager and the Files and Folders Plug-In,” on page 25](#)
- ♦ [Section 4.2, “Novell Remote Manager,” on page 28](#)
- ♦ [Section 4.3, “Novell NetStorage,” on page 31](#)
- ♦ [Section 4.4, “Novell Client,” on page 31](#)

## 4.1 Novell iManager and the Files and Folders Plug-In

Novell iManager 2.7 is a Web browser-based tool used for configuring, managing, and administering Novell eDirectory™ objects on your network.

- ♦ [Section 4.1.1, “Files and Folders Plug-In Quick Reference,” on page 25](#)
- ♦ [Section 4.1.2, “Accessing Novell iManager,” on page 27](#)
- ♦ [Section 4.1.3, “Accessing Roles and Tasks in iManager,” on page 27](#)
- ♦ [Section 4.1.4, “Selecting a File or Folder to Manage,” on page 27](#)

### 4.1.1 Files and Folders Plug-In Quick Reference

The Files and Folders plug-in for iManager 2.7 contains the Files and Folders role for Linux and NetWare®. You must install the `filemanager.npm` file in iManager. For information about installing NPM files for iManager, see the *Novell iManager 2.7 Installation Guide*.

The Files and Folders plug-in for Novell iManager 2.7 provides the tasks described in this section.

- ♦ [“Delete” on page 25](#)
- ♦ [“Deleted Files” on page 26](#)
- ♦ [“Download” on page 26](#)
- ♦ [“New Folder” on page 26](#)
- ♦ [“Properties” on page 26](#)
- ♦ [“Upload” on page 26](#)

#### Delete

Delete a file or folder on an NSS volume or an NCP volume (NCP share on Ext3 or Reiser file systems) on Linux.

## Deleted Files

Salvage or purge deleted files. Salvage and purge of deleted files and directories is available only for NSS volumes where the volume's Salvage attribute is enabled. Other NSS volume settings determine how long deleted files and directories are retained for salvage or purge actions. For information about configuring salvage and purge behavior for NSS volumes, see “[Salvaging and Purging Deleted Volumes, Directories, and Files](#)” in the *OES 2 SP1: NSS File System Administration Guide*.

## Download

Select and download a file from an NSS volume or NCP volume to a specified location on your local drive or mapped network drive.

## New Folder

Create a folder on an NSS volume or NCP volume.

## Properties

Add, remove, or modify file system trustees, trustee rights, and file attributes settings for files and folders.

**Table 4-1** *Properties Tasks*

Tab	Task Description
NetWare Info	View information about a selected file or directory, such as: <ul style="list-style-type: none"><li>♦ Current size</li><li>♦ Time stamps for when the file was created, modified, accessed, and archived</li><li>♦ File attributes</li></ul>
	View or modify the file owner.
	View or modify a directory quota. Directory quotas management is available only for NSS volumes where the volume's Directory Quotas attribute is enabled.
NetWare Rights	View, add, or remove file system trustees for a selected file or directory.
	View, grant, or revoke file system trustee rights for trustees of the selected file or directory.
	View or modify the inherited rights filter for a selected file or directory.
Inherited Rights	View or modify the inherited rights filters at every level of the path for a selected file or directory.
	View the effective rights for the selected file or directory.

## Upload

Upload a specified file from your local drive or a mapped network drive to a specified location on an NSS volume or NCP volume.

## 4.1.2 Accessing Novell iManager

1 Launch a Web browser.

2 Click *File > Open*, then enter

```
https://server-IP-address/nps/iManager.html
```

The URL is case sensitive. Replace *server-IP-address* with the actual server DNS name or IP address. For example:

```
https://192.168.1.1/nps/iManager.html
```

The iManager Login page opens.

3 Use your administrator username and password to log in to the Novell eDirectory™ tree that contains the server you want to manage.

In Novell iManager, you can access only the roles and tasks you are authorized to manage. For full access to all available Novell iManager features, you must log in as Supervisor of the tree.

## 4.1.3 Accessing Roles and Tasks in iManager

1 Access iManager, then log in to the eDirectory tree where the server you want to manage resides.

For information, see [Section 4.1.2, “Accessing Novell iManager,” on page 27](#).

2 In *Roles and Tasks*, Files and Folders to reveal its main tasks:

- ♦ *Delete*
- ♦ *Deleted Files*
- ♦ *Download*
- ♦ *New Folder*
- ♦ *Properties*
- ♦ *Upload*

3 To activate the options on the selected page, select a file or folder to manage.

For information, see [Section 4.1.4, “Selecting a File or Folder to Manage,” on page 27](#).

## 4.1.4 Selecting a File or Folder to Manage

Before you can access the management options on a selected task page, you must select a file or folder to manage. It must be on a server that is in the same Novell eDirectory tree where you are currently logged in.

1 Use one of the following methods to select a file or folder in the tree where you are logged in:

- ♦ Click the *Search* icon to open the eDirectory Object Selector. Browse or search the list to locate the file or folder you want to manage, then click the object’s name link.
- ♦ Click the *Object History* icon to select a file or folder that you have recently managed.

2 Wait for iManager to retrieve information about that file or folder and display the appropriate information to the task page you are in.

It might take several seconds to retrieve the information, depending on the size and complexity of your storage solution.

## 4.2 Novell Remote Manager

Novell Remote Manager (NRM) is a browser-based management utility for monitoring server health, changing the configuration of your server, or performing diagnostic and debugging tasks. NRM also allows you to create NSS pools and volumes and to manage some capabilities for NSS volumes on Linux and NetWare.

- ♦ [Section 4.2.1, “Prerequisites for Using Novell Remote Manager,” on page 28](#)
- ♦ [Section 4.2.2, “Novell Remote Manager for Linux,” on page 29](#)
- ♦ [Section 4.2.3, “Novell Remote Manager for NetWare,” on page 29](#)
- ♦ [Section 4.2.4, “Accessing Novell Remote Manager,” on page 30](#)
- ♦ [Section 4.2.5, “Starting, Stopping, or Restarting Novell Remote Manager on Linux,” on page 31](#)

### 4.2.1 Prerequisites for Using Novell Remote Manager

- ♦ [“Prerequisites for Remote Administration” on page 28](#)
- ♦ [“Prerequisites for Admin User Access on Linux Servers” on page 28](#)
- ♦ [“Prerequisite for Admin User Access on NetWare Servers” on page 29](#)

#### Prerequisites for Remote Administration

Your configuration must satisfy the following prerequisites:

- ♦ Make sure SSL 3.0 (where available) or SSL 2.0 is enabled in your Web browser.

Novell Remote Manager requires an SSL connection between your Web browser and the target server where it is running. You must enable SSL services for your Web browser; otherwise, the browser displays an error when it tries to display the Novell Remote Manager Web pages later.

- ♦ Ports 8008 (insecure) and 8009 (secure) are the default ports used for accessing Novell Remote Manager. If you change the port number assigned to it, make sure you specify the same value for the port number when you log in.

#### Prerequisites for Admin User Access on Linux Servers

You can log into Novell Remote Manager for Linux as the `root` user or equivalent for the OES Linux server you are managing.

You can alternately log in to Novell Remote Manager with your eDirectory credentials if you first enable Linux User Management (LUM) in your eDirectory tree and install and configure LUM on the target server. The Admin user or equivalent must be Linux-enabled and at least one of the following conditions must be met:

- ♦ The Admin user (or equivalent user) must be associated to the eDirectory group that has the Supervisor right for the Entry Rights property for the UNIX Workstation object in eDirectory.
- ♦ The Admin user (or equivalent user) must have the Supervisor right for the Entry Rights property to the NCP object that represents the Linux server in the eDirectory tree.

To tell if a user is Linux-enabled, go to iManager, select the User role, then select the user to see if the following is true:

- ♦ The user has a Linux Profile tab on the Modify User page in iManager.
- ♦ The user's eDirectory object is associated with the UNIX Workstation object that represents the Linux server.

For information about configuring Linux User Management and enabling users for Linux, see the *OES 2 SPI: Novell Linux User Management Technology Guide*.

### **Prerequisite for Admin User Access on NetWare Servers**

To access all pages necessary to manage your server remotely, log in as a user with the Supervisor right to the Server object. Usually, this is the Admin user or a user with rights equivalent to the Admin user.

## **4.2.2 Novell Remote Manager for Linux**

Novell Remote Manager for Linux allows you to browse NSS volumes on your Linux servers. It requires that the NCP™ Server and NCP Server plug-in for Novell Remote Manager be installed and running.

### **Tasks**

The NCP Server plug-in supports the following tasks:

- ♦ Managing connections to NSS volumes and viewing open files for a connection.

For information, see “[Managing Connections for NCP Volumes and NSS Volumes](#)” in the *OES 2 SPI: NCP Server for Linux Administration Guide*.

- ♦ Creating or managing shadow volumes with NSS volumes as the primary and secondary storage areas.

For information, see the *OES 2 SPI: Dynamic Storage Technology Administration Guide*.

Novell Remote Manager for Linux does not support the following tasks for NSS on Linux:

- ♦ Configuring directory quotas
- ♦ Salvaging and purging deleted files and directories
- ♦ Configuring file system trustees and attributes for directories and files
- ♦ Creating and managing partitions, pools, and volumes

### **Additional Information**

For detailed information about NRM on Linux, see the *OES 2 SPI: Novell Remote Manager for Linux Administration Guide*.

## **4.2.3 Novell Remote Manager for NetWare**

Novell Remote Manager for NetWare provides most of the functionality of the Monitor utility and other functionality from server-console-based utilities. It is the primary management tool for NetWare Traditional File System volumes.

## Tasks

Novell Remote Manager for NetWare supports the following tasks for managing NSS pools and volumes on NetWare servers:

- ♦ Configuring directory quotas.

This requires that the Directory Quotas attribute be enabled on the NSS volume. For information, see “[Managing Directory Quotas](#)” in the *OES 2 SP1: NSS File System Administration Guide*.

- ♦ Salvaging and purging deleted files and directories.

This requires that the Salvage attribute be enabled on the NSS volume. For information, see “[Salvaging and Purging Deleted Volumes, Directories, and Files](#)” in the *OES 2 SP1: NSS File System Administration Guide*.

- ♦ Configuring file system trustees, trustee rights, inherited rights filter, and file and folder attributes. For information, see “[Viewing and Changing Trustee Assignments and Inherited Rights Filters](#)” in the *OES 2 SP1: Novell Remote Manager for NetWare Administration Guide*.

- ♦ Creating and managing some aspects devices, partitions, pools, and volumes.

For full management and feature support, use NSSMU and iManager to manage storage.

- ♦ Managing connections to NSS volumes and viewing open files for a connection.

For information, see “[Managing Connections to the Server](#)” in the *OES 2 SP1: Novell Remote Manager for NetWare Administration Guide*.

## Additional Information

For detailed information, see the *OES 2 SP1: Novell Remote Manager for NetWare Administration Guide*.

### 4.2.4 Accessing Novell Remote Manager

- 1 From your Web browser, enter one of the following:

`http://server-ip-address:8008`

`https://server-ip-address:8009`

Replace *server-ip-address* with the IP address of the server you want to manage. If you have Domain Name Services (DNS) installed on your network for server name-to-IP address resolution, you can optionally use the server’s DNS name instead of the IP address.

- 2 Determine the authenticity of the SSL certificate, then accept it if the certificate is valid.

- 3 When the Login page appears, do one of the following:

- ♦ **Linux:** Type the username and password of the `root` user for that server, or type the username and password of the Admin user (or equivalent user) who is an eDirectory user and who has been Linux-enabled.
- ♦ **NetWare:** Type the username and password of the Admin user or equivalent.

- 4 Click *OK* to log in to the target server and initiate your SSL session.

The management interface opens in your Web browser. After logging in, your SSL session for Novell Remote Manager remains open until you close all your browser windows at that workstation.

## 4.2.5 Starting, Stopping, or Restarting Novell Remote Manager on Linux

Novell Remote Manager on Linux is installed and runs by default. If it hangs, you can use the `/etc/init.d/novell-httpstkd` script to get status or to stop, start, or restart `httpstkd`. For the latest information about `httpstkd`, see “Starting or Stopping HTTPSTKD” in the *OES 2 SPI: Novell Remote Manager for Linux Administration Guide*.

- 1 Open a terminal console, then log in as the `root` user.
- 2 At the terminal console prompt, enter the command for the task you need to perform:

Task	Command
Status	<code>rcnovell-httpstkd status</code>
Start	<code>rcnovell-httpstkd start</code>
Stop	<code>rcnovell-httpstkd stop</code>
Restart	<code>rcnovell-httpstkd restart</code>

## 4.3 Novell NetStorage

To access NetStorage, launch your Web browser and open it to the following location:

`http://192.168.1.1/oneNet/netstorage`

Replace `192.168.1.1` with the actual DNS name or IP address of your NetStorage server or the IP address for Apache-based services. If Apache-based services use a port other than 80, you must also specify that port number with the URL. For example, if the port number is 51080, the URL would be in the form

`http://192.168.1.1:51080/oneNet/netstorage`

The date and time on the workstation being used to access NetStorage should be reasonably close (within a few hours) to the date and time on the server running NetStorage to avoid conflicts.

NetStorage uses Novell eDirectory™ for authentication. Log in with your administrator username and password to manage file system access for directories and files on NSS volumes. You can also log in as any username with equivalent rights to the administrator. This limitation does not apply if you have created a Storage Location object using SSH (Secure Shell).

---

**NOTE:** Viewing or changing directory and file attributes and rights using NetStorage is only possible using a browser. This functionality is not available using Microsoft Web Folders.

---

## 4.4 Novell Client

In combination with NCP Server on your OES Linux or NetWare server, the Novell Client™ supports the following:

- ♦ Management of file system trustees, trustee rights, and inherited rights filters for directories and files on NSS volumes

- ♦ Purge and salvage of deleted files on NSS volumes, if the volume is configured to support it
- ♦ Drive mapping for NSS volumes
- ♦ Login scripts for automatic drive mapping on login

For information, see the following:

- ♦ *Novell Client 2.0 SP1 for Linux Administration Guide*
- ♦ *Novell Client SP1 for Windows Vista Administration Guide*
- ♦ *Novell Client 4.91 SP5 for Windows XP/2003 Installation and Administration Guide*



# Understanding Directory Structures for the NSS and NetWare Traditional File Systems

This section describes the following key concepts for the Novell® Storage Services™ (NSS) File System and the legacy NetWare® Traditional file system for Novell Open Enterprise Server (OES) 2 and NetWare 6.5 SP8:

- ♦ [Section 5.1, “Directory Structures,” on page 33](#)
- ♦ [Section 5.2, “Directory Path,” on page 34](#)
- ♦ [Section 5.3, “Root Directory,” on page 35](#)
- ♦ [Section 5.4, “Fake Root Directory,” on page 35](#)
- ♦ [Section 5.5, “Directory Map Objects,” on page 35](#)
- ♦ [Section 5.6, “Drive Map,” on page 36](#)

## 5.1 Directory Structures

The NSS and Traditional file systems provide a uniform method of referring to directories and files and locating them on a variety of storage media. As with your office filing system, you must impose organization on data you store in a volume. Within each volume, you can group information in logical containers called folders or directories.

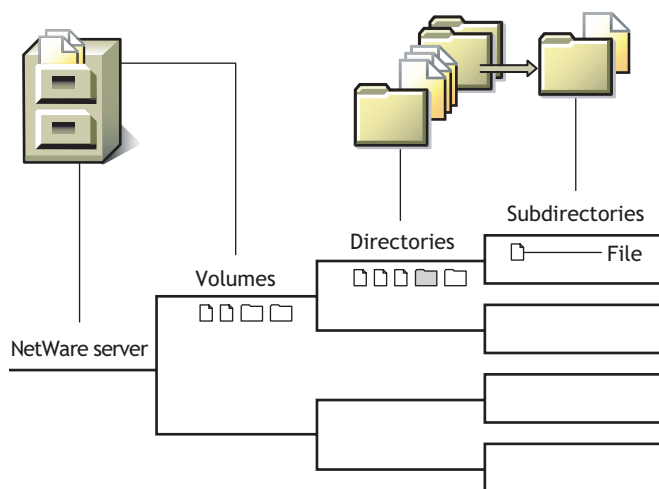
A directory is a logical separation within a volume where you store files and subordinate directories, called subdirectories. The directory is a special type of file that contains a list of its files and subdirectories. It can also contain metadata about the directory, such as who can access it and its attributes. For NetWare Traditional, the directory’s metadata is stored in a Directory Entry Table (DET), separate from the directory itself.

A file is the basic logical container for storing information, such as an image, a document, a program, text, or a database.

Within each volume, the directory structure is hierarchical. It is an inverted tree structure with a single root. The topmost directory in the hierarchy is called the root directory. A directory is called the parent directory of the subdirectories and files in it. A volume can contain any number of directories. A directory can contain any number of files and subdirectories.

The following figure illustrates how volumes are similar to drawers in an office filing cabinet that contain related information. For example, the `sys :` volume on NetWare contains the operating system and its extensions. Other volumes might contain applications, corporate data, or user home directories and files.

**Figure 5-1** Sample Directory Structure for NSS and Traditional File Systems on a NetWare Server



There is no one best solution for organizing files with directories. You can use a combination of approaches, such as by geographic location, applications, business units, projects, or owners. For information, see [“Planning Directory Structures for NetWare Servers” on page 39](#).

To control who can access directories and files on your NSS and Traditional NetWare file systems, you must assign file system trustees, trustee rights, and inherited rights filters. For information, see [Section 8.2, “File-System Trustee Rights,” on page 68](#).

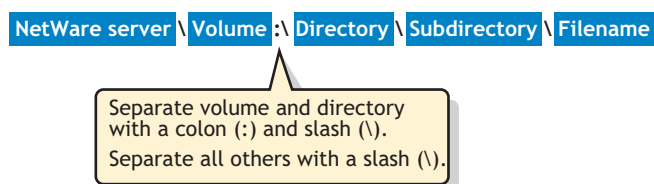
To control how authenticated users can use directories and files, you must set directory and file attributes. For information, see:

- [Section 8.6, “Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes,” on page 75](#)
- [Section 8.7, “Displaying Key NSS Directory and File Attributes as Linux POSIX Permissions,” on page 77](#)

## 5.2 Directory Path

A directory or file is located by its *path*, which states where the directory or file is logically located in a volume. A path includes the volume, directory, and any subdirectories leading to the file. The following figure shows how to specify a full path. Listing the server is optional. It is usually excluded when specifying a path relative to the server where you are logged in. The slash after the colon is required in some interfaces and optional in others. Refer to the interface’s documentation to determine if a colon and slash combination (: \) is required to separate a volume and directory.

**Figure 5-2** Directory Path Conventions



If your network uses multiple server or client operating systems or multiple file systems, keep in mind the conventions of the different file systems, such as delimiters, path length, and case sensitivity. For example, the NSS and Traditional file systems on NetWare use backslashes as delimiters and are case insensitive, while file systems native to Linux and UNIX use forward slashes and are case sensitive. As another example, NetWare allows 255 characters in a directory path (counting the drive letter and delimiters), but DOS allows only 127 characters. For more information, check the application's documentation.

## 5.3 Root Directory

The root directory is the base directory in the volume. The root directory of a volume typically contains only directories.

Storing files at this level is possible, but it can be a security risk. Granting file-system trustee rights to files at the root of the volume necessitates granting rights to the entire volume. For information about trustee rights, see [“Understanding File System Access Control Using Trustees” on page 67](#).

To avoid this security risk, create Fake Roots for applications that want to write files to the root directory. For information, see [Section 5.4, “Fake Root Directory,” on page 35](#).

## 5.4 Fake Root Directory

A fake root is a directory in a volume that functions as a root directory for a specific software application.

Some applications require their executable files to be located in a root directory. However, for security, you should not grant users rights to files at the root of the volume.

NetWare allows you to map a directory as a network drive that serves as a fake root directory, using the `map root` command. This allows you to install an application in a directory and assign rights for it at that directory level. For information, see [Section 7.12, “Creating a Fake Root Directory with the Map Root Command,” on page 60](#).

Fake roots work with the NetWare DOS Requester, with NetWare shells, and with clients, including Windows\* 98/ME and Windows 2000/XP/2003. Fake roots do not work for IBM\* OS/2\* clients. (Under OS/2, all mapped drives are roots, and search drives do not exist.)

For Windows NT\*/2000/XP workstations that use Novell Client™ login scripts, a `map` command in the login script automatically enables a mapped NetWare subdirectory as a fake root directory. For information about disabling this behavior, see [Section 7.13, “Disabling the Default Use of Map as Map Root in Login Scripts,” on page 61](#).

## 5.5 Directory Map Objects

In Novell eDirectory™, the Directory Map object is a pointer to a path in the NetWare server file system that represents a particular directory in the file system. It allows you to make simpler references to directories by using a Directory Map object in your login scripts instead of the fixed path. Directory Map objects are available only for NetWare NSS and Traditional volumes.

