

File Systems Management Guide

Open Enterprise Server 2 SP3

May 3, 2013

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About This Guide

This document describes how to create directories and files on a Novell Open Enterprise Server (OES) 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 and NetWare Core Protocol (NCP) volumes on Linux POSIX file systems.

For information about managing Linux POSIX file systems and access control lists, see the *SUSE Linux Enterprise Server 10 SP3 Installation and Administration Guide* (http://www.novell.com/documentation/sles10/book_sle_reference/data/book_sle_reference.html).

This guide is divided into the following sections:

- ♦ Chapter 1, “File Systems Overview,” on page 9
- ♦ Chapter 2, “What’s New for File System Management and Access,” on page 11
- ♦ Chapter 3, “Coexistence and Migration Issues,” on page 19
- ♦ Chapter 4, “Management Tools for Files and Folders Management,” on page 25
- ♦ Chapter 5, “Understanding File System Access Control Using Trustees,” on page 33
- ♦ Chapter 6, “Configuring Trustees and File System Attributes,” on page 61
- ♦ Chapter 7, “Understanding Directory Structures for the NSS File System,” on page 79
- ♦ Chapter 8, “Managing Files and Folders,” on page 81
- ♦ Chapter 9, “Managing Directory Quotas on NSS Volumes,” on page 91
- ♦ Chapter 10, “Salvaging or Purging Deleted Files and Folders on NSS Volumes,” on page 99
- ♦ Chapter 11, “Configuring File System Attributes for NSS Files and Folders,” on page 105
- ♦ Chapter 12, “Understanding Directory Structures in Linux POSIX File Systems,” on page 117
- ♦ Appendix A, “Documentation Updates,” on page 119

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

Consult the following guides for information about managing file systems and file access protocols:

- ♦ *OES 2 SP3: NSS File System Administration Guide for Linux*
- ♦ *OES 2 SP3: NCP Server for Linux Administration Guide*
- ♦ *SUSE Linux Enterprise Server 10 SP4 Installation and Administration Guide* (http://www.novell.com/documentation/sles10/book_sle_reference/data/book_sle_reference.html)
- ♦ *Novell Client 2.0 SP3 for Linux Administration Guide*
- ♦ *Novell Client 2 for Windows Vista/2008 Administration Guide*
- ♦ *Novell Client 2 SP3 for Windows Administration Guide* (for Windows 7, 8, Server 2008 R2, and Server 2012)
- ♦ *Novell Client 4.91 SP5 for Windows XP/2003 Installation and Administration Guide*
- ♦ *OES 2 SP3: Novell AFP For Linux Administration Guide*
- ♦ *OES 2 SP3: Novell CIFS for Linux Administration Guide*
- ♦ *OES 2 SP3: Domain Services for Windows Administration Guide*
- ♦ *OES2 SP3: Samba Administration Guide*

1 File Systems Overview

Novell Open Enterprise Server 2 Linux supports the Novell Storage Services file system, NetWare Core Protocol (NCP) volumes on Linux POSIX file systems, and Linux POSIX file systems such as Ext3, Reiser, and XFS. This section provides an overview of these file system options.

For an overview of file access protocols and other file services in OES 2 Linux, see “[File Services](#)” in the *OES 2 SP3: Planning and Implementation Guide*.

- ♦ [Section 1.1, “Novell Storage Services File System,”](#) on page 9
- ♦ [Section 1.2, “Linux POSIX File Systems,”](#) on page 9
- ♦ [Section 1.3, “NCP Volumes for Linux,”](#) on page 10

1.1 Novell Storage Services File System

Novell Open Enterprise Server Linux and later provides the Novell Storage Services (NSS) file system for Linux platforms. Its many features and capabilities include visibility, a trustee access control model, multiple simultaneous name space support, native Unicode, user and directory quotas, rich file attributes, multiple data stream support, event file lists, and a file salvage 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.

You can move NSS volumes on NetWare 6.5 SP8 to an OES 2 SP1 Linux (or later) server. For information, see “[Cross-Platform Issues for NSS Volumes](#)” in the *OES 2 SP3: NSS File System Administration Guide for Linux*.

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. For information, see the *OES 2 SP3: Novell Cluster Services NetWare to Linux Conversion 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 SP3: NSS File System Administration Guide for Linux*

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.
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/book_sle_reference/data/cha_filesystems.html) in the *SUSE Linux Enterprise Server 10 SP3 Installation and Administration Guide* (http://www.novell.com/documentation/sles10/book_sle_reference/data/book_sle_reference.html).

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, XFS, and 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.

For information, see *OES 2 SP3: NCP Server for Linux Administration Guide*.

2 What's New for File System Management and Access

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

- [Section 2.1, "What's New \(May 2013 Patches\)," on page 11](#)
- [Section 2.2, "What's New \(April 2013 Patches\)," on page 11](#)
- [Section 2.3, "What's New \(January 2013 Patches\)," on page 12](#)
- [Section 2.4, "What's New \(September 2011 Patches\)," on page 13](#)
- [Section 2.5, "What's New \(OES 2 SP3\)," on page 13](#)
- [Section 2.6, "What's New \(OES 2 SP2\)," on page 14](#)
- [Section 2.7, "What's New \(OES 2 SP1\)," on page 15](#)
- [Section 2.8, "What's New \(OES 2\)," on page 15](#)

2.1 What's New (May 2013 Patches)

Setting the [Public] Trustee for a Distributed File Services Junction in iManager

The Distributed File Services plug-in for iManager was modified to allow the [Public] trustee to be selected as a trustee of a junction. For information about setting trustees on DFS junctions, see ["Adding or Deleting Trustees for the Junction"](#) in the *OES 2 SP3: Novell Distributed File Services Administration Guide for Linux*.