For instructions, see [Section 7.14, “Creating and Configuring a Directory Map Object,” on page 61](#).

## Using a Directory Map Object

Directory Map objects can be especially useful in Novell Client login scripts to point to directories that contain applications or other frequently used files. In Novell Client login scripts, you can map a drive to a Directory Map object instead of to the directory. If the application's location in the directory structure changes, you can update the path in the Directory Map object instead of changing the related drive maps in numerous login scripts. For information about map command options, see “Using Login Scripts” in the *Novell Login Scripts Guide*.

For example, suppose a word processing application resides in a directory called `appsvol:wpapps\0010`. You map a network-search drive to that directory in login scripts you create for users.

Later, you upgrade the word processing application and rename its directory from `appsvol:wpapps\0010` to `appsvol:wpapps\0011`. You must modify the path in the network drive map in every login script where that network-search map appears.

If you map the directory path to a Directory Map object instead of a network-search drive, you can avoid tedious modifications of the login scripts. Use the eDirectory plug-in for Novell iManager to create a Directory Map object. For example, create a Directory Map object called `default_wpapp`, for `appsvol:wpapps\0011`. Place a map command in your login scripts that map a search drive to the Directory Map object, rather than to the specific directory. For example:

```
map ins s2:=.default_wpapp.dept.domain_us
```

When users log in, their network-search drive is mapped to the `default_wpapp` Directory Map object, which, in turn, points to `appsvol:wpapps\0011`.

Later, if you install a yet another default word processor and change the directory's name to `appsvol:wpapps\superwp`, you need to change only the directory path in the `default_wpapp` Directory Map object. You do not need to change the map command in the login script because the map command still indicates the correct Directory Map object.

## Additional Information

For information, see “Object Classes and Properties” in the *Novell eDirectory 8.8 Administration Guide*.

## 5.6 Drive Map

A drive map is a pointer to a location in your local or network file system. The map assigns a local drive letter to a directory path on a volume where you have access rights. The directory path includes the volume, directory, and any subdirectories leading to the file. The local drive letter can be used instead of the complete path name.

Drive maps can be permanent or temporary:

- ♦ **Permanent Map:** To map a drive so you can use it every time you log in, place a map command in your Novell Client login script, or use the mapping functionality of your client operating system and enable it to reconnect at login. The network drive is remapped every time you log in.
- ♦ **Temporary Map:** To map a drive so you can use it only during your current session, use the *Novell Map Network Drive* option in the Novell Client, use the NetWare map command from a system prompt, or use the mapping functionality of your client operating system. The network drive map is valid only until you log out.

NetWare recognizes three types of drive mappings:

- ♦ Local Drive Maps
- ♦ Network Drive Maps
- ♦ Network-Search Drive Maps

For information about how to use the NetWare map command, see the following:

- ♦ “MAP” in the *OES 2 SPI: Utilities Reference for NetWare*.
- ♦ “Using Login Scripts” in the *Novell Login Scripts Guide*.

## 5.6.1 Local Drive Maps

You create local drive maps to establish directory paths to local storage media such as your workstation disk drives, CD drives, Zip\* drives, USB drives, and floppy disk drives.

Typically, the `lastdrive` command in your DOS configuration settings on a Windows computer is set to end with drive E: (`lastdrive=e`), or with the last drive specification in use on your system. Typically, drives C: through E: are used for local drives, but you can assign more drive letters, if needed, by modifying the `lastdrive` command.

To change this default, use a text editor to add or modify the DOS `lastdrive` command in your workstation `config.sys` file. For example:

```
lastdrive=Z
```

## 5.6.2 Network Drive Maps

Network drive maps point to volumes and directories on the network where you have access rights. Typically, drives F: through Z: are used for network drive maps on your Windows computer. Each user can map drive letters to different directories.

## 5.6.3 Network-Search Drive Maps

Network-search drive maps point to directories that contain frequently used files such as applications files. This map enables the system to locate an application file even if it is not located in the directory where you are working.

Network-search drive maps are numbered, although they also have drive letters. For example, a network-search drive 1 (or s1) can also be known as network drive Z:.

You can map up to 16 network-search drives, beginning with drive letter Z: (s1) and moving backwards through the alphabet to K: (s16). You cannot map a network-search drive and a regular network drive to the same drive letter.

If you request a file that the system cannot find in your current directory, the system looks in every directory where a network-search drive is mapped. The system searches, following the numerical order of the search drives, until the program file is found or cannot be located.

Network-search drive maps are not supported on IBM OS/2 workstations. The search functionality is provided with the OS/2 `path`, `libpath`, and `dpath` commands in the `config.sys` file.

# Planning Directory Structures for NetWare Servers

# 6

This section presents a simple example of directory structures to help you organize data in the Novell® Storage Services™ (NSS) File System and the legacy NetWare® Traditional file system for Novell Open Enterprise Server 2 NetWare, NetWare 6.5 SP7, and later versions. Based on the example and the accompanying information, you can begin to design a directory hierarchy suitable to your own needs.

---

**IMPORTANT:** For file systems on NetWare, we recommend that you create separate volumes for applications and user data, reserving the `sys :` volume for the operating system and its extensions.

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- ♦ [Section 6.1, “Organizing Directory Structures Based on Access Requirements,” on page 39](#)
- ♦ [Section 6.2, “Managing Directory Structures for Network Applications,” on page 40](#)
- ♦ [Section 6.3, “Designing Application Directory Structures,” on page 40](#)
- ♦ [Section 6.4, “Designing Data Directory Structures,” on page 42](#)
- ♦ [Section 6.5, “Designing Home or User Directory Structures,” on page 42](#)

## 6.1 Organizing Directory Structures Based on Access Requirements

Security is one of the most important aspects of file system organization. File system trustees and trustee rights specify who can access different directories and files. File system directory and file attributes specify what authenticated users can do with the file, such as being able to merely read a file or to modify it.

### Organizing the Directory Structure

Organize directories and files according to who needs access to them. In other words, use the directory structure to reflect access requirements.

For example, you can structure the hierarchy of directories in such a way as to take advantage of the inheritance aspect of rights. Associate file system trustees and trustee rights with volumes, directories, and files as a safeguard against deletion or modification by users. Specify directory and file attributes to control what users can do.

### Grouping the User Community

Group the user community based on each user’s access requirements.

Users grouped by role (relative to file access) can be assigned ownership of directories and files, and users whose roles vary can be assigned rights on the basis of equivalence.

Users needing a particular kind of access to certain directories and files can be grouped so that appropriate access belongs to the group (and consequently, to each member).

## 6.2 Managing Directory Structures for Network Applications

You can install various types of network applications, such as word processing or spreadsheet programs, to make them available to users. When installing applications, keep the following in mind:

- ♦ To install applications on your NSS or Traditional file system, you must be a Trustee with the Create right for the directory where you will be installing the application. The Supervisor user of the server automatically has this file-system trustee right.
- ♦ Follow the instructions in the application's documentation for installing the application onto a network. Make sure the application is designed for network (multiuser) use.
- ♦ When creating application directories, consider issues related to ease of distribution, installation, and operational control for network applications.
- ♦ If the application requires that it be installed at the root of a volume, but you would rather install it in a subdirectory for security reasons, you can map the directory to a fake root.

For information, see [Section 5.4, "Fake Root Directory," on page 35](#).

- ♦ After you install the application:
  - ♦ Designate Novell eDirectory organization, role, and user objects as file system Trustees for the application directory and its contents.
  - ♦ Assign access rights for each trustee.
  - ♦ Configure attributes for the directory and its files.

For information, see ["Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes" on page 83](#).

- ♦ To allow users to access network-based applications, map search drives to the directories that contain these applications. For information, see ["Network-Search Drive Maps" on page 37](#).

To make the mapped search drives permanent, place them in login scripts, which are executed when users log in. For information, see the [Novell Login Scripts Guide](#).

- ♦ You can create a Directory Map object that points to an application directory.

Directory Map objects are useful in login scripts. Instead of mapping a drive to a specific directory path, you map a drive to a Directory Map object that points to a directory.

If you change the directory path, you need to change only the Directory Map object's definition.

- ♦ If you install the application in the `sys:\public` directory, it is not necessary to make file system Trustee assignments or map a search drive. Because users generally have Read and File Scan rights in `sys:\public`, users can see and use all applications installed there. Use this directory structure only if you want all users to have access to all applications.

## 6.3 Designing Application Directory Structures

Application directories are storage areas where you install applications for convenient network access by groups, users, and other applications. You can install a variety of network applications, such as word processing or spreadsheet programs, and make them available to users.



For ease of management, create a separate volume for your applications and store applications in different directories. Mixing NetWare utilities with application program files complicates the file structure when you upgrade a network. An application file might have the same filename as a NetWare utility file or another application's program file. If filenames are the same, one file overwrites the other because two files with the same filename cannot coexist in a directory.

Keep program files separate from data files to simplify application management. For example, program files seldom change, but user data changes frequently. By creating a separate application volume and data volume, you can back up program files separately from a data files. Frequent network backup can then focus only on data directories, with application volumes being backed up as needed. Creating data directories for shared data files allows single-point backup and management of shared files.

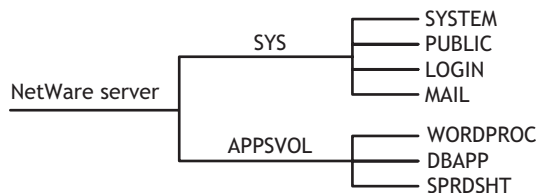
This section describes the following examples of application directory structures:

- ♦ **Application Volume with Separate Application Directories Off Its Root**
- ♦ **Sys: Volume with a Parent Application Directory Off Its Root**
- ♦ **Sys: Volume with Separate Application Directories Off Its Root**
- ♦ **Sys:public Directory with a Parent Application Directory**

### 6.3.1 Application Volume with Separate Application Directories Off Its Root

Create a separate volume for applications. Create a separate directory for each application off the root of the application volume, as shown in the following example.

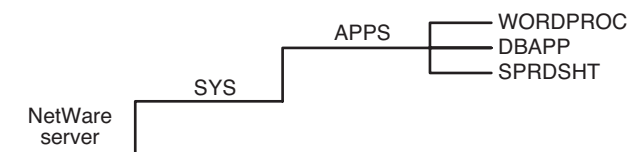
**Figure 6-1** Application Volume with Separate Application Directories Off Its Root



### 6.3.2 Sys: Volume with a Parent Application Directory Off Its Root

In the `sys :` volume, create a parent application directory at the root. Create a separate directory for each application in the parent application directory, as shown in the following example.

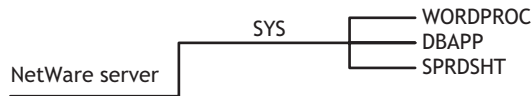
**Figure 6-2** Sys: Volume with a Parent Application Directory Off Its Root



### 6.3.3 Sys: Volume with Separate Application Directories Off Its Root

In the `sys :` volume, create a separate directory for each application at the root of the volume, as shown in the following example.

**Figure 6-3** *Sys: Volume with Separate Application Directories Off Its Root*

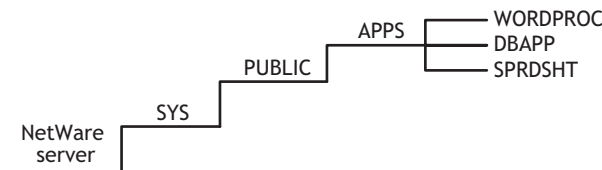


### 6.3.4 Sys:public Directory with a Parent Application Directory

Because users generally have Read and File Scan rights in `sys : \public`, users can see and use all applications installed in it. Use this directory structure only if you want all users to have access to all applications.

We do not recommend installing applications in the `sys : \public` directory. If you decide to use the `sys : \public` directory, create a parent directory for applications in `sys : \public`, as shown in the following example.

**Figure 6-4** *Sys:public Directory with a Parent Application Directory*



## 6.4 Designing Data Directory Structures

Data directories are storage areas where groups and users store work files and databases. Data directories allow users to share data, create work directories, and make Trustee assignments for groups or users who need access to these directories. You can also create a directory to transfer files between directories on the network.

For ease of management, create a separate volume for your data and store different types of data in different directories.

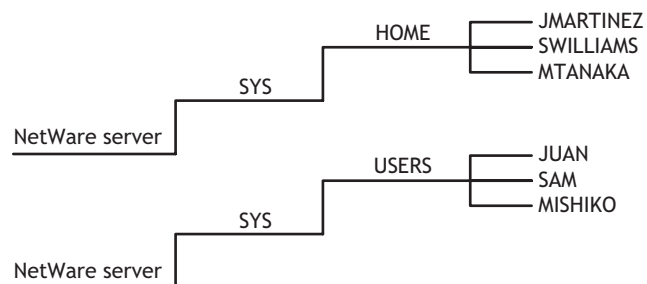
## 6.5 Designing Home or User Directory Structures

To provide personal workspace for users, create a separate home or user volume and create a subdirectory in it for each user. You can also create parent directories for groups of user directories. The data files a home or user directory contains are not available to other users, except network administrators or managers who have the necessary access rights.

For ease of management, create a separate volume for your home or user directories.

If you decide to use the `sys :` volume, create a parent directory in volume `sys :`, such as `home` or `users`. Within the parent directory, the name of each subdirectory should be the username. Usernames can be up to 47 characters, but DOS displays only 8 characters in a one-level directory name.

**Figure 6-5** *Home or User Directory Structure*





# Managing Folders and Files on NSS and NetWare Traditional Volumes

# 7

This section discusses how to configure directories in the Novell® Storage Services™ (NSS) file system for Linux and NetWare® and the legacy NetWare Traditional file system.

- ♦ [Section 7.1, “Creating a Folder \(Directory\),” on page 45](#)
- ♦ [Section 7.2, “Deleting a File or Folder on an NSS Volume,” on page 48](#)
- ♦ [Section 7.3, “Uploading Files to an NSS Volume,” on page 49](#)
- ♦ [Section 7.4, “Downloading Files from an NSS Volume,” on page 50](#)
- ♦ [Section 7.5, “Viewing Directory and File Information,” on page 51](#)
- ♦ [Section 7.6, “Managing Directory Quotas,” on page 51](#)
- ♦ [Section 7.7, “Copying or Moving Directories and Files,” on page 56](#)
- ♦ [Section 7.8, “Salvaging or Purging Deleted Files with iManager,” on page 56](#)
- ♦ [Section 7.9, “Salvaging or Purging Deleted Files with Other Tools,” on page 58](#)
- ♦ [Section 7.10, “Purging Deleted Files or Directories \(NetWare\),” on page 59](#)
- ♦ [Section 7.11, “Moving a User’s Home Directory to a Different Partition \(Linux\),” on page 60](#)
- ♦ [Section 7.12, “Creating a Fake Root Directory with the Map Root Command,” on page 60](#)
- ♦ [Section 7.13, “Disabling the Default Use of Map as Map Root in Login Scripts,” on page 61](#)
- ♦ [Section 7.14, “Creating and Configuring a Directory Map Object,” on page 61](#)
- ♦ [Section 7.15, “Mapping Network Drives,” on page 64](#)

## 7.1 Creating a Folder (Directory)

- ♦ [Section 7.1.1, “Prerequisites for Creating Folders,” on page 45](#)
- ♦ [Section 7.1.2, “Tools for Creating Folders,” on page 46](#)
- ♦ [Section 7.1.3, “Using Novell iManager to Create a Folder \(Directory\),” on page 46](#)
- ♦ [Section 7.1.4, “Using Novell Remote Manager for NetWare to Create a Folder \(Directory\) \(NetWare\),” on page 47](#)

### 7.1.1 Prerequisites for Creating Folders

Before you can create a folder (directory) on an NSS volume or a NetWare traditional volume, you must be a trustee of the parent folder where you want to create the new folder, and have been granted the Create right for it. When creating a folder in the root directory of a volume, you must be a trustee of the Volume object and have the Create right for it. For information about assigning trustees and trustee rights, see [Chapter 9, “Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes,” on page 83](#).

## 7.1.2 Tools for Creating Folders

On a NetWare server, you can create new folders (directories) at the server console. For Linux or NetWare servers, you can create folders by using the following management tools for the NSS file system and NetWare Traditional file system:

**Table 7-1** Tools for Creating Folders on NSS and NetWare Traditional File Systems

Management Tool	NSS on Linux	NSS on NetWare	NetWare Traditional
Files and Folders plug-in for Novell iManager 2.7	Yes	Yes	Yes
Novell Client for Linux	Yes	Yes	Yes
Novell Client™ for Windows XP/2003 and for Windows Vista	Yes	Yes	Yes
Novell NetStorage	Yes	Yes	No
Novell Remote Manager for Linux	No	No	No
Novell Remote Manager for NetWare	No	Yes	Yes

## 7.1.3 Using Novell iManager to Create a Folder (Directory)


As an administrator, you can use the Files and Folders plug-in to iManager to create a folder on NSS volumes or NetWare Traditional volumes, and NCP volumes (NCP controlled shares on Reiser or Ext3 volumes on an OES 2 Linux server).

### Prerequisites



- ♦ The destination NSS volume must be in the same tree where you are currently logged in to iManager.
- ♦ You must have trustee rights for the volume and destination location where you want to create the new folder. The Create right is required for creating files and folders.

### Procedure

- 1 In iManager, click *Files and Folders*, then click *New Folder* to open the *New Folder* page.

**New Folder** 

Specify the path and name for the new folder.

Path:   

Folder Name:

- 2 Use one of the following methods to specify the destination path on the NSS volume where you want to create the new folder:
  - ♦ Click the *Search* icon to browse and locate the destination folder, then click the name link of the folder to select it.
  - ♦ Click the *History* icon to select a folder from the list of folders that you recently accessed.The pathname of the folder appears in the *Path* field.
- 3 In *Folder Name*, type the name the folder you want to create in the selected location.
- 4 Click *OK* to create the folder, or click *Cancel* to abandon it.

A message confirms when the folder has been successfully created.
- 5 Click *Repeat Task* to create another folder, or click *OK* to dismiss the confirmation message.
- 6 Click *Files and Folders*, then click *Properties* to set file system trustees, trustee rights, and attributes for the new folder or folders.

### 7.1.4 Using Novell Remote Manager for NetWare to Create a Folder (Directory) (NetWare)

- 1 In your Web browser, log in to Novell Remote Manager on the NetWare server where you want to create a directory in an NSS volume. The general form of the URL is

`http://192.168.1.1:8008`

`https://192.168.1.1:8009`

Replace `192.168.1.1` with the actual IP address or DNS name of your server.

- 2 Click *Manage Server > Volumes*.
- 3 Click the *Properties* icon next to the volume you want to manage.

[\[Back to directory listing for: /TEST\]](#)**Directory entry information**

<b>Owner</b>	ACATT
<b>Creation date and time</b>	Jun 30, 2004 12:51 pm
<b>Effective rights</b>	SRWCEMFA
<b>Inherited rights filter</b>	<a href="#">SRWCE_F_</a>
<b>File space limit</b>	None
<b>File space in use</b>	Not available

**Trustee information:**

Object name	Trustee rights	
.CN=acatt.O=novell.T=TODDSBUILDTREE.	<a href="#">SRWCEMFA</a>	<a href="#">Delete</a>
.CN=ddogg.O=novell.T=TODDSBUILDTREE.	<a href="#">R_F_</a>	<a href="#">Delete</a>
.CN=animals.O=novell.T=TODDSBUILDTREE.	<a href="#">RWCEMFA</a>	<a href="#">Delete</a>

**User Name:**

**Salvageable files:** None

**New name:**

**New name:**

4 Type the name of the subdirectory, then click *Create Subdirectory*.

## 7.2 Deleting a File or Folder on an NSS Volume

As an administrator, you can use the Files and Folders plug-in to iManager to delete a file or folder on an NSS volume.

### 7.2.1 Prerequisites

- The NSS volume must be in the same tree where you are currently logged in to iManager.
- You must have trustee rights for the file or folder that you want to delete. The Erase right is required to delete the file.
- A folder must be empty before it can be deleted.

### 7.2.2 Procedure

1 In iManager, click *Files and Folders*, then click *Delete* to open the *Delete File or Folder* page.





**Delete File or Folder** ?

---

Specify a file or folder to delete.

Name:   

---

2 Use one of the following methods to specify the file or folder that you want to delete from the NSS volume:

- ♦ Click the *Search* icon to browse and locate the file or folder, then click the name link of the object to select it.
- ♦ Click the *History* icon to select a file or folder from the list of files and folders that you recently accessed.

The pathname of the folder appears in the *Name* field.

3 Click *OK* to delete the selected file or folder, or click *Cancel* to abandon the delete process.

A message confirms when the file or folder has been successfully deleted.

4 Click *Repeat Task* to delete another folder, or click *OK* to dismiss the confirmation message.

## 7.3 Uploading Files to an NSS Volume

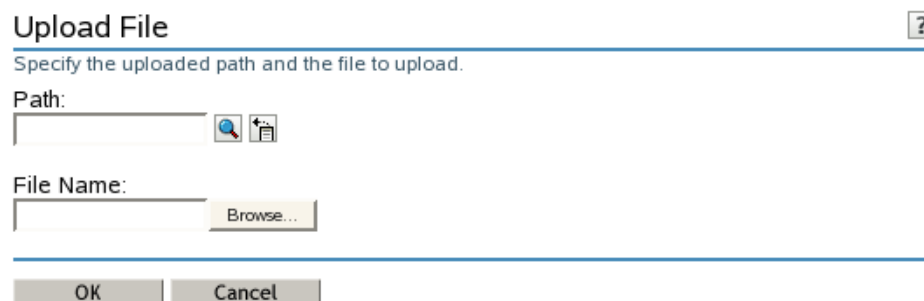
As an administrator, you can use the Files and Folders plug-in to iManager to upload files from your local computer to an existing folder on an NSS volume.

### 7.3.1 Prerequisites

- ♦ The destination NSS volume must be in the same tree where you are currently logged in to iManager.
- ♦ You must have trustee rights for the destination folder in order to be able to find the folder and upload the file. The Create right is required for file uploads.

### 7.3.2 Procedure



1 In iManager, click *Files and Folders*, then click *Upload* to open the *Upload File* page.



**Upload File** ?

---

Specify the uploaded path and the file to upload.

Path:   

File Name:

---

- 2 Use one of the following methods to specify the path to the folder on the NSS volume where you want to put the file:
  - ♦ Click the *Search* icon to browse and locate the folder, then click the name link of the folder to select it.
  - ♦ Click the *History* icon to select a folder from the list of folders that you recently accessed.

The pathname appears in the *Path* field.

- 3 Select the file on your local computer that you want to upload:

**3a** Click *Browse* to open a local file browser dialog box.

**3b** Browse and locate the file.

**3c** Select the file, then click *Open*.

The local pathname for the selected file appears in the *File Name* field.

- 4 Click *OK* to begin the upload, or click *Cancel* to abandon the process.

A message confirms when the file has been successfully uploaded. Wait until the upload completes before proceeding to other tasks.

- 5 Click *Repeat Task* to upload another file, or click *OK* to dismiss the confirmation message.

## 7.4 Downloading Files from an NSS Volume

As an administrator, you can use the Files and Folders plug-in to iManager to download a file from an NSS volume to your local computer.

### 7.4.1 Prerequisites

- ♦ The NSS volume must be in the same tree where you are currently logged in to iManager.
- ♦ You must have trustee rights for the file in order to be able to browse to and download the file.

### 7.4.2 Procedure

- 1 In iManager, click *Files and Folders*, then click *Download* to open the *Download File* page.



- 2 Use one of the following methods to select the file that you want to download from the NSS volume to your local drive:
  - ♦ Click the *Search* icon to browse and locate the file, then click the name link of the file to select it.
  - ♦ Click the *History* icon to select a file from the list of files that you recently accessed.

The pathname appears in the *File Name* field.

- 3 Click *OK* to open the *File Download* dialog box.

---

**IMPORTANT:** If the File Download dialog box does not open, make sure the security settings in your browser allow downloads from the server by adding the server as a trusted site, then try again.

---

- 4 Use one of the following methods to save the file to the local computer:
- ♦ Click *Open* to view the file in an appropriate application, then save the file by using the application's *File > Save* options.

The application that opens the file must already be installed on your computer.

- ♦ Click *Save* to open the *Save As* dialog box, browse to an existing folder or create a new local folder where you want to save the file, then click *Save*.

The browser's download manager manages the download and notifies you when the download is complete.

You can continue with other iManager tasks while the file is downloading.

## 7.5 Viewing Directory and File Information

You can see extended information about a directory or file with Novell NetStorage, Novell Remote Manager, and the Novell Client.

You can view directory information such as

- ♦ Owner and trustees
- ♦ Creation date and time
- ♦ Attributes, effective rights, and the IRF
- ♦ Disk space limitations

You can view file information such as

- ♦ Owner and trustees
- ♦ Attributes, effective rights, and the Inherited Rights and Filters (IRF)
- ♦ Name space
- ♦ File size
- ♦ Creation, access, archive, and modify dates

For information, see [“Understanding File System Access Control Using Trustees” on page 67](#).

## 7.6 Managing Directory Quotas

A directory quota limits the amount of space on an NSS volume that can be consumed by all of the files and folders in that directory. If the value you specify exceeds the volume quota, the volume quota overrides the directory quota. If the current size of the directory exceeds the specified limit, users cannot save data to the directory until space is cleared by removing files from the directory.

Before you can set directory quotas, you must enable the volume's Directory Quotas attribute. As the administrator user, you can view and configure directory quotas with the Files and Folders plug-in for iManager, NetStorage, and the Novell Client™. For NSS on NetWare, you can also use Novell Remote Manager for NetWare.

This section describes the following:

- ♦ [Section 7.6.1, “Enabling or Disabling the Directory Quotas Attribute for an NSS Volume,” on page 52](#)
- ♦ [Section 7.6.2, “Configuring Directory Quotas,” on page 52](#)
- ♦ [Section 7.6.3, “Removing a Directory Quota,” on page 55](#)
- ♦ [Section 7.6.4, “Removing All Directory Quotas for an NSS Volume,” on page 55](#)

## 7.6.1 Enabling or Disabling the Directory Quotas Attribute for an NSS Volume

Before setting directory quotas on an NSS volume, you must enable the Directory Quotas attribute for the volume. You can set the attribute at create time or at any time for an existing volume.

To set the Directory Quotas attribute for an existing volume:

- 1 In iManager, click *Storage > Volumes*.
- 2 Select a server to manage to view a list of NSS volumes on the server.
- 3 In the *Volumes* list, select a volume that you want manage.  
Wait for the volume details to be displayed before you continue.
- 4 Click *Properties*.  
The *Properties* page has three tabs: *Attributes*, *Statistics*, and *Quota Usage*. It opens to the *Attributes* tab.
- 5 On the *Attributes* tab, select or deselect the *Directory Quotas* check box, then click *Apply*.
- 6 (Linux) If you enabled or disabled the *Directory Quotas* attribute, restart NCP2NSS by entering the following at a terminal console prompt:

```
/etc/init.d/ncp2nss restart
```

## 7.6.2 Configuring Directory Quotas

- ♦ [“Adding or Modifying a Directory Quota with iManager” on page 52](#)
- ♦ [“Adding or Modifying a Directory Quota with Novell NetStorage” on page 53](#)
- ♦ [“Adding or Modifying Directory Quotas with the Novell Client” on page 53](#)
- ♦ [“Adding or Modifying a Directory Quota with Novell Remote Manager for NetWare” on page 54](#)

### Adding or Modifying a Directory Quota with iManager

- 1 In iManager, select *Files and Folders > Properties*.
- 2 Click the *Search* icon, then browse to locate and select the folder you want to manage on an NSS volume.
- 3 On the *Information* tab, select *Restrict Size* to enable space restrictions for the selected directory.
- 4 In the *Limit* field, type the directory quota in KB.

The value must be an increment of 4 KB; that is, it must be divisible by 4 with no remainder.

- 5 Click *Apply* or *OK* to apply the changes.

## Adding or Modifying a Directory Quota with Novell NetStorage

Using Novell NetStorage, you can manage directory quotas for directories in an NSS volume from any computer with a supported Web browser. This requires you to first configure a NetStorage server in the same context. For information, see the following:

- ♦ *OES 2 SP1: NetStorage for Linux Administration Guide*
- ♦ *OES 2: NetStorage for NetWare Administration Guide*

To create or modify NSS directory quotas with NetStorage:

- 1 In a Web browser, connect to NetStorage.
- 2 Log in to NetStorage with the username and password of the Admin user or equivalent user.
- 3 Navigate to the directory you want to manage.
- 4 Right-click the directory, then select *Properties*.
- 5 Click the *NetWare Info* tab.

Use the *NetWare Info* tab whether your server is OES Linux or NetWare.

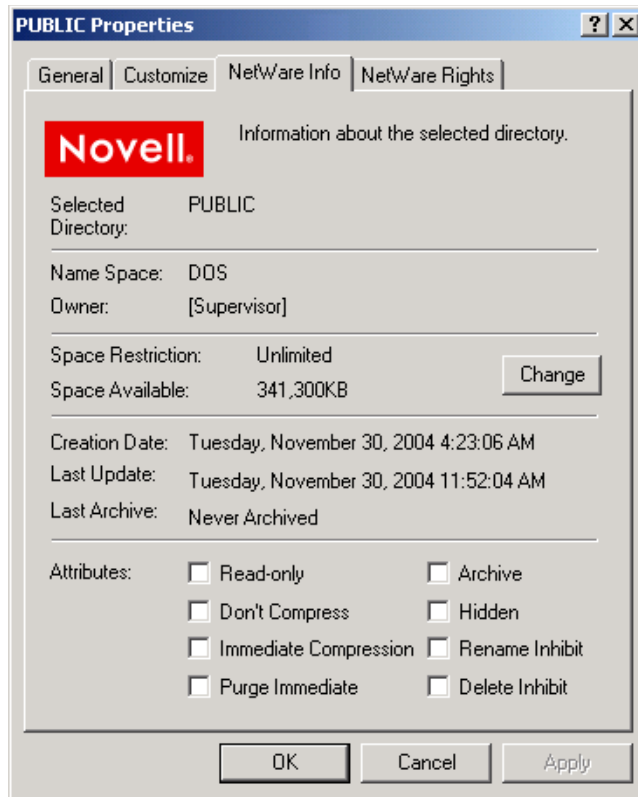
- 6 Do one of the following to configure the directory quota:
  - ♦ **Space Restriction:** Select *Restrict Size*, then specify the directory quota in KB. The value must be a multiple of 4.
  - ♦ **No Space Restriction:** Deselect *Restrict Size* to set the directory quota to Unlimited.
  - ♦ **Complete Space Restriction:** Select *Restrict Size*, then specify the directory quota as 0 KB. If the directory already contains files and subdirectories, the directory cannot grow beyond the current space consumed.
- 7 Click *Apply* to accept the directory quota configuration.

## Adding or Modifying Directory Quotas with the Novell Client

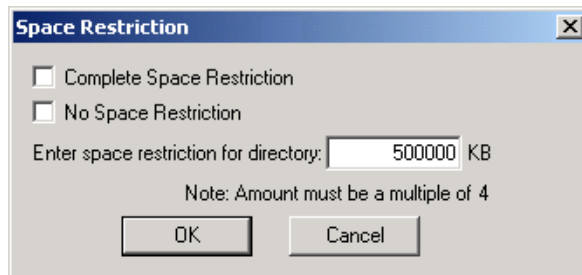
The Novell Client for Windows 2000/XP allows the admin user to manage directory quotas for directories in an NSS volume from a Windows computer.

- 1 In the Novell Client, map a drive to the NSS directory you want to manage, or map to its parent directory.
  - 1a Right-click the *Novell Client* icon (the red N icon in the notification area), then select *Novell Map Network Drive*.
  - 1b Specify the network path to the directory. For example: 192.168.1.1/users.
  - 1c Specify the username of the Admin user or equivalent user, then click *Map*.
  - 1d When prompted, enter the user's password.
- 2 In a file browser, locate and right-click the directory you want to manage, then click *Properties* > *NetWare Info*.

Use the *NetWare Info* tab whether your server is OES Linux or NetWare.




- 3 In the *Space Restriction* field, click *Change* to open the *Space Restriction* dialog box.



- 4 Do one of the following to configure the directory quota:
- ♦ **Space Restriction:** Specify the directory quota in KB. The value must be a multiple of 4.
  - ♦ **No Space Restriction:** Select *No Space Restriction* to set the directory quota to Unlimited.
  - ♦ **Complete Space Restriction:** Select *Complete Space Restriction* to set the directory quota to 0 KB. If the directory already contains files and subdirectories, the directory cannot grow beyond the current space consumed.
- 5 Click *OK* to accept the directory quota.

### Adding or Modifying a Directory Quota with Novell Remote Manager for NetWare

- 1 Access Novell Remote Manager for your NetWare server.
- 2 Click *Volumes* to open the *Volumes* page.

- 3 Locate the volume where the directory resides, then click the volume name link to view a directory listing for the volume.
- 4 Locate the directory you want to manage, then click the *Directory Information* icon  to the left of the directory to open the *Directory Entry Information* page.
- 5 In the *Directory Entry Information* field, click the *File Space Limit* link.

**Figure 7-1** NetStorage Directory Quota's File Space Limit Link

#### Directory entry information

<b>Owner</b>	ADMIN
<b>Creation date and time</b>	Feb 1, 2005 5:11 pm
<b>Effective rights</b>	SRWCEMFA
<b>Inherited rights filter</b>	<a href="#">SRWCEMFA</a>
<b>File space limit</b>	<a href="#">None</a>
<b>File space in use</b>	0 KB

This link is not available if you did not enable the Directory Quotas attribute when you created the parent volume.

- 6 Do one of the following:
  - ♦ **Space Restriction:** Specify the maximum size (in kilobytes) for the selected directory, then click *Set Space Restriction* to apply the setting.
  - ♦ **No Space Restriction:** Click *No Quota* to remove space restrictions for the selected directory.
  - ♦ **Complete Space Restriction:** Specify the maximum size as 0 KB. If the directory already contains files and subdirectories, the directory cannot grow beyond its current space consumed.

### 7.6.3 Removing a Directory Quota

- 1 In iManager, select *Files and Folders > Properties*.
- 2 Click the *Search* icon, then browse to locate and select the folder you want to manage on an NSS volume.
- 3 On the *Information* tab, deselect *Restrict Size* to disable space restrictions for the selected folder.
- 4 Click *Apply* or *OK* to apply the changes.

### 7.6.4 Removing All Directory Quotas for an NSS Volume

To delete the directory quotas for all directories on an NSS volume without dealing individually with each directory, you can simply disable the Directory Quotas attribute for the NSS volume.

- 1 In iManager, click *Storage > Volumes*.
- 2 Select a server to manage.
- 3 In the *Volumes* list, select a volume that you want manage.
- 4 Click *Properties*.

The *Properties* page has three tabs: *Attributes*, *Statistics*, and *Quota Usage*. It opens to the *Attributes* tab.

5 On the *Attributes* tab, deselect the *Directory Quotas* check box, then click *Apply*.

6 (Linux) Restart NCP2NSS by entering the following at a terminal prompt:

```
/etc/init.d/ncp2nss restart
```

## 7.7 Copying or Moving Directories and Files

You can copy or move a directory's subdirectories and files, if you have the necessary rights to do so. You cannot move the location of the directory itself, unless you also have the necessary rights for the parent directory of the target directory and for the destination directory.

To copy or move a directory's subdirectories and files, you must have File Scan rights to the source directory, and you must have the Create right to the destination directory.

To move a directory's subdirectories and files, you must also have the Erase right to the source directory, because moving files includes deleting them from the source directory. For instructions, see “[Viewing Details about Files and Performing Actions on Them](#)” in the *OES 2 SP1: Novell Remote Manager for NetWare Administration Guide*.

## 7.8 Salvaging or Purging Deleted Files with iManager

As an administrator, you can use the Files and Folders plug-in to iManager to salvage or purge deleted files from an NSS volume where the Salvage attribute is enabled. When salvaging deleted files, the file content, trustees, trustee rights, and inherited rights filter are just as they were before the file was deleted. If the rights in the tree above the salvaged file have changed, then the inherited rights for the salvaged deleted file is calculated based on the current rights above it in the directory tree.

- ♦ [Section 7.8.1, “Prerequisites,” on page 56](#)
- ♦ [Section 7.8.2, “Salvaging a Deleted File,” on page 57](#)
- ♦ [Section 7.8.3, “Purging Deleted Files,” on page 57](#)

### 7.8.1 Prerequisites

- ♦ The NSS volume that you want to manage must be in the same tree where you are currently logged in.
- ♦ You must have trustee rights for the file that you want to manage.
- ♦ The NSS volume must be configured for salvage in order for deleted files to be available. Enable the Salvage attribute by going to the volume's *Attributes* page (*Storage > Volumes > Properties > Attributes*), select *Salvage*, then click *OK*.
- ♦ Deleted files are typically purged according to the Purge Delay settings on the server. When the delay time elapses, the deleted file is no longer available for salvage.
- ♦ Deleted files can be salvaged by any trustee for the file with the Create right. If another user has salvaged the deleted file, it is no longer available for salvage.



- ♦ Deleted files can be purged by any trustee for the file with the Erase right. If another user has purged the deleted file, it is no longer available for purge.
- ♦ If the Purge Immediate attribute is set for a file or folder, it is immediately and permanently removed from the volume upon deletion.

## 7.8.2 Salvaging a Deleted File

You can salvage a deleted file and restore it to the directory from which it was deleted if you are a trustee of the file with the Create write. You can choose to overwrite any existing copies of the file in that location, or to rename the deleted file before it is salvaged. Review the guidelines in

[Section 7.8.1, “Prerequisites,” on page 56](#) to understand when deleted files are available for salvage.

- 1 In iManager, click *Files and Folders*, then click *Deleted File* to open the *Deleted File* page.
- 2 On the *Deleted File* page, use one of the following methods to locate the folder on an NSS volume where the deleted file existed when it was deleted:
  - ♦ Click the *Search* icon to browse and locate the folder, then click the name link of the folder to select it.
  - ♦ Click the *History* icon to select a folder from the list of folders that you recently accessed.

The *Deleted Files* report lists the deleted files in the folder and shows who deleted each file and when it was deleted.

- 3 Browse the list of deleted files to locate the version of the file you want to salvage.
- 4 Select the deleted file that you want to salvage, then click *Salvage*.
- 5 If a current file in the folder is named the same as the salvaged file, you are prompted to do one of the following:
  - ♦ Type a new name for the salvaged file, then click *OK*.
  - ♦ Click *OK* to overwrite the current file with the salvaged file.

A confirmation message confirms that the file was successfully saved.

- 6 Click *Repeat Task* to salvage or purge other deleted files, or click *OK* to dismiss the confirmation message.

## 7.8.3 Purging Deleted Files

You can purge a deleted file to remove it immediately from the volume if you are a trustee of the file with the Erase right. Purged files can no longer be salvaged. Review the guidelines in [Section 7.8.1, “Prerequisites,” on page 56](#) to understand when deleted files are available.

Deleted files can be purged by any trustee for the file with the rights to do so. The Erase right is required for purging.

- 1 In iManager, click *Files and Folders*, then click *Deleted File* to open the *Deleted File* page.
- 2 On the *Deleted File* page, use one of the following methods to locate the folder on an NSS volume where the deleted file existed when it was deleted:
  - ♦ Click the *Search* icon to browse and locate the folder, then click the name link of the folder to select it.
  - ♦ Click the *History* icon to select a folder from the list of folders that you recently accessed.

The *Deleted Files* report lists the deleted files in the folder and shows who deleted each file and when it was deleted.

**3** Browse the list of deleted files to locate the version of the file you want to purge.

**4** Select one or multiple deleted files that you want to purge, then click *Purge*.

A confirmation message confirms that the file was successfully purged.

**5** Click *Repeat Task* to salvage or purge other deleted files, or click *OK* to dismiss the confirmation message.

## 7.9 Salvaging or Purging Deleted Files with Other Tools

Use any of the following methods to salvage or purge deleted files. To purge, the user must be a trustee of the file with the Erase right. To salvage, the user must be a trustee of the file with the Create right.

- ♦ [Section 7.9.1, “Using NetStorage,” on page 58](#)
- ♦ [Section 7.9.2, “Using the Novell Client,” on page 58](#)
- ♦ [Section 7.9.3, “Using Novell Remote Manager for NetWare \(NetWare\),” on page 59](#)

### 7.9.1 Using NetStorage

Using NetStorage, the Admin user, the Admin-equivalent user, and individual users can purge and possibly undelete NSS files that were previously deleted on your Linux or NetWare server.

- 1** Access NetStorage.
- 2** In the left column, select the directory where the deleted files were located when they were deleted.
- 3** Click *View*, then click *Show Deleted Files*.
- 4** Select the check box next to one or more files you want to undelete or purge.
- 5** Click *File*, then click *Undelete* or click *Purge*.

### 7.9.2 Using the Novell Client

Using the Novell Client™ for Windows 2000/XP/2003, Admin users, Admin-equivalent users, and individual users can purge and possibly undelete NSS files that were previously deleted on your Linux or NetWare server.

- 1** Right-click the Novell Client icon (the red N) in the notification area to display the menu.  
Use the NetWare utility even if the NSS volume resided on a Linux server.
- 2** If you want to salvage a deleted file, click *NetWare Utilities* > *Salvage*, browse to locate the directory where the deleted file resided, then do one of the following:
  - ♦ To restore one or more deleted files, select the deleted files, then click *Salvage File*.
  - ♦ To restore all deleted files in the directory, click *Salvage All*.

When you are done, click *OK*.

- 3 If you want to purge a deleted file, click *NetWare Utilities > Purge*, browse to locate the directory where the deleted file resided, then do one of the following:
  - ♦ To purge one or more deleted files, select the deleted files, then click *Purge File*.
  - ♦ To purge all deleted files in the directory, click *Purge All*.
  - ♦ To purge the directory's subdirectories and all deleted files in them, click *Purge Subdirectories*.
- 4 When you are done, click *OK*.

### 7.9.3 Using Novell Remote Manager for NetWare (NetWare)

Using Novell Remote Manager for NetWare, the Admin user or equivalent user can purge and possibly undelete NSS files that were previously deleted on your NetWare server.

- 1 In a Web browser, connect to Novell Remote Manager on the NetWare server where the deleted file resides.

For information, see [Section 4.2.4, “Accessing Novell Remote Manager,” on page 30](#).
- 2 On the *Volumes* page, click the volume name link of the volume where the file was deleted.
- 3 From the *Directory* list, click the *Information* icon to left of the directory name where the file was deleted.
- 4 On the *Directory Information* page, find the *Salvageable Files* field, then click the *Select for List* link.
- 5 Do one of the following:
  - ♦ **Salvage:** Locate the deleted file you want to restore, then click the *Salvage* button next to the filename.
  - ♦ **Purge:** Locate the deleted file you want to purge, then click the *Purge* button next to the filename.
  - ♦ **Purge All:** Click the *Purge All Files* button to purge all the files in the directory.

## 7.10 Purging Deleted Files or Directories (NetWare)

If your NetWare server is running out of disk space or you want to immediately purge files that have been deleted, you can easily do so on each volume from the *Volume Information* page in Novell Remote Manager for NetWare.

### 7.10.1 Purging All Deleted Files

To immediately purge all files that have been deleted from a volume:

---

**IMPORTANT:** Files that have been purged can no longer be recovered.

---

- 1 In Novell Remote Manager for NetWare, open the *Volumes* page.
- 2 Click the *Information* icon to left of the name of the volume that you want to manage.
- 3 On the *Volume Information* page, click the *Purge Deleted Files* link.

## 7.10.2 Purging Specific Directories or Files

To immediately purge specific files that have been deleted from a directory, or to immediately purge all files from a specific directory:

---

**IMPORTANT:** Files that have been purged can no longer be recovered.

---

- 1 In Novell Remote Manager for NetWare, open the *Volumes* page.
- 2 Click the volume name link of the volume where the file was deleted.
- 3 In the volume's *Directory* list, click the *Information* icon to left of the directory where the file was deleted.
- 4 On the *Directory Information* page, find the *Salvageable Files* field, then click the *Select for List* link.
- 5 Do one of the following:
  - ♦ Locate the file that you want to purge, and click the *Purge* button next to the file name.
  - ♦ Click the *Purge All Files* button to purge all the files in the directory.
  - ♦ Click the *Purge* link for each directory that you want to purge.

## 7.11 Moving a User's Home Directory to a Different Partition (Linux)

You can move a user's home directory to a new partition on the Linux server without losing current configurations, rights, and so on. The following procedure assumes that the home directories reside on Linux file systems such as Ext3 or Reiser.

- 1 Log in to the server as the root user.
- 2 Move the user's home directory to the new location.
- 3 Assign the user as the owner of the new location and everything under it by entering:

```
chown -R username /newlocation/username
```

Replace *username* with the user's Linux username. Replace */newlocation/username* with the new path to the user's home directory.

- 4 Point the user's home environment to the new location.
  - 4a In YaST, click *User Management > Edit > Details > Home Directory*.
  - 4b Type the path to the new location.
  - 4c Save the changes.

## 7.12 Creating a Fake Root Directory with the Map Root Command

If your application must be installed at the root, load the files in a directory, then use the `map root` command in the login script to designate the directory as a fake root directory. For information about using the `map` command in a login script, see the *Novell Login Scripts Guide*.

For example, suppose you want to install a word processing application, named *mywpapp*, on the `apps :` volume, and it requires a root directory installation. You do not want to put the application in the `apps :` volume's root directory for security reasons. Instead, you install the application in the `apps : wpapps \mywpapp` subdirectory. In the Novell Client login script for users of the application, you use the `map root` command to map the subdirectory to the `K :` drive as a fake root:

```
map root sl6:=k:=apps:wpapps\mywpapp
```

To change the fake root back to the original root, remap the drive.

---

**NOTE:** You cannot use the DOS Change Directory (`cd`) command at the fake root to return to the original root.

---

## 7.13 Disabling the Default Use of Map as Map Root in Login Scripts

For Windows NT/2000/XP/2003 workstations that use Novell Client login scripts, a `map` command in the login script has the same effect as using an explicit `map root` command. It automatically enables a mapped NetWare subdirectory as a fake root directory. Applications installed in the subdirectory serving as the fake root cannot access directories above that subdirectory.

If necessary, you can disable the `map` command's automatic Map Root behavior on Windows by adding `SET MAPROOTOFF="1"` as the first line in the login script. To create a fake root when the `MapRootOff` parameter is enabled, the login script must explicitly use the `map root` command.

For more information, see the *Novell Login Scripts Guide*.

## 7.14 Creating and Configuring a Directory Map Object

- 1 In your Web browser, log in to Novell iManager, then select the NetWare server where you want to create the Directory Map object. The general form of the URL is

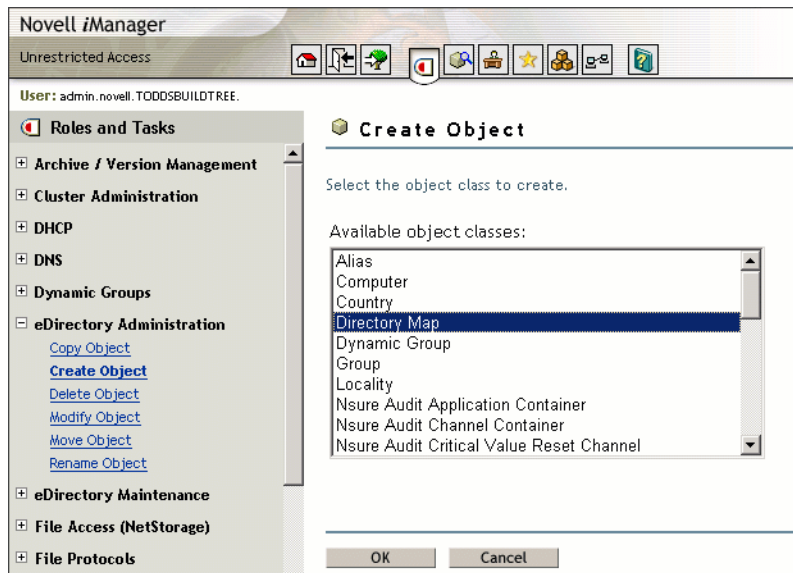
```
https://192.168.1.1/nps/iManager.html
```

Replace `192.168.1.1` with the actual IP address or DNS name of your iManager server.

The NetWare server must contain a NetWare NSS or Traditional volume.

To provide access from your tree to NetWare file systems in other trees, you can create NetWare Server and Volume objects in your tree that point to the NetWare servers and volumes in the other trees. The NetWare Server objects must be created before the Volume or Directory Map objects.

- 2 In *Roles and Tasks*, click *eDirectory Administration > Create Object* to open the Create Object page.




- 3 (Conditional) If Directory Map is not one of the Available Object Classes, you must add the Directory Map object class to the list.

When you select the *Create Object* task, it presents a list of available object classes. By default, it lists only the most commonly-used object classes in the list. You can add additional object classes to the list, which enables you to create corresponding objects using the *Create Object* option.

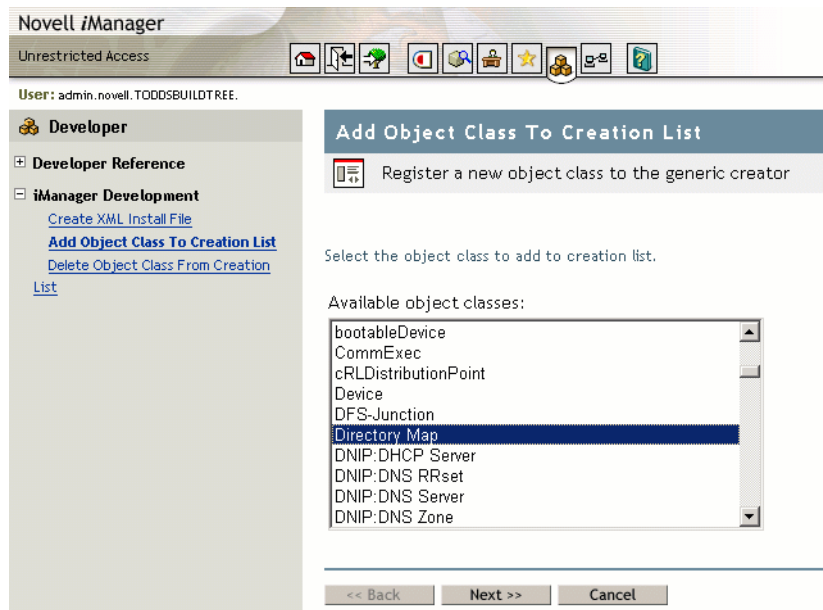
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**IMPORTANT:** Role-Based Services must be configured before you can use the iManager Development role. For information, see “[Configuring and Customizing iManager](#)” in the *Novell iManager 2.7.1 Administration Guide*.

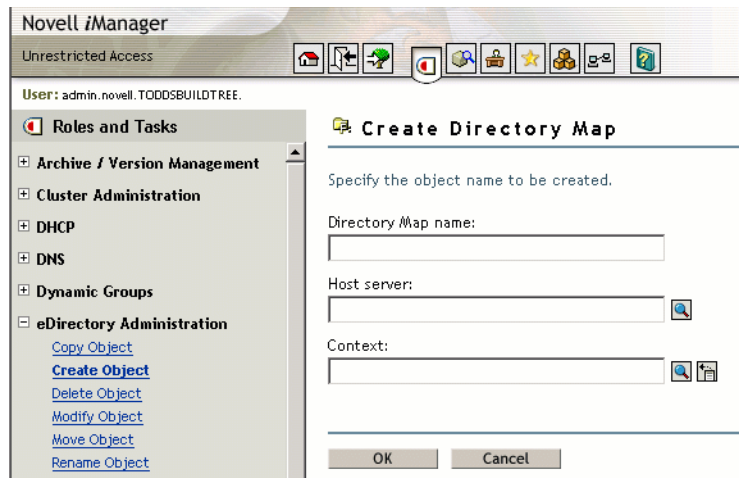
---

**3a** In iManager, click the *Developer* icon .

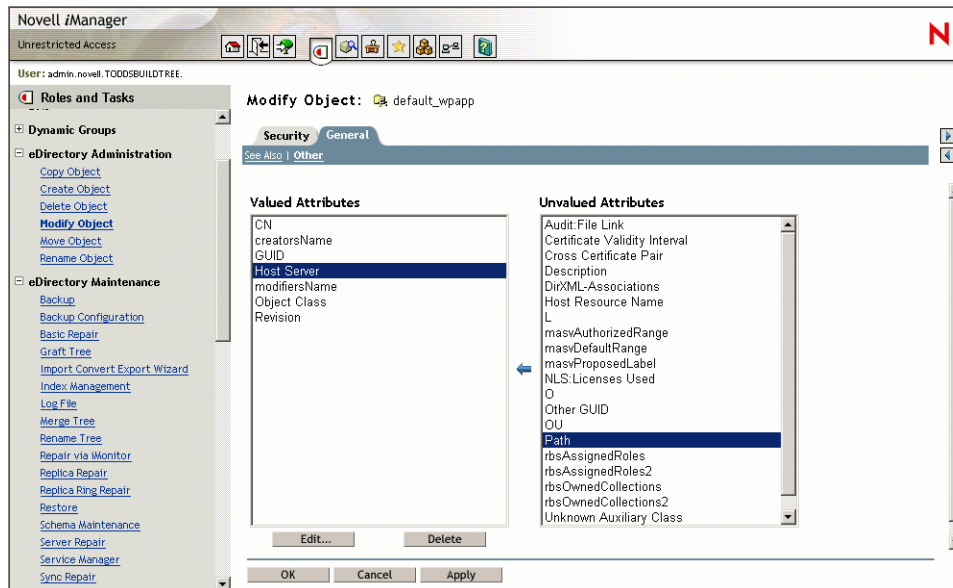
**3b** Click *iManager Development > Add Object Class To Creation List*.



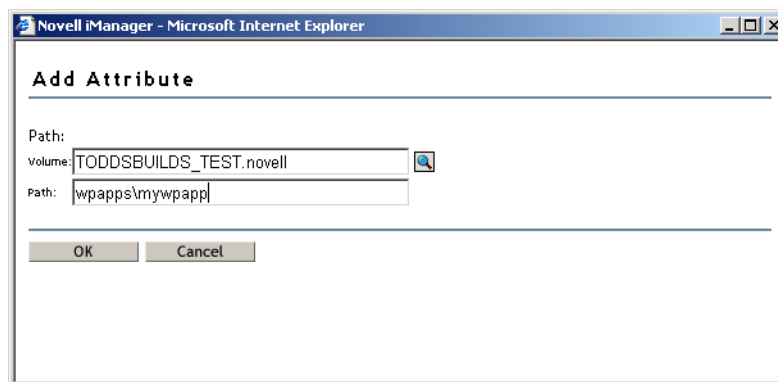
- 3c Select *Directory Map* from the *Available Object Classes* list, then click *Next*.
- 3d At the summary page, verify that the value of the *class-name* entry is `com.novell.emframe.fw.GenericCreator`, click *Finish*, then click *OK*.
- 3e Return to the Create Object task by clicking the *Roles and Tasks* icon , then clicking *eDirectory Administration > Create Object*.
- 3f Verify that the object classes you added are in the list of available object classes.  
In case of errors during this process, the Web server might need to be restarted in order for the newly added object type to be available in the *Create Object* task.
- 4 In the *Available Object Classes* list, select *Directory Map*, then click *OK*.



- 5 Specify the following information for the *Directory Map* object, then click *OK*.
  - ♦ **Directory Map Name:** Type the common name that represents this Directory Map object for use in `map` and `map root` commands.
  - ♦ **Host Server:** Select the NetWare 6.5 or later server where the directory resides.
  - ♦ **Context:** Select the context of the directory you plan to specify as the path this object represents.
- 6 Click *Modify > General > Other* to open the Modify Object page to the Directory Map's Attributes information.



- 7 In the *Unvalued Attributes* list, select *Path*, then click the *left-arrow* to add the attribute.



- 8 Specify the volume and path for the Directory Map object that the object represents, then click *OK*.

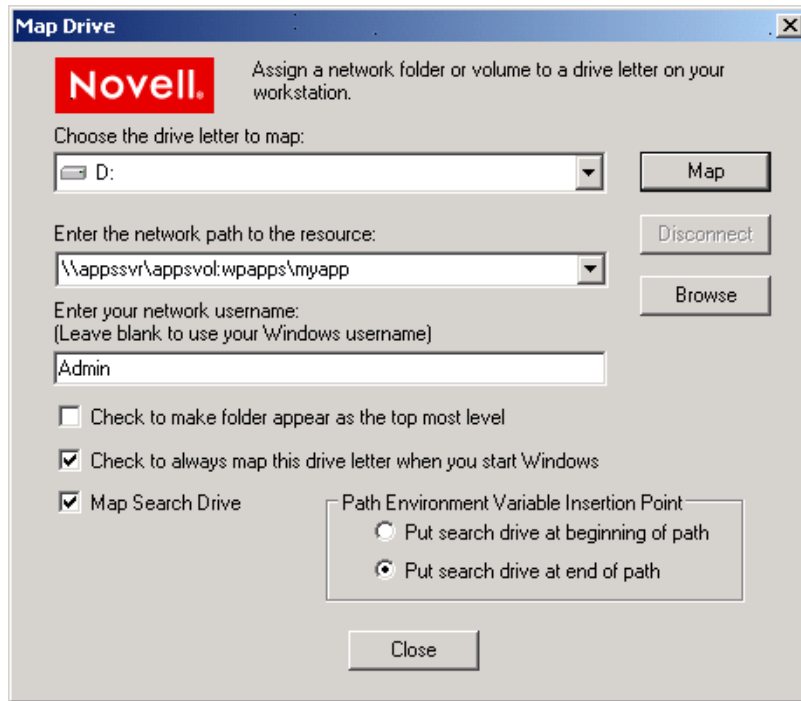
Novell iManager creates the Directory Map object with the specified volume and path, whether or not the specified path actually exists.

- 9 (Conditional) If the path you specified for the Directory Map object does not exist on the NetWare 6.5 or later server, create the specified path.

## 7.15 Mapping Network Drives

- 1 In the taskbar of your workstation, right-click the Novell Client icon, then select Novell Map Network Drive.





- 2 Specify a drive letter to map.
- 3 Type or browse to the path to the network resource where you want to map a drive.
- 4 Specify the login name to use for the map.  
If none is provided, the client uses your Windows logon username. If necessary, the client later prompts you for the password that matches the server login username you provide.
- 5 (Optional) Select (enable) the *Check to Make Folder Appear as the Top-Most Level* option.
- 6 (Optional) Select (enable) the *Check to Always Map This Drive Letter When You Start Windows* option.
- 7 (Optional) Select (enable) the *Map Search Drive* option.
- 8 Under *Path Environment Variable Insertion Point*, specify whether to put the search drive at the beginning or end of the path.
- 9 Click *Map*.

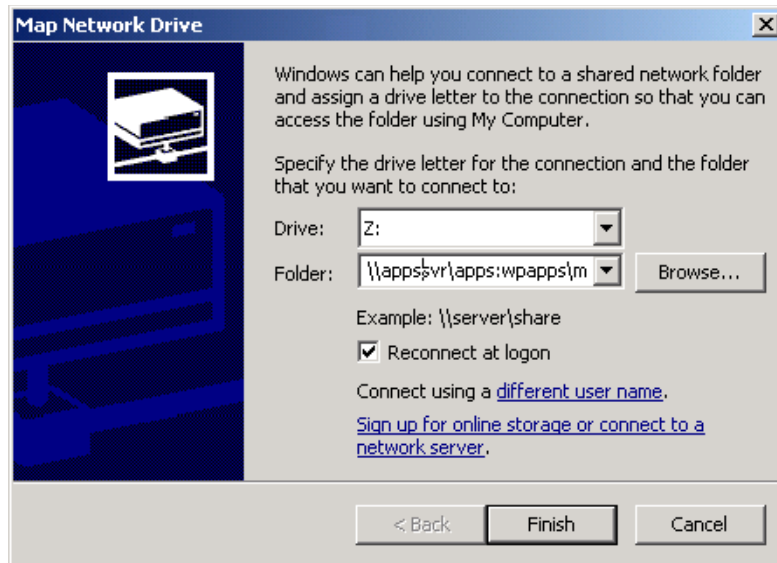
For more information, see the following:

- ♦ “[Configuring Map Settings](#)” in the *Novell Client 2.0 SP1 for Linux Administration Guide*
- ♦ *Novell Login Scripts Guide*

## Mapping Network Drives with Windows Explorer

You can also use native methods for mapping drives on your Windows client.

- 1 In Windows Explorer browser, click *Tools > Map Network Drive*.



- 2 Specify a drive letter to map.
- 3 Type or browse to specify the folder you want to map.
- 4 (Optional) To make the map automatically recur for subsequent logins to the network, select *Reconnect at Logon*.
- 5 Click *Finish*.

### Mapping Network Drives on DOS Clients with the Map Command

You can also use native methods for mapping drives on your DOS client. Use the map command to map drives and search drives to network directories. For a general description of the map command, see “**MAP**” in the *OES 2 SP1: Utilities Reference for NetWare*.

# Understanding File System Access Control Using Trustees





# 8

Security is one of the most important aspects of file system organization. The Novell® Storage Services™ File System and the NetWare® Traditional file system use the Novell trustee model to secure access to directories and files. Novell eDirectory™ objects, file-system trustee rights, and file system attributes for directories and files work together to allow you to determine who can access a directory or file and which actions are possible.

- Section 8.1, “eDirectory Objects and Security Equivalence,” on page 67
- Section 8.2, “File-System Trustee Rights,” on page 68
- Section 8.3, “Access Control for NSS on Linux,” on page 73
- Section 8.4, “The Connection Manager for NetWare,” on page 74
- Section 8.5, “Novell Client,” on page 75
- Section 8.6, “Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes,” on page 75
- Section 8.7, “Displaying Key NSS Directory and File Attributes as Linux POSIX Permissions,” on page 77
- Section 8.8, “Using QuickFinder with NCP Volumes and NSS Volumes,” on page 81
- Section 8.9, “What’s Next,” on page 81

## 8.1 eDirectory Objects and Security Equivalence

In OES, administrators, users, and network resources are represented as objects in an eDirectory database. Use Novell iManager to create eDirectory objects, such as Organizational, Organizational Unit, Group, User, and Admin. For information, see the *Novell eDirectory 8.8 Administration Guide*.

For example, in the following figure, The TREE container  is configured and created when you install eDirectory. Later, you must populate the tree with container and leaf objects to represent the various resources in your company. YourCo is the main Organization (O) object  in your TREE domain. In the YourCo container, you create Finance as an Organizational Unit (OU) object . In the Finance container, you create Accounts as an OU object that contains all accounting resources. Other OUs within Finance might represent Sales or Marketing organizations. In the Accounts container, Bob is a User object  for a system user who is assigned to the Accounts Department.

**Figure 8-1** Example eDirectory Container and Objects



Security equivalences help to simplify the task of assigning objects as file system trustees for your directories and files. Security equivalence is recorded in eDirectory as the value for the Security Equal To property of a User object. You can establish security equivalences explicitly, automatically, or implicitly.

- ♦ **Explicit:** By assignment. Trustees of a file or directory with the Supervisor or Access Control right can assign rights explicitly. An eDirectory Administrator can modify an object's Security Equal To property to explicitly assign it the same rights as those assigned to another object. For example, suppose you make a User object named Joe security equivalent to the Admin object. After you create the security equivalence, Joe has the same rights to the tree and file system as the Admin user.
- ♦ **Automatic:** By membership in a group or role. Whenever you assign an object to be a member in a Group object or Organizational Role object, the security equivalence is automatically added to the object's Security Equal To property.
- ♦ **Implied:** Equivalent to all parent containers and the [Public] trustee. Security equivalence for an object is implied by its parent container and by the Public container, which applies to all users.

Security equivalence is effective only for one step; it is not transferred by a subsequent security equivalence. For example, if you make a third user security equivalent to Joe in the example above, that user receives only Joe's original security settings. The third user does not receive Admin rights or any other Security Equal To properties Joe might have.

Whenever a user attempts to access a network resource, eDirectory calculates the user's security equivalence and makes that information available to NetWare. NetWare compares the user's security equivalence information to the trustee assignments for the path and target directory or file to determine if the user can access the target resource and what action on it is permitted.

For more information about eDirectory objects and rights, see “[eDirectory Rights](#)” in the *Novell eDirectory 8.8 Administration Guide*. For information about file-system trustee rights, see [Section 8.2, “File-System Trustee Rights,” on page 68](#).

## 8.2 File-System Trustee Rights

File-system trustee rights determine access and usage for directories and files on NSS volumes and Traditional volumes. A trustee is any eDirectory object, such as a User object, Group object, Organizational Role objects, or container object, that you grant one or more rights for a directory or file. Trustee assignments allow you to assign ownership, set permissions, and monitor user access.

The file system stores each file system Trustee's ID and rights assignment as metadata with its directory or file in the NSS file system. In the NetWare Traditional file system, the file's security and attributes metadata is stored in the Directory Entry Table (DET) of its parent directory. For NSS, the files and directory properties contain this information.

File-system trustee rights granted at the directory level apply to all the files and subdirectories in that directory, unless the rights redefined at the file or subdirectory level override them.

File-system trustee rights assigned to files and subdirectories redefine the rights that users inherit from directory rights. Eight file-system trustee rights can be granted at either the directory or file level, as described in the table below:

File-System Trustee Right	Description
Supervisor	<p>Grants the trustee all rights to the directory or file and any subordinate items.</p> <p>The Supervisor right cannot be blocked with an IRF (Inherited Rights Filter) and cannot be revoked. Users who have this right can also grant other users any rights to the directory or file and can change its Inherited Rights Filter.</p> <p>Default=Off</p>
Create	<p>Grants the trustee the ability to create directories and files and salvage deleted files.</p> <p>Default=Off</p>
Erase	<p>Grants the trustee the ability to delete directories and files.</p> <p>Default=Off</p>
File Scan	<p>Grants the trustee the ability to view directory and file names in the file system structure, including the directory structure from that file to the root directory.</p> <p>Default=On</p>
Modify	<p>Grants the trustee the ability to rename directories and files, and change file attributes. Does not allow the user to modify the contents of the file.</p> <p>Default=Off</p>
Read	<p>Grants the trustee the ability to open and read files, and open, read, and execute applications.</p> <p>Default=On</p>
Write	<p>Grants the trustee the ability to open and modify (write to) an existing file.</p> <p>Default=Off</p>
Access Control	<p>Grants the trustee the ability to add and remove trustees for directories and files and modify their trustee assignments and inherited rights filters.</p> <p>Default=Off</p>

## 8.2.1 Inherited Rights Masks

In NetWare, trustee rights assignments made at a given directory level flow down to lower levels until they are either changed or masked out. This is referred to as *inheritance*. The mechanism provided for preventing inheritance is called the Inherited Rights Mask (IRM).

IRMs are taken into account when NSS builds what is referred to as the effective Access Control List (ACL) for a file or directory. The effective ACL is a list of all users who have rights to the directory and includes the rights they have. It is calculated by starting at the root of the volume and working down to the file.

At each level, the IRM is applied to all rights inherited from the parent directory. Only those rights allowed by the mask are inherited by the child object. Rights for the various trustees explicitly assigned to the child are then collected. When a trustee inherits rights from above, the new rights replace the old ones (except the Supervisor right, which cannot be masked or removed by a new assignment to the same trustee).

By the time NSS reaches the target file or directory, it has a list of all trustees and the rights assigned and inherited for the requested file or directory. This list is then compared against the entries in the connection table structure. Every time there is a match in the connection table with an entry in the effective ACL, the rights are added to those that the owner of the connection has to the requested file or directory.

In reality, the rights are not calculated at every directory level. The actual algorithm NSS uses to calculate the rights for a particular file or directory is somewhat complicated because it ties in closely with the way the rights cache is implemented. The algorithm almost never needs to start at the root and work down.

In effect, when the effective rights of a user to an object are finally resolved, you have a list of all users who have rights to the file or directory (the effective ACL) and a list of all users in the connection table. These lists are seldom very large.

The one exception to this is a connection that has Admin-equivalent rights (not to be confused with having the Supervisor right from a trustee assignment). Admin-equivalent users have all rights to files, and they cannot be masked out by an IRM or explicit trustee assignment. The only way to keep an Admin-equivalent user from accessing files is to make a special trustee assignment that bars access to all but system connections. This assignment cannot be set through normal tools.

All rights other than Supervisor can be stripped away with an IRM at any level for nearly any user, except a user that has Supervisor right to the Server object itself (such as Admin and equivalents, which usually have rights resulting from an eDirectory rights inheritance). In this situation, the Admin user can see all files and folders regardless of IRMs because the access is not granted in the file system. Instead, a bit is set in the connection table to indicate that the user is an admin and as such has full access to the server and all volumes thereon.

## 8.2.2 Visibility Lists

The Visibility list is only used for making parent directories visible for navigation purposes. If a user has rights to a file, the NCP™ (via NCP Server for NetWare or NCP Server for Linux) makes all directories above the file visible to the user. This saves the administrator the task of assigning explicit rights to each directory above where the actual rights are assigned.

Visibility entries are stored in a manner similar to explicitly-assigned trustees. The first four entries are in the actual beast object; the rest are stored in overflow beast objects linked from the directory beast object.

Visibility lists only appear on directories. There is one entry for every trustee assigned anywhere in the subtree below the directory. Therefore, the further toward the root you go, the more GUIDs you see against that directory. At the root, the list has GUIDs for every trustee on the volume.

Each visibility entry has an eDirectory GUID and a count of the number of references to that GUID in the entries for the directory (not the subtree) where the Visibility list is assigned. This includes trustees that are explicitly assigned, as well as trustees in Visibility lists.

A Visibility list entry can be created in one of two ways:

- ♦ An immediate subordinate directory or file has a trustee that the parent does not.
- ♦ A visibility entry for a subordinate subdirectory is present.

Visibility counts do not consider trustees from directories or contents of directories that are not immediately subordinate to the considered directory.

The Visibility list is not affected by adding, deleting, or modifying IRMs. These operate in a transverse flow to the Visibility list. In other words, IRMs flow down the directory structure, while the Visibility list works up the structure.

For each request, GUID entries in the connection table are compared for the connection requesting against all GUIDs on the directory in question. If a match is found, the directory is made visible to the user in the Visibility list.

### 8.2.3 Supervisor Trustee Rights

A trustee of a Server object in eDirectory is automatically granted the Supervisor right [S] to the root directory of every NSS or NetWare Traditional volume attached to that server. You cannot override Supervisor rights with trustee rights applied at the subdirectory or file level, nor with Inherited Rights Filters. The Admin User object is automatically a trustee of the Server object.

The Supervisor user of the NSS or NetWare Traditional volume is automatically a trustee for all directories and files on the system and has all file-system trustee rights for them. The Supervisor right allows its trustee to assign other eDirectory objects as trustees and to specify any of the file-system trustee rights to them.

A trustee must have the Access Control right [A] to make trustee assignments in a directory or file.

Also, a trustee with the Write right to the File Server object is granted the Supervisor right to the file system.

### 8.2.4 Trustee Assignments for a Volume

If you grant a user privileges at the root directory of a volume, the user gains privileges to the entire volume unless those rights are specifically revoked at a lower level. You should be especially cautious about granting the Access Control right in a root directory. Users with the Access Control right can grant themselves all other rights in any subdirectory on the volume. You can improve network security by granting each user privileges only to the specific directories he or she uses.

### 8.2.5 Default Trustee Rights

In a trustee assignment for a directory, the default rights are File Scan and Read. Any trustee assignment, whether for a directory or a file, also includes the right to see the path leading from the root to that directory or file.

A new assignment of trustee rights at the file level can revoke rights assigned at the directory level, or it can allow additional rights.

## 8.2.6 Inherited Trustee Rights

Subdirectories and files can inherit rights from their parent directory. The directory's rights flow down through its structure to subdirectories and files, except for specific subdirectories or files with their own trustee assignments that supersede inherited rights. The trustee can exercise rights on subordinate directories and files without having explicit trustee assignments on each item.

When granting a trustee assignment to a subdirectory or file, the trustee assignment takes precedence over the inherited rights of its parent directory.

## 8.2.7 Public Trustee Rights

[Public] is a specialized trustee; it is not an eDirectory object. [Public] represents any network user, logged in or not, for rights assignment purposes. [Public] has Browse rights to the top of the tree, giving all users the right to view any object in the tree.

You can always specify [Public] as the trustee of a file, directory, or object. An unspecified authorized user who tries to access a file, directory, or object without any other rights is allowed the rights granted to the [Public] trustee.

## 8.2.8 Example of Rights Needed for Typical Access Tasks

The following table lists some common tasks and the rights required to do them.

Task	Trustee Assignment Needed
See a filename (visibility)	File Scan
Read a closed file	Read
Open or save an OpenOffice.org file	Read, Write, File Scan, Create, Modify, Erase
Open or save an Microsoft Office file	Read, Write, File Scan, Create, Modify, Erase
Search a directory	File Scan
Write to a closed file	Write, Create, Erase, Modify
Create and write to a file	Create
Copy files into a directory	Create
Remove an empty subdirectory	Erase
Delete a file	Erase
Change directory or file attributes	Modify
Rename a file	Modify
Change the Inherited Rights Filter	Access Control
Change trustee assignments	Access Control
Modify a directory's disk space assignment for users	Access Control



## 8.3 Access Control for NSS on Linux

For an OES Linux server, you can control access to services locally or with eDirectory. If the server contains Novell Storage Systems (NSS) volumes, you can control access in only one of the two methods, not both, and not a combination. The access methods are referred to as Independent mode and NetWare mode.

Access Control	File System	Local Users	eDirectory Users	Access Mode
Local only	Linux POSIX file systems	Yes	No	xNFS Independent
NCP/eDirectory, except for Root user	Linux POSIX file systems	No	Yes	xNFS Independent
Local and NCP/eDirectory	Linux POSIX file systems	Yes	Yes, Linux-enabled local users	xNFS Independent
Local only	NSS	Root user only	No	xNFS Independent
NCP/eDirectory, except for Root user	NSS	Root user only	Yes	xNFS NetWare
Local and NCP/eDirectory	NSS	Root user only	Yes, Linux-enabled local users	xNFS NetWare

For more information about NSS, NCP Server, and Linux User Management, see the following:

- ♦ [Section 3.2, “Compatibility Issues for File System Rights on Linux,” on page 19](#)
- ♦ [“Access Control for NSS on Linux” in the \*OES 2 SPI: NSS File System Administration Guide\*](#)

In NetWare mode, NCP calculates access control permissions for three entities:

- ♦ The eDirectory User object mapped to the directory or file User ID (UNIX User ID (UID))
- ♦ The eDirectory Group object mapped to the directory or file Group ID (UNIX Group ID (GID))
- ♦ The eDirectory Group object mapped to the directory or file Others ID (UNIX GID 65535)

These user entities are referred to as *mapped users*. All other users are called *unmapped users*.

For NSS volumes, the POSIX directory and file permissions are not used to determine access permission. NSS uses the permission fields to store Read Only, Read/Write, Execute, and Hidden attributes for directories and files. NSS does not allow the Linux system to set typical access control permissions in the POSIX fields. It interprets Linux `chmod` commands to apply the values as NetWare directory and file attributes, according to the way NSS maps them to the User, Group, and Other permission fields. For information, see [Section 8.7, “Displaying Key NSS Directory and File Attributes as Linux POSIX Permissions,” on page 77](#).

When the user connects to the system with a data request, NCP calculates the effective rights table for the user. As NCP accesses the data on an NSS volume, it compares the ID values to the user’s effective rights to determine what access is allowed. It then interprets the directory or file attributes from the NSS metadata.

The NCP server ensures that trustee rights and directory and file attributes are enforced when users access their data. To ensure that the user's data is not less secure when accessed from the Linux environment or with other protocols, the NSS volume data tends to be less accessible when accessed locally on the Linux system or through other protocols. NCP users only have rights where they have been explicitly granted to them through trustee assignments on the volume or to the NCP server object in eDirectory so NCP does not create security back doors into other parts of the system.

NCP provides basic accessibility when the Linux-enabled authenticated user accesses the system locally or through another protocol. In order to accomplish this with file systems other than NSS, NCP sets the UID of files and directories to be that of the user who creates them. Using LUM (Linux User Management), these IDs map to valid Linux UIDs. Additionally, a local user on the Linux system could use NCPFS (`ncpmount`) and establish an authenticated NCP session with the NCP server, allowing the user's local access rights to mirror the rights available remotely through NCP.

With NSS volumes, the trustee information is stored in NSS with the directory or file. NSS allows access to their file system to Linux user IDs based on what their trustee rights are in the NSS file system. If a user has an NCP-assigned trustee right to a subdirectory on an NSS volume, that same user could log in at the Linux console and have the same access locally that he or she has through NCP. Protocols such as NFS and Samba that access files with the remote client's UID should also work well with NSS.

## 8.4 The Connection Manager for NetWare

For NetWare, the Connection Manager module (`connmgr.nlm`) builds a connection table when a user connects to the file system. When a file is requested from either the NSS file system or the NetWare Traditional file system, the Connection Manager gathers information for the connection table from the eDirectory Services module (`ds.nlm`) in the form of a connection table comprised of the eDirectory EIDs for the object, for group memberships, and for security equivalences.

When the connection is established, the information in the connection table is relatively static unless the connected user is added to a new group or is given an explicit trustee assignment or security equivalence. In those situations, the connection manager updates the connection table and sends out an event that the table has changed. NSS uses this event to update its own connection table.

### 8.4.1 Connections to the NetWare Traditional File System

For the NetWare Traditional file system, the table of EIDs is all that is needed to proceed with authentication. After eDirectory provides the list of EIDs, the Connection Manager compares the list to the Directory Entry Table (DET) for the Traditional volume. It determines valid trustees by looking at the assigned trustees in the directory structure above (for trustee inheritance) and at the target file system object (for explicit trustee assignments). Inherited Rights Masks (IRMs) are also taken into consideration.

### 8.4.2 Connections to the NSS File System

For the NSS file system, the NSS connection table establishes an entry for a user when the regular connection table entry is created, rather than at the file system access time. Logically, the NSS connection table is part of the connection table with NSS-specific information, including the eDirectory object's GUID.

NSS uses GUIDs as the key for trustees. It keeps its own connection table with these GUIDs and compares it with the beast object entry to look for valid trustees. It finds valid trustees by looking at assigned trustees in the directory structure above (for trustee inheritance) and at the target file system object (for explicit trustee assignments), also taking IRMs into consideration.

If this fails to provide a method of access, NSS then checks the Visibility list to see if the requested object is a parent directory that requires visibility due to a rights assignment for a child directory. For information about the Visibility list, see [Section 8.2.2, “Visibility Lists,” on page 70](#).

When GUIDs are used instead of EIDs, it does not matter which server you are on, provided it is in the same tree, which is why Novell Cluster Services uses NSS pools and volumes.

NSS does not directly access the connection table. However, it does make calls to read information from it to form its own connection table with GUIDs and file-system trustee rights. For information about trustee rights, see [Section 8.2, “File-System Trustee Rights,” on page 68](#).

## 8.5 Novell Client

The Novell Client™ establishes an authenticated connection to the server through eDirectory. It does not perform periodic authentication checks, nor does it track rights. NCP Server and NSS work together to ensure that the Security Equivalence Vector is up-to-date, and that the entries in it are used to give correct access to the file system. The client does not control the rights process. To do so would introduce a security flaw into the client/server relationship in NetWare.

## 8.6 Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes

Directory and file attributes assign properties to individual directories or files. Some attributes are meaningful only when applied at the file level, but some apply to both the directory and the file levels.

File attributes apply universally to all users. For example, a file that has a read-only attribute is read-only for all users. The file attribute settings are like an on/off switch. Attributes can be set by any trustee with the Modify right to the directory or file, and attributes stay set until they are changed. Attributes do not change when you log out or when you down a file server.

---

**IMPORTANT:** Be careful when assigning a directory and file attribute. The attribute applies to all users.

---

For example, if a trustee with the Modify right enables the Delete Inhibit attribute for a file, no one, including the owner of the file or the network administrator, can delete the file. However, any trustee with the Modify right can disable the Delete Inhibit attribute to allow the file's deletion.

[Table 8-1](#) describes directory and file attributes and whether they apply to directories, files, or both.

**Table 8-1** *Directory and File Attributes for NSS Volumes and NetWare Traditional Volumes*

Attribute Code	Description	Applies to
A	Archive Needed identifies files and folders that have been modified since the last backup. This attribute is assigned automatically.	Directories and files
Ci	<p>Copy Inhibit prevents users from copying a file. This attribute works only for clients using Macintosh operating systems to access NSS volumes on NetWare.</p> <p>This attribute overrides the trustee Read right and File Scan right. A trustee with the Modify right must disable this attribute to allow the file to be copied.</p>	Files only
Dc	Do Not Compress keeps data from being compressed. This attribute overrides settings for automatic compression of files not accessed within a specified number of days.	Directories and files
Di	<p>Delete Inhibit prevents users from deleting a directory or file.</p> <p>This attribute overrides the trustee Erase right. When it is enabled, no one, including the owner and network administrator, can delete the directory or file. A trustee with the Modify right must disable this attribute to allow the directory or file to be deleted.</p>	Directories and files
Dm	Do Not Migrate prevents directories and files from being migrated from the server's server disk to another storage medium.	Directories and files
Ds	Do Not Suballocate prevents data from being suballocated.	Files only
H	The Hidden attribute hides directories and files so they do not appear in a file manager or directory listing.	Directories and files
I	Index allows large files to be accessed quickly by indexing files with more than 64 File Allocation Table (FAT) entries. This attribute is set automatically.	Files only
Ic	Immediate Compress sets data to be compressed as soon as a file is closed. If applied to a directory, every file in the directory is compressed as each file is closed.	Directories and files
N	Normal indicates the Read/Write attribute is assigned and the Shareable attribute is not. This is the default attribute assignment for all new files.	Directories and files
P	Purge flags a directory or file to be erased from the system as soon as it is deleted. Purged directories and files cannot be recovered.	Directories and files
Ri	Rename Inhibit prevents the directory or file name from being modified.	Directories and files
Ro	Read Only prevents a file from being modified.	Files only
Rw	Read/Write allows you to write to a file. All files are created with this attribute.	Files only
Sh	Shareable allows more than one user to access the file at the same time. This attribute is usually used with Read Only.	Files only

Attribute Code	Description	Applies to
Sy	The System attribute hides the directory or file so it does not appear in a file manager or directory listing. System is normally used with operating system files, such as DOS system files.	Directories and files
T	Transactional allows a file to be tracked and protected by the Transaction Tracking System™ (TTS™). This option works only on NetWare.	Files only
X	The Execute attribute indicates program files such as .exe or .com.	Files only

## 8.7 Displaying Key NSS Directory and File Attributes as Linux POSIX Permissions

NSS displays its Read Only (Ro), Read/Write (Rw), Execute (X), and Hidden (H) attributes for directories and files in the Linux POSIX permission fields when the volume is mounted on Linux. However, NSS does not support the POSIX set-user-ID mode bit and set-group-ID mode bit. For information about Ro, Rw, X, and H attributes, see [Section 8.6, “Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes,” on page 75](#).

For NSS volumes on Linux, the POSIX permissions are not used conventionally to provide access control. Instead, they are merely a means of displaying NSS attributes in a familiar format to Linux users.

For NSS volumes on Linux, only the Root user can create files in a directory that is marked as Read Only. If the Read Only attribute is enabled for a directory, LUM-enabled users cannot create files in the directory even if they have the trustee Supervisor right assigned to them. For example, the POSIX fields for a Read Only directory might be

```
dr-x r-x r-x (for a directory with Read Only enabled and Hidden disabled)
```

```
d--x --x --x (for a directory with Read Only and Hidden enabled)
```

To enable LUM-enabled users to create files, you must disable Read Only for the directory, which is indicated in the POSIX rights field by enabling Write. For example, the POSIX fields when the Read Only attribute is disabled might be

```
drwx rwx rwx (for a directory with Read Only disabled and Hidden disabled)
```

```
d-wx -wx -wx (for a directory with Read Only disabled and Hidden enabled)
```

The following table describes how the NSS directory and file attributes are displayed in the Linux POSIX fields and how they handle conventional management commands such as `chmod`.

OES NetWare Directory and File Attributes	OES Linux Permissions (User, Group, Other)	Description
Read Only is enabled.  Execute is disabled.  Hidden is disabled.	r-- r-- r--	<p>NSS enables the Read permission bit and disables the Write permission bit for the User, Group, and Other fields to indicate that the NetWare Read Only attribute is enabled and the Hidden attribute is disabled. The directory or file is visible in your file manager.</p> <p>The NetWare Read Only attribute is always set to On for files and directories. When the Hidden attribute is set to Off, the Read permission bit is set to On for the User, Group, or Other permission fields on Linux.</p> <p>Example: <code>chmod 400</code> has the same result as <code>chmod 444</code></p> <p>r-- r-- r--</p> <p>The binary value for octal 4 is 100, which corresponds to Read=On, Write=Off, and Execute=Off.</p>
Read Only is enabled.  Execute is disabled.  Hidden is enabled.	--- --- ---	<p>NSS disables the Read and Write permission bits for the User, Group, and Other fields to indicate that the NetWare Read Only attribute is enabled and the Hidden attribute is enabled. The directory or file is not visible in your file manager, unless the file manager is set to view hidden files.</p> <p>The NetWare Read Only attribute is always set to On for files and directories. When the Hidden attribute is set to On, the Read permission bit is set to Off for the User, Group, or Other permission fields on Linux.</p> <p>Example: <code>chmod 044</code> or <code>chmod 040</code> has the same result as <code>chmod 000</code></p> <p>--- --- ---</p> <p>The binary value for octal 0 is 000, which corresponds to Read=Off, Write=Off, and Execute=Off.</p>

OES NetWare Directory and File Attributes	OES Linux Permissions (User, Group, Other)	Description
Read Only is disabled.  Execute is disabled.  Hidden is disabled.	<code>rw- rw- rw-</code>	<p>NSS enables the Write permission bit to indicate that Read Only is disabled. All users can read and modify the file or directory.</p> <p>If you set the Write permission bit for the User permission field, NSS sets the Write bit in all fields to the value in the User field.</p> <p>By default, NSS disables the Read Only attribute for files, so both the Read and Write permission bits are set to On in the Linux permissions.</p> <p>Example 1: <code>chmod 620</code> or <code>chmod 644</code> has the same result as <code>chmod 666</code></p> <p><code>rw- rw- rw-</code></p> <p>The binary value for octal 6 is 110, which corresponds to Read=On, Write=On, and Execute=Off for the User field. The binary value for octal 2 is 010, which corresponds to Read=Off, Write=On, and Execute=Off for the Group field. NSS always sets the Read field to On. Because Write is set to On for the User field, it is also set to On for all fields. The NetWare Read Only attribute is disabled.</p> <p>Example 2: <code>chmod 420</code> or <code>chmod 466</code> has the same result as <code>chmod 444</code></p> <p><code>r-- r-- r--</code></p> <p>NSS always sets the Read field to On. Because Write is set to Off for the User field, it is also set to Off for all. The NetWare Read Only attribute is enabled.</p>

OES NetWare Directory and File Attributes	OES Linux Permissions (User, Group, Other)	Description
Read Only is enabled.	<code>r-x r-x r-x</code> <code>[XXX]</code>	NSS enables the Execute permission bit to indicate that Execute is enabled. When the Execute permission is enabled, all users can list the contents of the directory and change to the directory.
Execute is enabled.		For files, if you set the Execute permission bit to On for any of the User, Group, or Other permission fields, NSS sets the Execute bit to On for all fields.
Hidden is disabled.		For files, if you set the Execute permission bit to Off for all of the User, Group, or Other permission fields, NSS sets the Execute bit to Off for all fields.
		For directories, both the Read and Execute permission bits are always set to On.
		Example 1: <code>chmod 001</code> , <code>chmod 441</code> , or <code>chmod 401</code> has the same result as <code>chmod 555</code>
		<code>r-x r-x r-x</code>
		The binary value for octal 5 is 101, which corresponds to Read=On, Write=Off, and Execute=On. The binary value for octal 1 is 001, which corresponds to Read=Off, Write=Off, and Execute=On for the Other field. NSS always sets the Read field to On. Because the Execute bit is set to On for one of the fields, it is set to On for all of the fields.
		Example 2: <code>chmod 622</code> , <code>chmod 700</code> , or <code>chmod 766</code> has the same result as <code>chmod 777</code>
		<code>rwX rwX rwX</code>
		The binary value for octal 7 is 111, which corresponds to Read=On, Write=On, and Execute=On. NSS always sets the Read field to On. Because the Execute bit is set to On for one of the fields, it is set to On for all of the fields. Because Write is On for the User field, it is set to On for all fields.
		Example 3: for directories, <code>chmod 000</code> , <code>chmod 400</code> , and <code>chmod 022</code> have the same result as <code>chmod 555</code>
		<code>r-x r-x r-x</code>
		The binary value for octal 2 is 010, which corresponds to Read=Off, Write=On, and Execute=Off. NSS always sets the Read field to On. NSS always sets the Execute field to On for directories. The <code>chmod</code> command has no effect on the state of Read and Execute permission bits for directories. Because the Write bit is set to Off in the User field, it is set to Off for all fields.



OES NetWare Directory and File Attributes	OES Linux Permissions (User, Group, Other)	Description
Read Only is disabled.	<code>rwX rwX rwX</code>	NSS enables the Read, Write, and Execute permission bits when Read Only is disabled and Execute is enabled. All users can read and modify the directory or file, and they can list the contents of the directory and change to the directory.
Execute is enabled.		
Hidden is disabled.		

## 8.8 Using QuickFinder with NCP Volumes and NSS Volumes

QuickFinder indexing honors Novell file system trustees and rights in what it returns to the requesting user for NCP volumes and NSS volumes. The user sees only those files that the user has rights to see.

## 8.9 What's Next

Continue with “[Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes](#)” on page 83.



# Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes

# 9

This section discusses how to configure Trustee Rights and Inherited Rights and Filters for directories and files on the Novell® Storage Services™ File System and NetWare® Traditional File System.

- ♦ [Section 9.1, “Generating a Server Security Report \(NetWare\),” on page 83](#)
- ♦ [Section 9.2, “Viewing a File System Trustee Report for a Volume \(NetWare\),” on page 84](#)
- ♦ [Section 9.3, “Viewing a File System Trustee Report for a Directory or File,” on page 85](#)
- ♦ [Section 9.4, “Viewing a File System Trustee Report for All Directories in a Volume,” on page 85](#)
- ♦ [Section 9.5, “Viewing Properties of a File or Folder,” on page 85](#)
- ♦ [Section 9.6, “Managing Directory Quotas, File Ownership, and File or Directory Attributes for NSS Volumes,” on page 86](#)
- ♦ [Section 9.7, “Managing File System Trustees in iManager,” on page 89](#)
- ♦ [Section 9.8, “Managing File System Trustees, Trustee Rights, and Inherited Rights Filters,” on page 93](#)
- ♦ [Section 9.9, “Managing File System Attributes for NSS and NetWare Traditional Volumes,” on page 97](#)
- ♦ [Section 9.10, “Trustee Rights Utility for Linux,” on page 101](#)
- ♦ [Section 9.11, “Trustee Rights Utility for NetWare,” on page 104](#)
- ♦ [Section 9.12, “Attributes Utility for Linux,” on page 106](#)
- ♦ [Section 9.13, “FLAG \(NetWare\),” on page 108](#)

For an explanation of trustee rights, see [“Understanding File System Access Control Using Trustees” on page 67](#).

## 9.1 Generating a Server Security Report (NetWare)

For NetWare, you can generate the server Security report in Novell Remote Manager for NetWare to help track potential security risks. This report shows only the information that the logged-in user is allowed to view. To receive a report with the most helpful information, log in as the Admin user or as a user with eDirectory rights equivalent to Admin.

To generate the Security report for your NetWare server:

- 1 Open a Web browser to the Novell Remote Manager, then log in as administrator or equivalent.
- 2 In the left navigator, click *Reports/Log Files* to open the Reports/Log Files page.
- 3 Click *View Security Report*.

From this report, you can track the following file system security information:

- ♦ Trustee assignments for each volume

Granting a user privileges at the root directory of a volume gives that user privileges to the entire volume unless those rights are specifically revoked at a lower level. You should be especially cautious about granting the Access Control right in a root directory. Users with the Access Control right can grant themselves all other rights in any subdirectory on the volume. You can improve network security by granting each user privileges only to the specific directories he or she uses.

- ♦ Trustee assignments for each common folder on the `sys :` volume

User, organization, role, or other eDirectory objects should have only limited access, such as Read and File Scan rights, to common directories on volume `sys:` such as `sys:\public` and `sys:\login`.

- ♦ A list of users that have security equivalence to user Admin

As the number of users with rights equivalent to user Admin increases, your security risks multiply. Any time a user with rights equivalent to user Admin leaves a server unattended, anyone can gain access to the server.

For information, see “**Security Report**” in the *OES 2 SP1: Novell Remote Manager for NetWare Administration Guide*.

## 9.2 Viewing a File System Trustee Report for a Volume (NetWare)

For NetWare, administrators can view a Volume Trustee Report to see which users are trustees of which files and directories on a volume.

- 1 In Novell Remote Manager for NetWare, click *Manage Server > Volumes* to open the Volume Management page.
- 2 Click the *Information* icon ⓘ next to volume you are monitoring.
- 3 Scroll down the page, then click the *Volume Trustee Report* link.

TEST



### Volume Trustee Report

[/TEST/acatt\\_home](#)

**Rights:** SRWCEMFA, **User / Group:** .CN=acatt.O=novell.T=THEACME\_TREE.

**Rights:** \_R\_\_\_\_F\_, **User / Group:** .CN=ddogg.O=novell.T=THEACME\_TREE.

**Rights:** \_RWCEMFA, **User / Group:** .CN=animals.O=novell.T=THEACME\_TREE.

## 9.3 Viewing a File System Trustee Report for a Directory or File

- 1 In iManager, use either of the following methods to locate the file or directory and display its properties.
  - ♦ In *Roles and Tasks*, select *Files and Folders > Properties*, then browse to locate and select the file or directory.
  - ♦ In the iManager toolbar, select the *View Objects* icon, browse the *Tree* view to locate and select the file or directory, then select *Actions > Properties*.
- 2 On the Properties page, select the *Rights* tab to view a list of trustees and their rights.

## 9.4 Viewing a File System Trustee Report for All Directories in a Volume

There are currently no supported tools that can generate a trustee report for all directories in a volume. Check the [Novell Support](http://www.novell.com/support/) (<http://www.novell.com/support/>) Web site and the [Novell Cool Solutions](http://www.novell.com/cool solutions/) (<http://www.novell.com/cool solutions/>) Web site for possible solutions that meet your needs. For example, one possible solution is [Display Trustee Assignments](http://www.novell.com/cool solutions/tools/14092.html) (<http://www.novell.com/cool solutions/tools/14092.html>).

## 9.5 Viewing Properties of a File or Folder

- 1 In iManager, click *Files and Folders*, then click *Properties* to open the *Properties* page.
- 2 Use one of the following methods to specify the volume, folder, or file that you want manage:
  - ♦ Click the *Search* icon to browse and locate volume, folder or file from the Storage objects, then click the name link of the object to select it.
  - ♦ Click the *History* icon to select a volume, folder, or file from the list of Storage objects that you recently accessed.

The pathname of the object appears in the *Name* field.

- 3 Click *OK* to view the properties for the selected volume, folder, or file.

The properties are displayed in three *Files and Folders* tabs:

Properties Tabs	Description	For Information
Information	<ul style="list-style-type: none"><li>♦ View details about the selected volume, folder, or file.</li><li>♦ Configure directory quotas for folders on NSS volumes where the Directory Quotas attribute is enabled.</li><li>♦ Modify the file owner.</li><li>♦ Configure file or directory attributes.</li></ul>	See <a href="#">Section 9.6, "Managing Directory Quotas, File Ownership, and File or Directory Attributes for NSS Volumes,"</a> on page 86.

Properties Tabs	Description	For Information
Rights	<ul style="list-style-type: none"> <li>View details about trustees, trustee rights, and inherited rights filter for the selected volume, folder, or file.</li> <li>Add or remove trustees.</li> <li>Grant or revoke trustee rights for one or multiple trustees.</li> <li>Configure the inherited rights filter.</li> </ul>	See <a href="#">Section 9.7.2, “Configuring Rights (File System Trustees, Trustee Rights, and Inherited Rights Filter),” on page 90.</a>
Inherited Rights	<ul style="list-style-type: none"> <li>View details about explicitly assigned trustee rights and inherited rights at all levels along the path from the selected file or folder to the <code>root</code> of the volume.</li> <li>View the effective rights for a given trustee for the selected volume, folder, or file.</li> </ul>	See <a href="#">Section 9.7.3, “Viewing Effective Rights for a Trustee,” on page 93.</a>

## 9.6 Managing Directory Quotas, File Ownership, and File or Directory Attributes for NSS Volumes

- 1 Select a volume, folder, or file to manage.

For instructions, see [Section 9.5, “Viewing Properties of a File or Folder,” on page 85.](#)

- 2 Click the *Information* tab to view or modify the following properties for the selected volume, folder, or file:

**IMPORTANT:** Changes do not take effect until you click *OK* or *Apply*. If you click a different tab before you save, changes you make on this page are lost.

Property	Description
Location	<p>The pathname of the selected volume, folder, or file. For example:</p> <pre>VOL1:dir1\dirB\filename.ext</pre>
Restrict Size (Enable or Disable a Directory Quota on a Folder)	<p>Enable (select) or disable (deselect) a directory quota on the specified folder on an NSS volume where the Directory Quotas attribute is enabled. The default is Disabled.</p> <p>If this option is enabled, you must also specify a value for the quota in the Limit field.</p> <p>A directory quota limits the amount of space on a volume that can be consumed by all of the files and folders in that directory. The directory quota applies to files and folders created by any user of the directory.</p> <p>Select <i>Restrict Size</i> to enable a directory quota for the selected folder, specify the quota value in <i>Limit</i>, then click <i>Apply</i>.</p> <p>Deselect <i>Restrict Size</i> to disable a directory quota for the selected folder, then click <i>Apply</i>.</p>

Property	Description
Limit (Set Limit for a Directory Quota on a Folder)	<p>The maximum size allowed for the specified directory and its contents.</p> <p>Default: Disabled (not available unless <i>Restrict Size</i> is enabled).</p> <p>If you enable <i>Restrict Size</i> for the selected folder, you must specify a limit for the directory quota. Type a value in KB for the quota. The value must be an increment of 4 KB; that is, it must be divisible by 4 with no remainder. Click <i>Apply</i> to save the changes.</p> <p>If the value you specify exceeds the volume quota, the volume quota overrides the directory quota.</p> <p>If the current size of the selected folder exceeds the specified limit, users cannot save data to the folder until space is cleared by removing files from it.</p> <p>If a user quota is set for a user on the volume, the user space restriction overrides the directory quota. That is, the user cannot save data to the folder if doing so causes the user to exceed his or her user quota.</p>
Created	The time stamp (MM/DD/YYYY hh:mm) for when the file or folder was created.
Modified	The time stamp (MM/DD/YYYY hh:mm) for when the file or folder was last modified.
Accessed	The time stamp (MM/DD/YYYY hh:mm) for when the file or folder was last accessed.
Archived	The time stamp (MM/DD/YYYY hh:mm) for when the file or folder was last archived.
Creator (View or Modify Ownership)	<p>The typeless distinguished Novell eDirectory™ username (such as username.context) of the user who created the file or folder. If the username becomes invalid, such as if an employee leaves the company, the GUID of the username is reported. For NSS, any number of files or folders can be represented by GUIDs instead of valid usernames.</p> <p>User quotas for NSS volumes consider file ownership to enforce user space restrictions. You might need to change the ownership of a file or folder in order to make the space it consumes be charged against a different user.</p> <p>For NSS volumes on NetWare and Linux, NCP volumes on Linux, and NetWare traditional volumes on NetWare, all access to data is controlled by file system trustees and trustee rights instead of by ownership. When a user creates a file or folder, the trustees and trustee rights for accessing the file are automatically inherited from the directory where the file is created. If you intend different trustees and rights for the file, you must assign them explicitly. For instructions, see <a href="#">Section 9.7.2, “Configuring Rights (File System Trustees, Trustee Rights, and Inherited Rights Filter),” on page 90</a>.</p> <p>Changing the ownership of the file or folder does not modify who can access it, but it does modify whose username is charged for the space it consumes. If you modify the ownership, you must click <i>Apply</i> or <i>OK</i> to save the changes.</p>
Archiver	The distinguished username (such as username.context) of the user who modified the version of the file or folder that was last archived.

Property	Description
Modifier	The distinguished username (such as username.context) of the user who last modified the current version of the file or folder.
Attributes	<p>File attributes determine how the file or folder behaves when accessed by any user. Enable or disable an attribute by selecting or deselecting the check box next to it. If you modify a setting, click <i>Apply</i> or <i>OK</i> to save the changes.</p> <p>File attributes apply universally to all users. For example, a file that has a read-only attribute is read-only for all users.</p> <p>Attributes can be set by any trustee with the Modify right to the directory or file, and attributes stay set until they are changed. Attributes do not change when you log out or when you down a file server.</p> <p>For example, if a trustee with the Modify right enables the Delete Inhibit attribute for a file, no one, including the owner of the file or the network administrator, can delete the file. However, any trustee with the Modify right can disable the Delete Inhibit attribute to allow the file's deletion.</p>

The following table defines file system attributes and whether they apply to files, folders, or both files and folders.



Attribute	Description	Files	Folders
Read Only	Prevents a file from being modified.	Yes	No
Archive	Identifies files and folders that have been modified since the last backup. This attribute is assigned automatically.	Yes	Yes
Hidden	Hides directories and files so they do not appear in a file manager or directory listing.	Yes	Yes
Shareable	Allows more than one user to access the file at the same time. This attribute is usually used with Read Only.	Yes	No
Transactional	<p>Allows a file on an NSS volume or a NetWare Traditional volume to be tracked and protected by the Transaction Tracking System™ (TTS™) for NetWare.</p> <p>For NSS, the TTS attribute for the volume must be enabled in order for this setting to be enforced. TTS is not available for NSS on Linux.</p>	Yes	No
Purge Immediate	Flags a directory or file to be erased from the system as soon as it is deleted. Purged directories and files cannot be recovered.	Yes	Yes
Rename Inhibit	Prevents the directory or file name from being modified.	Yes	Yes
Delete Inhibit	<p>Prevents users from deleting a directory or file.</p> <p>This attribute overrides the file system trustee Erase right. When Delete Inhibit is enabled, no one, including the owner and network administrator, can delete the directory or file. A trustee with the Modify right must disable this attribute to allow the directory or file to be deleted.</p>	Yes	Yes
Copy Inhibit	<p>Prevents users from copying a file. This attribute works only for clients using Macintosh operating systems to access NSS volumes on NetWare.</p> <p>This attribute overrides the trustee Read right and File Scan right. A trustee with the Modify right must disable this attribute to allow the file to be copied.</p>	Yes	No

3 If you modified any settings, click *Apply* or *OK* to save your changes.

## 9.7 Managing File System Trustees in iManager

NSS uses the Novell Trustee Model for controlling access to user data. As an administrator or a user with the Supervisor right or Access Control right, you can use the Files and Folders plug-in to iManager to manage file system trustees, trustee rights, inherited rights filters, and attributes for a file or folder on an NSS volume. A user who has only the Access Control right cannot modify the rights of another user who has the Supervisor right.

- ♦ [Section 9.7.1, “Prerequisites,” on page 90](#)
- ♦ [Section 9.7.2, “Configuring Rights \(File System Trustees, Trustee Rights, and Inherited Rights Filter\),” on page 90](#)
- ♦ [Section 9.7.3, “Viewing Effective Rights for a Trustee,” on page 93](#)

## 9.7.1 Prerequisites

- ♦ The volume that you want to manage must be in the same tree where you are currently logged in to iManager.
- ♦ You must have trustee rights for the volume, folder, and file that you want to manage.
- ♦ The volume must be a file system that uses the Novell trustee model for file access, such as an NSS volume on OES 2 NetWare or Linux, an NSS or NetWare traditional volume on NetWare® 6.5, or an NCP™ (NetWare Core Protocol™) volume (an NCP share on Ext3 or Reiser file system) on OES 2 Linux.

## 9.7.2 Configuring Rights (File System Trustees, Trustee Rights, and Inherited Rights Filter)

File system trustees, trustee rights, and inherited rights filters are used to determine access and usage for directories and files on NSS volumes on OES 2 NetWare and Linux, NCP volumes on OES 2 Linux, and NSS and NetWare Traditional volumes on NetWare 6.5. If you modify any settings, you must click *Apply* or *OK* to save the changes.

### Viewing, Adding, or Removing File System Trustees

A trustee is any Novell eDirectory object (such as a User object, Group object, Organizational Role object, or other container object) that you grant one or more rights for a directory or file. Trustee assignments allow you to set permissions for and monitor user access to data.

- 1 In iManager, click *Files and Folders*, then click *Properties* to open the *Properties* page.
- 2 On the *Properties* page, select a volume, folder, or file to manage.  
For instructions, see [Section 9.5, “Viewing Properties of a File or Folder,” on page 85](#).
- 3 Click the *Rights* tab to view the trustees, trustee rights, and inherited rights filter for the selected volume, folder, or file.
- 4 Add trustees.
  - 4a Scroll down to the *Add Trustees* field.
  - 4b Use one of the following methods to add usernames as trustees:
    - ♦ Click the *Search* icon, browse to locate the usernames of the users, groups, or roles that you want to add as trustees, click the name link of the objects to add them to the *Selected Objects* list, then click *OK*.
    - ♦ Click the *History* icon to select usernames from a list of users, groups, or roles that you recently accessed.
    - ♦ Type the typeless distinguished username (such as username.context) in the *Add Trustees* field, then click the *Add (+)* icon.

The usernames appear in the Trustees list, but they are not actually added until you click *Apply* or *OK*. Each of the usernames has the default Read and File Scan trustee rights assigned.

  - 4c On the *Properties* page, click *Apply* to save the changes.
- 5 Remove trustees.
  - 5a Scroll down to locate and select the username of the user, group, or role that you want to remove as a trustee.

**5b** Click the *Remove* (red X) icon next to the username to remove it as a trustee.

The username disappears from the list, but it is not actually removed until you click *Apply* or *OK*.

**5c** On the *Properties* page, click *Apply* to save changes.

### Viewing, Granting, or Revoking File System Trustee Rights

Administrator users and users with the Supervisor right or the Access Control right can grant or revoke file system trustee rights for a volume, folder, or file. Only the administrator user or user with the Supervisor right can grant or revoke the Access Control right.

**1** In iManager, click *Files and Folders*, then click *Properties* to open the *Properties* page.

**2** On the *Properties* page, select a volume, folder, or file to manage.

For instructions, see [Section 9.5, “Viewing Properties of a File or Folder,” on page 85](#).

**3** Click the *Rights* tab to view the trustees, trustee rights, and inherited rights filter for the selected volume, folder, or file.

**4** Scroll to locate the username of the trustee you want to manage.

**5** In the check boxes next to the trustee name, select or deselect the rights you want to grant or revoke for the trustee.

---

**IMPORTANT:** Changes do not take effect until you click *OK* or *Apply*. If you click a different tab before you save, any changes you have made on this page are lost.

---

Trustee Right	Description
Supervisor (S)	Grants the trustee all rights to the directory or file and any subordinate items.  The Supervisor right cannot be blocked with an inherited rights filter (IRF) and cannot be revoked. Users who have this right can also grant other users any rights to the directory or file and can change its inherited rights filter.  Default=Off
Read (R)	Grants the trustee the ability to open and read files, and open, read, and execute applications.  Default=On
Write (W)	Grants the trustee the ability to open and modify (write to) an existing file.  Default=Off
Erase (E)	Grants the trustee the ability to delete directories and files.  Default=Off
Create (C)	Grants the trustee the ability to create directories and files and salvage deleted files.  Default=Off
Modify (M)	Grants the trustee the ability to rename directories and files, and change file attributes. Does not allow the user to modify the contents of the file.  Default=Off
File Scan (F)	Grants the trustee the ability to view directory and file names in the file system structure, including the directory structure from that file to the root directory.  Default=On
Access Control (A)	Grants the trustee the ability to add and remove trustees for directories and files and modify their trustee assignments and inherited rights filters.  Default=Off

**6** Click *Apply* or *OK* to save changes.

### Configuring the Inherited Rights Filter for a File or Directory

File system trustee rights assignments made at a given directory level flow down to lower levels until they are either changed or masked out. This is referred to as inheritance. The mechanism provided for preventing inheritance is called the inherited rights filter. Only those rights allowed by the filter are inherited by the child object. The effective rights that are granted to a trustee are a combination of explicit rights set on the file or folder and the inherited rights. Inherited rights are overridden by rights that are assigned explicitly for the trustee on a given file or folder.

- 1** In iManager, click *Files and Folders*, then click *Properties* to open the *Properties* page.
- 2** On the *Properties* page, select a volume, folder, or file to manage.  
For instructions, see [Section 9.5, “Viewing Properties of a File or Folder,” on page 85](#).
- 3** Click *Information*, then scroll down to view the inherited rights filter.

The selected rights are allowed to be inherited from parent directories. The deselected rights are disallowed to be inherited.

- 4 In the *Inherited Rights Filter*, enable or disable a right to be inherited from its parent directory by selecting or deselecting the check box next to it.
- 5 Click *Apply* or *OK* to save the changes.

### 9.7.3 Viewing Effective Rights for a Trustee

Effective rights are the explicit rights defined for the trustee plus the rights that are inherited from the parent directory. The *Inherited Rights* page shows the inheritance path for a trustee for the selected file or folder and the effective rights at each level from the current file or directory to the root of the volume. You can use this information to help identify at which directory in the path a particular right was filtered, granted, or revoked.

- 1 In iManager, click *Files and Folders*, then click *Properties* to open the *Properties* page.
- 2 On the *Properties* page, select a volume, folder, or file to manage.  
For instructions, see [Section 9.5, “Viewing Properties of a File or Folder,” on page 85](#).
- 3 On the *Properties* page, click the *Inherited Rights* tab to view the effective rights for a given trustee.  
By default, the page initially displays the effective rights for the username you used to log in to iManager.
- 4 On the *Inherited Rights* page, click the *Search* icon next to the *Trustee* field to browse for and locate the username of the trustee you want to manage, then select the username by clicking the name link.  
The path for the selected file or folder is traced backwards to the root of the volume. At each level, you can see the rights that have been granted and inherited to create the effective rights for the trustee.
- 5 If you make any changes, click *Apply* or *OK* to save them.

## 9.8 Managing File System Trustees, Trustee Rights, and Inherited Rights Filters

Use the following methods to modify file system trustees for directories and files on NSS or NetWare Traditional file systems.

- ♦ [Section 9.8.1, “Using Novell NetStorage,” on page 93](#)
- ♦ [Section 9.8.2, “Using the Novell Client to Manage Trustees and Trustee Rights,” on page 94](#)
- ♦ [Section 9.8.3, “Using the Novell Client to Manage Inherited Rights and Filters,” on page 95](#)
- ♦ [Section 9.8.4, “Using Novell Remote Manager for NetWare \(NetWare\),” on page 96](#)

### 9.8.1 Using Novell NetStorage

- 1 Open your Web browser to NetStorage and log in.
- 2 Right-click the directory or file you want to manage, then select *Properties*.
- 3 Do one or more of the following:

Although the option labels refer to NetWare, use the options for your NSS volumes on Linux or NetWare.

- ♦ **Add Trustees:** Click the *NetWare Rights* tab, click the *eDirectory Object* viewer and brows to select the trustee you want to add, then click *Plus (+)*.
- ♦ **Remove Trustees:** Click the *NetWare Rights* tab, select the *Trustee* check box next to one or more trustees you want to remove, then click *Remove*.
- ♦ **Modify File System Rights:** Click the *NetWare Rights* tab, in the *Rights* check boxes next to the trustee, select or deselect rights for the trustee, then click *Apply*.

For information, see [Section 8.2, “File-System Trustee Rights,” on page 68](#).

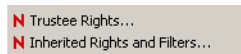
- ♦ **Modify Inherited Rights Filter:** Click the *NetWare Rights* tab, select or deselect *Inherited Rights*, then click *Apply*.

For information, see [Section 8.2, “File-System Trustee Rights,” on page 68](#).

## 9.8.2 Using the Novell Client to Manage Trustees and Trustee Rights

Administrators and users can manage file-system trustee rights for network directories and files, using the Novell Client on their workstations.

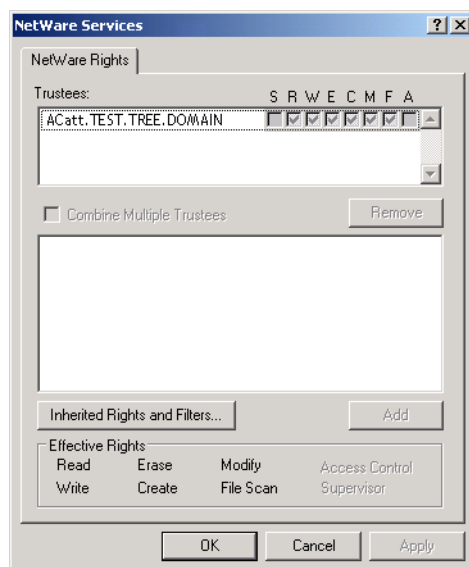
- 1 In a file manager, right-click the network directory or file, then select *Trustee Rights*.



- 2 In the *Trustees* area, click the username to display the user's trustee rights.

Each trustee's rights are shown by a check mark under the letters of the associated rights. If there are no trustees listed, access for the selected directory or file is currently governed only by its Inherited Rights and Filters.

If you are viewing the properties of multiple directories or files, the trustees and rights shown are the combined trustees and rights for all the files.



- 3 In the *Effective Rights* area, view the actual rights of the selected user.

Explicit file-system trustee rights override inherited rights. If there are no trustees listed, the effective rights are the same as the inherited rights.

- 4 (Conditional) If you have the Supervisor right or the Access Control right for the selected network directory or file, you can configure trustee rights.

Do one or more of the following:

- ♦ **Add a Trustee:** Click *Add*, type the fully distinguished name (*username.context.tree.domain*) of the user you want to add, then click *OK*.
- ♦ **Modify Trustee Rights:** Select one or more trustees, select or deselect the check box for each trustee right you want to modify, then click *Apply*.
- ♦ **Delete a Trustee:** Select one or more trustees, then click *Remove*.
- ♦ **Combine Multiple Trustees:** This option is available only when viewing the file-system trustee rights for multiple directories or files. Additionally, at least one of the selected directories or files must have at least one trustee assignment.

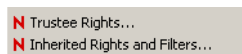
Select one or more trustees from the *Trustees* list, select *Combine Multiple Trustees*, then click *Apply*. The trustees' rights are combined and applied to all selected directories and files. All selected trustees become trustees of all selected directories and files.

- 5 When you are done, click *OK* to apply your changes.

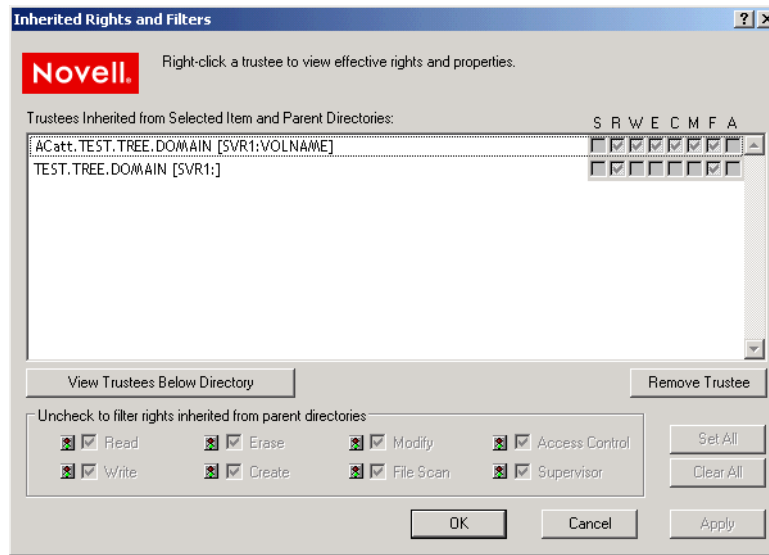
### 9.8.3 Using the Novell Client to Manage Inherited Rights and Filters

Administrators and users can manage file system inherited rights and filters for network directories and files, using the Novell Client on their workstations. For information about filtering inherited rights, see [Section 8.2.6, “Inherited Trustee Rights,” on page 72](#).

- 1 Use one of the following methods to access the Inherited Rights and Filters dialog box:
- ♦ In a file manager, right-click the network directory or file, then select *Inherited Rights and Filters*.



- ♦ In the file-system trustee rights window, click *Inherited Rights and Filters*.



- 2 (Conditional) If you have the Supervisor right or the Access Control right for the selected network directory or file, you can configure its inherited rights. Do one or more of the following:
  - ♦ **Modify Trustee Rights:** Select the trustee you want to manage from the *Trustees Inherited from Selected Item and Parent Directories*. Select or deselect the check box of the file-system trustee right you want to modify, then click *Apply*.  
Changing the Inherited Rights and Filters does not grant rights; it removes rights previously assigned at a higher level in the path. Deselect the right to filter the right for a specific trustee or for all trustees of the selected directory or file.
  - ♦ **Delete a Trustee:** Select the trustee you want to manage from the *Trustees Inherited from Selected Item and Parent Directories*, then click *Remove Trustee*.
- 3 (Conditional) If you selected a directory, click *View Trustees Below Directory* to view a list of trustees for files or directories in the selected directory.
- 4 When you are done, click *OK*.

#### 9.8.4 Using Novell Remote Manager for NetWare (NetWare)

Administrators can also use Novell Remote Manager for NetWare to perform these tasks on NetWare.

- 1 In Novell Remote Manager, click *Manage Server > Volumes* to open the Volume Management page.
- 2 Click the *Volume* link of the volume you want to manage.
- 3 Browse to the directory or file you want to manage.
- 4 Click the *Properties* icon to the left of the directory or file you want to manage.



[\[Back to directory listing for: /TEST\]](#)

## Directory entry information

Owner	ACATT
Creation date and time	Jun 30, 2004 12:51 pm
Effective rights	SRWCEMFA
Inherited rights filter	<a href="#">SRWCE_F</a>
File space limit	None
File space in use	Not available

## Trustee information:

Object name	Trustee rights	
.CN=acatt.O=novell.T=TODDSBUILDTREE.	<a href="#">SRWCEMFA</a>	<a href="#">Delete</a>
.CN=ddogg.O=novell.T=TODDSBUILDTREE.	<a href="#">R_F</a>	<a href="#">Delete</a>
.CN=animals.O=novell.T=TODDSBUILDTREE.	<a href="#">RWCEMFA</a>	<a href="#">Delete</a>

Add Trustee **User Name:**  Browse

Salvageable files: None

**New name:**

**New name:**

## 5 Do one or more of the following:

- ♦ **Add a Trustee:** Type the full distinguished name or bindery name of the User object you want to add in the *User Name* field of the *Trustee Information*, or browse to the User object and select it, then click *Add Trustee*.
- ♦ **Modify Trustee Rights:** Locate the User object name in the list of User objects under the *Trustee Information*, then click the *Trustee Rights* link next to the username. Select or deselect the check box for the trustee right you want to change, then click *OK*.
- ♦ **Delete a Trustee:** Locate the User object name in the list of User objects under the *Trustee Information*, then click the *Delete* link next to the username.
- ♦ **Modify the Inherited Rights Filter:** Click the *Inherited Rights Filter* link in the directory or file information table. Select or deselect the check box for the rights you want to modify, then click *OK*.

Changing the Inherited Rights Filter does not grant rights; it only removes rights previously assigned at a higher level in the tree.

## 9.9 Managing File System Attributes for NSS and NetWare Traditional Volumes

Administrators can configure NetWare directory and file attributes using the following methods:

- ♦ [Section 9.9.1, “Using Novell NetStorage,” on page 98](#)
- ♦ [Section 9.9.2, “Using the Novell Client,” on page 98](#)

- ♦ [Section 9.9.3, “Using Novell Remote Manager \(NetWare\),” on page 99](#)
- ♦ [Section 9.9.4, “Using the NetWare GUI \(NetWare\),” on page 100](#)

For information about NetWare directory and file attributes and how to apply them, see [Section 8.6, “Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes,” on page 75](#).

## 9.9.1 Using Novell NetStorage

- 1 Open your Web browser to NetStorage and log in.
- 2 Right-click the directory or file you want to manage, then select *Properties*.
- 3 Click the *NetWare Info* tab, select or deselect attributes for the selected directory or file, then click *Apply*.

Although the option label refers to NetWare, use the option for your Linux and NetWare NSS volumes.

Select from the following attributes:

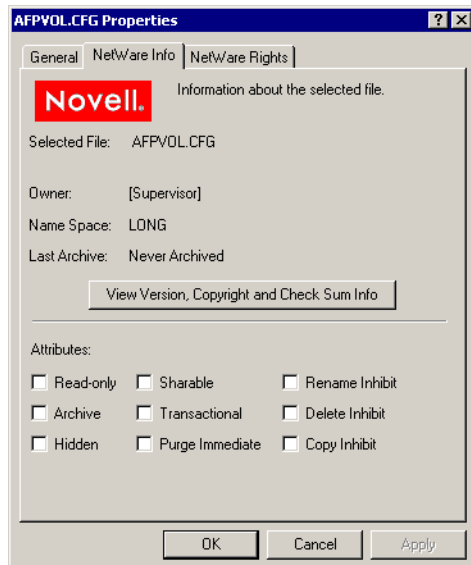
- ♦ *Read only*
- ♦ *Archive*
- ♦ *Hidden*
- ♦ *Shareable*
- ♦ *Transactional*
- ♦ *Purge immediate*
- ♦ *Rename inhibit*
- ♦ *Delete inhibit*
- ♦ *Copy inhibit*

For information, see [Section 8.6, “Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes,” on page 75](#)

## 9.9.2 Using the Novell Client

Administrators and users with trustee rights can specify some file system attributes for directories and files, using the Novell® Client™ on their workstations.

- 1 In a file manager, right-click the network directory or file, select *Properties*, then click *NetWare Info*.



- 2 In the *Attributes* area, select the attribute to enable it, then click *Apply*.

The attribute change is applied only if all the following conditions are met:

- ♦ The user has the correct trustee rights necessary to modify the selected attribute.
- ♦ The attribute must be a viable attribute for the underlying file system where the file resides. For example, some attributes apply only to NetWare Traditional volumes.
- ♦ The attribute must be enforceable by NCP or NSS in the current network configuration.

- 3 Click *OK*.

### 9.9.3 Using Novell Remote Manager (NetWare)

- 1 In Novell Remote Manager for NetWare, click *Manage Server > Volumes* to open the Volume Management page.
- 2 Click the *Volume* link of the volume you want to manage.
- 3 Browse to select the directory or file you want to manage.
- 4 View the resource's attributes in the *Attributes* column.

/TEST ?

[Upload](#)
[Text Search](#)
[Inventory](#)
[File Search](#)

NetWare File Listing					
Info	Name	Type	Size	Date and time	Attributes
	.				
	acatt_home		N/A	Jun 30, 2004 12:05 pm	---A-----
	Icon		0	Jun 30, 2004 12:03 pm	---A-Rw-----
	VOLDATA.TDF		1,784	Jul 9, 2004 3:00 pm	---A-Rw-----
	Volume_Inventory.xml		4,756	Jun 30, 2004 1:10 pm	---A-Rw-----
	Volume_Trustees.xml		374	Jun 30, 2004 1:10 pm	---A-Rw-----

4 Files.  
 6 KBytes in use.  
 180 MBytes available.

5 To modify the attributes, click the *Attributes* link.

/TEST/acatt\_home

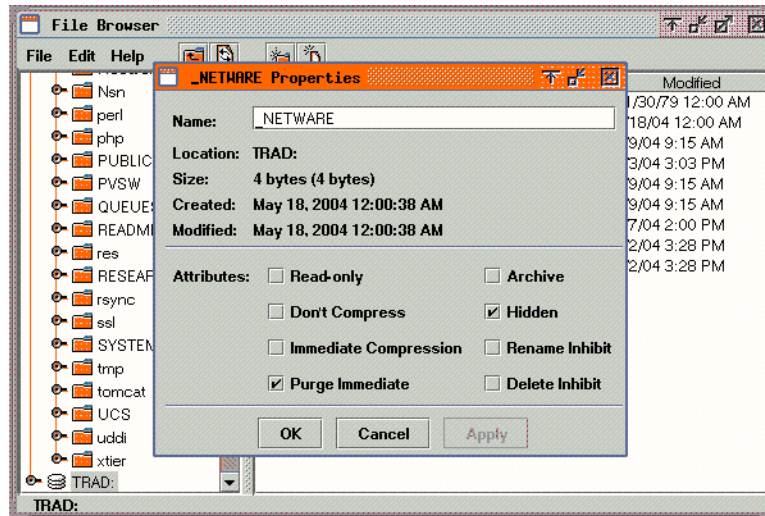
Folder Attributes	Description
<input type="checkbox"/> System	If checked, this indicates a system file or folder.
<input type="checkbox"/> Hidden	If checked, this indicates that this file or folder is excluded from normal directory searches.
<input checked="" type="checkbox"/> Archive	If checked, this indicates that the file or folder needs to be archived.
<input type="checkbox"/> Immediate Purge	If checked, this indicates that when this file or folder or the folder contents are deleted and are unrecoverable.
<input type="checkbox"/> Don't Compress	If checked, this indicates that this file or the contents of the folder cannot be compressed..
<input type="checkbox"/> Don't Migrate	If checked, this indicates that this file or folder cannot be migrated to near line storage..
<input type="checkbox"/> Delete Inhibit	If checked, this indicates that this file or folder cannot be deleted.
<input type="checkbox"/> Rename Inhibit	If checked, this indicates that this file or folder name cannot be renamed.
<input type="checkbox"/> Immediate Compress	If checked, this indicates that this file or the folder contents will be scheduled for compression..

6 Select or deselect the check box for the attribute you want to set.

7 Click *OK*.

## 9.9.4 Using the NetWare GUI (NetWare)

- 1 In your NetWare GUI console, browse to the directory or file you want to view or change the attributes of.
- 2 Right-click the directory or file to open its Properties page.



- 3 View the attributes in the Attribute area.
- 4 Select or deselect the check box for the attribute you want to set.
- 5 Click *OK*.

## 9.10 Trustee Rights Utility for Linux

The Trustee Rights Utility for Linux allows you to specify trustee rights for directories and files in NSS volumes on OES Linux. This utility does not provide support for Trustees on Linux file systems. It is also not meant to be used to set trustees for NSS volumes on OES NetWare. The trustee information is saved in the file and directory metadata in the NSS volume and works seamlessly with OES NetWare if the volume is moved to OES NetWare.

### 9.10.1 Purpose

Use this utility at a workstation to

- ♦ View or modify user or group rights for files
- ♦ View or modify user or group rights for directories and volumes

### 9.10.2 Syntax

```
rights [OPTIONS]
rights [TOPTIONS] trustee USERNAME
rights [DOPTIONS] delete USERNAME
rights [IOPTIONS] irf
rights [EROPTIONS] effective USERNAME
rights [SOPTIONS] show
```

### 9.10.3 Actions

The first argument indicates the action to be taken.

---

trustee	Add or modify a trustee on a file or directory.
delete	Remove a trustee from a file or directory.
irf	Set the inherited rights filter on a directory.
effective	Display a user's effective rights.
show	Display the trustees and inherited rights filter.

---

### 9.10.4 Options

#### OPTIONS

---

-v, --version	Display the program version information.
-h, --help	Display the help screen.

---

#### TOPTIONS

---

-r, --rights=MASK	Specify the rights to be given to this trustee. For information, see MASK.  If the No Rights (n) option is assigned, the trustee is removed.  If rights are not specified, the default assignment is Read and File Scan rights.
-f, --file=filename	Specify the name of file or directory to assign trustees to. Filename is the path for the file or directory. For example:  -f /users/username/userfile.sxi  --file=/designs/topsecret  If a file or directory is not specified, the current directory is used.

---

#### DOPTIONS

---

-f, --file=filename	The name of file or directory to delete trustees from. Filename is the path for the file or directory.  If a file or directory is not specified, the current directory is used.
---------------------	---

---

## OPTIONS

---

<code>-r, --rights=MASK</code>	Specify the rights to be passed through the filter. For information, see MASK.  If rights are not specified, the default assignment is All Rights.
<code>-f, --file=filename</code>	Specify the name of the directory where the filter is to be applied. Filename is the path for the directory.  If a directory is not specified, the current directory is used.

---

## EROPTIONS

---

<code>-f, --file=filename</code>	The name of file or directory where effective right are to be calculated. Filename is the path for the file or directory.  If a file or directory is not specified, the current directory is used.
----------------------------------	--

---

## SOPTIONS

---

<code>-f, --file=filename</code>	Specify the name of the file or directory to display a list of its trustees.  If a file or directory is not specified, the current directory is used.
----------------------------------	---

---

## USERNAME

The username is the fully distinguished name of an eDirectory object, including the tree name. For example: `username.context.treename` or `joe.engineer.acme_tree`.

If you use special characters in a username, you must escape those special characters in the command line. For example, the '\$' is a special character reserved to the shell and must be escaped. For the bash shell, the command could be written in one of two ways on the command line:

```
rights -f /media/nss/DATA/stuff -r none \$j\$o\$e.engineer.acme_tree
```

```
rights -f /media/nss/DATA/stuff -r none '$j$o$e.engineer.acme_tree'
```

If you are using another shell, the special characters might need a different escape technique. In this case, please refer to the shell documentation for this information.

## MASK

The mask is a string of characters, with each character representing a type of rights. The following table lists the rights, the letter to use for each right, and what the right is used for.

---

Right	Use to
s (Supervisor)	Grant all rights to the file or directory.
r (Read)	Open and read files in the directory.
w (Write)	Open and write to files in the directory.

---

Right	Use to
c (Create)	Create files and subdirectories.
e (Erase)	Erase files and directories.
m (Modify)	Rename files and directories, and change file attributes.
f (File Scan)	View and search on file and directory names in the file system structure.
a (Access Control)	Add and remove trustees and change trustee rights to files and directories.
none (No Rights)	Remove all rights.
all (All Rights)	Add All rights except Supervisor.

## 9.10.5 Example

```
rights -f /designs/topsecret -r rwfc trustee joe.engineer.acme_tree
```

This command assigns Read, Write, File Scan, and Create rights to the `/designs/topsecret` directory for user `joe` in the `engineer` context of the `acme_tree` eDirectory tree.

# 9.11 Trustee Rights Utility for NetWare

The Trustee Rights Utility for NetWare allows you to specify trustee rights for directories and files in NSS volumes on OES NetWare.

## 9.11.1 Purpose

Use this utility at a workstation to

- ♦ View or modify user or group rights for files
- ♦ View or modify user or group rights for directories and volumes

## 9.11.2 Syntax

```
RIGHTS path [[ + | - ] rights] [/option...] [/? | /VER]
```

Parameter	Use to
<i>path</i>	Specify the path to the file, directory, or volume you want to modify or view rights to (you must always specify a path).
<i>+   -</i>	Add or delete the specified rights. See <a href="#">“Using RIGHTS” on page 105</a> .
<i>rights</i>	Specify one or more file or directory rights. See <a href="#">“File and Directory Rights” on page 105</a> .
<i>/option</i>	Replace <i>option</i> with any available option. See <a href="#">“RIGHTS Options” on page 105</a> .
<i>/?</i>	View online help. All other parameters are ignored when <i>/?</i> is used.



Parameter	Use to
/VER	View the version number of the utility and the list of files it uses to execute. All other parameters are ignored when /VER is used.

## RIGHTS Options

Option	Use to
/C	Scroll continuously through output.
/F	View the Inherited Rights Filter (IRF).
/I	View the trustee and group rights that created the inherited rights, and view where the inherited rights came from.
/NAME= <i>username</i>	View or modify rights for the user or group listed. Replace <i>username</i> with the name of the user or group whose rights you want to view or modify.
/S	View or modify subdirectories below the current level.
/T	View trustee assignments in a directory.

## File and Directory Rights

The following table lists the rights, the letter to use for each right, and what the right is used for.

Right	Use to
S (Supervisor)	Grant all rights to the file or directory.
R (Read)	Open and read files in the directory.
W (Write)	Open and write to files in the directory.
C (Create)	Create files and subdirectories.
E (Erase)	Erase files and directories.
M (Modify)	Rename files and directories, and change file attributes.
F (File Scan)	View and search on file and directory names in the file system structure.
A (Access Control)	Add and remove trustees and change trustee rights to files and directories.
N (No Rights)	Remove all rights.
REM (Remove)	Remove the user or group as a trustee of the specified file or directory.
ALL	Add All rights except Supervisor.

### 9.11.3 Using RIGHTS

- ♦ If you use + (plus) to add rights, the rights you list are added to the existing rights.
- ♦ If you use – (minus) to remove rights, the rights you list are deleted from the existing rights.

- ♦ If you add and delete rights in the same command, group all added rights together and all deleted rights together.
- ♦ If you list rights without using + or -, the rights you list replace the existing rights.
- ♦ You must always specify a path. You can use a period (.) to represent your current directory.
- ♦ You can use wildcard characters.

### 9.11.4 Examples

- ♦ To set the trustee rights in the current directory for user JANICE to Read, Write, and File Scan, enter

```
RIGHTS . RWF /NAME=JANICE
```

- ♦ To remove user ERNESTO as a trustee of SYS:USERS, enter

```
RIGHTS SYS:USERS REM /NAME=ERNESTO
```

- ♦ To see where user PATRICK's inherited rights came from for SYS:USERS\HOME, type

```
RIGHTS SYS:USERS\HOME /NAME=PATRICK /I
```

## 9.12 Attributes Utility for Linux

The Attributes (ATTRIB) Utility for Linux allows you to specify file system attributes for directories and files in NSS volumes on OES Linux.

---

**IMPORTANT:** This utility works only with directories and files in the NSS file system on Linux.

---

### 9.12.1 Purpose

Use at a workstation to

- ♦ View or modify file system attributes for files
- ♦ View or modify file system attributes for directories

### 9.12.2 Syntax

```
attrib [OPTIONS] [filename]
```

If both the set and clear options are selected, the clear option is done before the set option. If the filename is not specified, the operation is done on the current directory.

### 9.12.3 Options

#### OPTIONS

Option	Description
-s, --set=ATTRIBUTES	Sets the attributes on the file

Option	Description
-c, --clear=[ATTRIBUTES   all]	Clears the attributes on the file
-l, --long	Displays a long version of the file's attributes
-q, --quiet	Does not display any normal output
-v, --version	Displays the program version information
-h, --help	Displays the ATTRIB help screen

## ATTRIBUTES

Multiple attributes are comma separated.

Code	Description	Applies to Files	Applies to Directories
aa	Attribute Archive identifies that a file's metadata has been modified since the last backup. This attribute is assigned automatically.	Yes	No
all	All (used only for the Clear option) represents all attributes that can be modified.	Yes	Yes
ar	Archive identifies files that have modified content since the last backup. This attribute is assigned automatically.	Yes	No
cc	Cannot compress (status display only) displays if the file cannot be compressed because of limited space savings.	Yes	No
ci	Copy Inhibit prevents users from copying a file. This attribute overrides the trustee Read right and File Scan right. This attribute works only for clients using Macintosh operating systems.	Yes	No
cm	Compressed (status display only) displays whether the file is currently stored in compressed format.	Yes	No
dc	Do Not Compress keeps data from being compressed. This attribute overrides settings for automatic compression of files not accessed within a specified number of days.	Yes	No
di	Delete Inhibit prevents users from deleting a directory or file.  This attribute overrides the trustee Erase right. When it is enabled, no one, including the owner and network administrator, can delete the directory or file. A trustee with the Modify right must disable this right to allow the directory or file to be deleted.	Yes	Yes
ex	Execute indicates program files such as .exe or .com.	Yes	No
hi	Hidden hides directories and files so they do not appear in a file manager or directory listing.	Yes	Yes

Code	Description	Applies to Files	Applies to Directories
ic	Immediate Compress sets data to be compressed as soon as a file is closed. If applied to a directory, every file in the directory is compressed as each file is closed.  The files in the specified directory are compressed as soon as the operating system can perform the operation after the file is closed. This does not apply to the directory's subdirectories and the files in them.	Yes	Yes
ip	Immediate Purge flags a directory or file to be erased from the system as soon as it is deleted. Purged directories and files cannot be recovered.	Yes	Yes
ln	Link (status display only) indicates a symbolic link (soft link).	Yes	No
mg	Migrated (status display only) displays if the file or directory is migrated to near-line media.	Yes	Yes
mi	Migrate Inhibit prevents directories and files from being migrated from the server's disk to a near-line storage medium.	Yes	Yes
ri	Rename Inhibit prevents the directory or file name from being modified.	Yes	Yes
ro	Read Only prevents a file from being modified.	Yes	No
sd	Subdirectory (status display only) indicates that the entry is a directory, not a file.	No	Yes
sh	Sharable allows more than one user to access the file at the same time. This attribute is usually used with Read Only.	Yes	No
sy	System hides the directory or file so it does not appear in a file manager or directory listing. System is normally used with operating system files, such as Linux or NetWare system files.	Yes	Yes
tr	Transactional allows a file to be tracked and protected by the Transaction Tracking System™ (TTS™). This option works only on NetWare.	Yes	No
vo	Volatile indicates that a file can change without being written to so that opportunistic locks cannot be set on it.	Yes	No

### 9.12.4 Example

```
attrib /designs/topsecret -c=all -s=ro,di
```

This command clears all attributes, then sets read-only and delete-inhibit on the /designs/topsecret file.

## 9.13 FLAG (NetWare)

For NetWare, you can use the FLAG utility to set directory and file attributes from the command line. For information, see “**FLAG (NetWare)**” in the *OES 2 SP1: NSS File System Administration Guide*.

# Understanding Directory Structures in Linux POSIX File Systems

# 10

This section discusses directory structures for Linux POSIX file systems on your Novell® Open Enterprise Server 2 Linux server.

- ♦ [Section 10.1, “Linux Filesystem Hierarchy,” on page 109](#)
- ♦ [Section 10.2, “Default Directories,” on page 109](#)
- ♦ [Section 10.3, “Linux File Types,” on page 110](#)
- ♦ [Section 10.4, “POSIX Access Control Lists,” on page 110](#)

For information about OES Linux file systems, see the *SUSE Linux Enterprise Server 10 Installation and Administration Guide* ([http://www.novell.com/documentation/sles10/sles\\_admin/data/sles\\_admin.html](http://www.novell.com/documentation/sles10/sles_admin/data/sles_admin.html)).

## 10.1 Linux Filesystem Hierarchy

Linux recommends a standard file and directory placement. For information, see the *Linux Filesystem Hierarchy* (<http://www.tldp.org/LDP/Linux-Filesystem-Hierarchy/html/index.html>) at the *Linux Documentation Project* (<http://www.tldp.org>).

---

**IMPORTANT:** Refer to individual product documentation to understand where Novell applications store files within this hierarchy.

---

## 10.2 Default Directories

In Linux, all directories are attached to the root directory, which is identified by a forward slash (/). Directories that are only one level below the root directory are preceded by a slash, to indicate their position and prevent confusion with other directories that could have the same name. For example, the table below lists some common second-level directories:

Linux Directory	Description
/bin	System binaries, user programs with normal user permissions
/sbin	Executables that need root permission
/data	A user-defined directory
/dev	System device tree
/etc	System configuration
/home	Users' home directories
/home/ <i>username</i>	A user's personal home directory

Linux Directory	Description
/tmp	System temporary files
/usr	Applications software
/usr/bin	Executable files for programs with user permission
/var	System variables
/lib	Libraries needed for installed programs to run

Every device and hard disk partition is represented in the Linux file system as a subdirectory of the root directory. For example, the floppy disk drive in Linux might be /etc/floppy. The root directory lives in the root partition, but other directories (and the devices they represent) can reside anywhere. Removable devices and hard disk partitions other than the root are mounted (attached) to subdirectories in the directory tree. This is done either at system initialization or in response to a mount command.

**NOTE:** There are no standards in Linux for which subdirectories are used for which devices.

All the file systems use directories and subdirectories. NetWare<sup>®</sup> separates directories with a backslash, and Linux uses a forward slash. NetWare filenames are case insensitive. Linux file names are case sensitive. For example “abc” and “aBc” are different files in Linux, but in NetWare, they refer to the same file.

## 10.3 Linux File Types

As with most file systems, Linux supports a variety of file types, as described in the following table:

File Type	First Character in File Listing	Description
Regular file	-	Normal files such as text, data, or executable files
Directory	d	Files that are lists of other files
Link	l	A shortcut that points to the location of the actual file
Special file	c	Mechanism used for input and output, such as files in /dev
Socket	s	A special file that provides inter-process networking protected by the file system's access control
Pipe	p	A special file that allows processes to communicate with each other without using network socket semantics

## 10.4 POSIX Access Control Lists

For information, see “Access Control Lists” ([http://www.novell.com/documentation/sles10/sles\\_admin/data/cha\\_acls.html](http://www.novell.com/documentation/sles10/sles_admin/data/cha_acls.html)) in the *SUSE Linux Enterprise Server 10 Installation and Administration Guide* ([http://www.novell.com/documentation/sles10/sles\\_admin/data/sles\\_admin.html](http://www.novell.com/documentation/sles10/sles_admin/data/sles_admin.html)).

# Documentation Updates

# A

This section contains information about documentation content changes made to the *OES 2: File Systems Management Guide* since the initial release of Novell® Open Enterprise Server 2. If you are an existing user, review the change entries to readily identify modified content. If you are a new user, simply read the guide in its current state.

Refer to the publication date, which appears on the front cover and the Legal Notices page, to determine the release date of this guide. For the most recent version of the *OES 2: File Systems Management Guide*, see the [Novell documentation Web site \(http://www.novell.com/documentation/oes2/stor\\_filesys\\_lx\\_nw/data/hn0r5fzo.html\)](http://www.novell.com/documentation/oes2/stor_filesys_lx_nw/data/hn0r5fzo.html).

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

This document was updated on the following dates:

- ♦ [Section A.1, “December 2008 \(OES 2 SP1, NetWare 6.5 SP8\),” on page 111](#)
- ♦ [Section A.2, “January 4, 2008,” on page 112](#)

## A.1 December 2008 (OES 2 SP1, NetWare 6.5 SP8)

Updates were made to address new documentation standards. In addition, updates were made to the following sections. The changes are explained below.

- ♦ [Section A.1.1, “Coexistence and Migration Issues,” on page 111](#)
- ♦ [Section A.1.2, “Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes,” on page 112](#)
- ♦ [Section A.1.3, “Managing Folders and Files on NSS and NetWare Traditional Volumes,” on page 112](#)
- ♦ [Section A.1.4, “Understanding File System Access Control Using Trustees,” on page 112](#)

### A.1.1 Coexistence and Migration Issues

Location	Change
<a href="#">Section , “Core Linux Utilities,” on page 21</a>	<b>IMPORTANT:</b> To enable users of NSS volumes and NCP volumes to use the core Linux utilities, you must PAM-enable the utility with Linux User Management (LUM) and Linux-enable the users with LUM.

## A.1.2 Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes

Location	Change
<a href="#">Section 9.12, “Attributes Utility for Linux,” on page 106</a>	The Copy Inhibit attribute works only for Macintosh clients to access NSS volumes on NetWare.

## A.1.3 Managing Folders and Files on NSS and NetWare Traditional Volumes

Location	Change
<a href="#">Section 7.2, “Deleting a File or Folder on an NSS Volume,” on page 48</a>	A folder must be empty before it can be deleted.

## A.1.4 Understanding File System Access Control Using Trustees

Location	Change
<a href="#">Section 8.6, “Directory and File Attributes for NSS Volumes or NetWare Traditional Volumes,” on page 75</a>	Read only prevents a file from being modified.

## A.2 January 4, 2008

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

- [Section A.2.1, “What’s New for File System Management and Access,” on page 112](#)
- [Section A.2.2, “Management Tools for Files and Folders Management,” on page 113](#)

### A.2.1 What’s New for File System Management and Access

Location	Change
<a href="#">Section 2.2.1, “Files and Folders Plug-In to Novell iManager 2.7,” on page 16</a>	Directory quotas management is available only for NSS volumes where the volume’s Directory Quotas attribute is enabled.
	Salvage and purge of deleted files and directories is available only for NSS volumes where the volume’s Salvage attribute is enabled.



## A.2.2 Management Tools for Files and Folders Management

Location	Change
<a href="#">“Deleted Files” on page 26</a>	Salvage and purge of deleted files and directories is available only for NSS volumes where the volume’s Salvage attribute is enabled.
<a href="#">“Properties” on page 26</a>	Directory quotas management is available only for NSS volumes where the volume’s Directory Quotas attribute is enabled.