2.2 What's New (April 2013 Patches)

Upgrade to eDirectory 8.8.7

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

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

2.3 What's New (January 2013 Patches)

Upgrade to Novell iManager 2.7.6

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

Novell iManager 2.7.6 provides the following enhancements:

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

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

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

Novell Client Support for Windows 8 and Server 2012

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

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

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

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

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

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

OES Client Services Support for Windows 8 and IE 10

In the January 2013 Scheduled Maintenance for OES 2 SP3, OES client services added support for user access from Windows 8 clients (excluding Windows 8 RT), with the exception of Domain Services for Windows (DSfW). DSfW was not tested with Windows 8 clients and does not support them.

Client applications are supported to run on Windows 8 clients in the desktop user interface view.

Web-based client access is supported for the Internet Explorer 10 Web browser in the desktop user interface view for Windows 7 clients and Windows 8 clients.

OES Client Services Do Not Support Windows Server 2012

In the January 2013 Scheduled Maintenance for OES 2 SP3, OES client services were not tested with Windows Server 2012 servers. Client access support for Windows Server 2012 is not planned for OES 2 SP3.

OES Client Services Support for Mac OS X 10.8 and Safari 6.0

In the January 2013 Scheduled Maintenance for OES 2 SP3, OES client services added support for user access from Mac OS X Mountain Lion (version 10.8) clients, with the exception of Domain Services for Windows (DSfW) and Novell iFolder:

- ♦ DSfW was not tested with Mac OS X 10.8 clients and does not support them. DSfW support for Mac OS X 10.8 clients is planned for a future release.
- ♦ The iFolder client does not run on Mac OS X 10.8 clients and does not support them.

Web-based client access is supported for the Apple Safari 6.0 Web browser on Mac OS X 10.8 clients. Safari 6.0 is not supported by DSfW and iFolder.

2.4 What's New (September 2011 Patches)

In addition to bug fixes, Novell Cluster Services added support for OES 2 SP3 services and file systems on the SUSE Linux Enterprise Server (SLES) 10 SP4 operating system. You can upgrade to SLES 10 SP4 by using the `move-to-sles10-sp4` patch in the SLES patch channel.

2.5 What's New (OES 2 SP3)

In addition to bug fixes, the following file access features were added for the OES 2 SP3 release.

- ♦ [Section 2.5.1, "Files and Folders Plug-in to iManager," on page 13](#)
- ♦ [Section 2.5.2, "NCP Volumes on XFS File System," on page 14](#)
- ♦ [Section 2.5.3, "Novell Client 2 SP3 for Linux," on page 14](#)
- ♦ [Section 2.5.4, "Novell Client 2 SP1 for Windows," on page 14](#)
- ♦ [Section 2.5.5, "Novell CIFS," on page 14](#)
- ♦ [Section 2.5.6, "Novell FTP," on page 14](#)

2.5.1 Files and Folders Plug-in to iManager

Move and rename options were added for the Files and Folders plug-in to iManager. For information, see the following:

- ♦ [Section 8.2, "Moving a File or Folder to a Different Folder on the Same Volume," on page 83](#)
- ♦ [Section 8.3, "Renaming a File or Folder on an NSS Volume or NCP Volume," on page 84](#)

2.5.2 NCP Volumes on XFS File System

NCP volumes have been fully tested on the XFS file system. NCP volumes are supported on the Linux POSIX file systems Ext3, XFS, and ReiserFS.

2.5.3 Novell Client 2 SP3 for Linux

The Novell Client 2 SP3 for Linux supports SLES 10 SP3 and OES 2 SP3 Linux. For information, see the [Novell Client 2.0 SP3 for Linux Administration Guide](#).

2.5.4 Novell Client 2 SP1 for Windows

Novell Client 2 SP1 for Windows added support for Windows 7. For information, see the [Novell Client 2 for Windows Vista/2008 Administration Guide](#).

2.5.5 Novell CIFS

Novell CIFS added support for the merged view of Dynamic Storage Technology volumes that are configured with NSS volumes. For information, see the [OES 2 SP3: Novell CIFS for Linux Administration Guide](#).

2.5.6 Novell FTP

Novell FTP provides integration of the native Linux PureFTPd with eDirectory to provide authenticated and anonymous access to FTP sites. For information, see “[Novell FTP \(Pure-FTPd\) and OES 2](#)” in the [OES 2 SP3: Planning and Implementation Guide](#).

2.6 What’s New (OES 2 SP2)

The enhancements and changes described in this section were made to file systems management features for OES 2 SP2.

- ♦ [Section 2.6.1, “Deleting a Non-Empty Folder,” on page 14](#)
- ♦ [Section 2.6.2, “New Units for Directory Quotas in the Files and Folders Plug-In to iManager,” on page 14](#)

2.6.1 Deleting a Non-Empty Folder

Beginning in OES 2 SP2, it is possible to delete a non-empty folder. Previously, you had to delete all of the folder’s contents before deleting the folder.

2.6.2 New Units for Directory Quotas in the Files and Folders Plug-In to iManager

Beginning in OES 2 SP2, the Files and Folders plug-in to iManager allows directory quotas to be specified in KB (kilobytes), MB (megabytes), or GB (gigabytes). Previously and in other tools, directory quotas must be specified in KB.

2.7 What's New (OES 2 SP1)

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

- ♦ [Section 2.7.1, “Novell AFP for Linux,” on page 15](#)
- ♦ [Section 2.7.2, “Novell CIFS for Linux,” on page 15](#)
- ♦ [Section 2.7.3, “Novell Domain Services for Windows,” on page 15](#)

2.7.1 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 SP3: Novell AFP For Linux Administration Guide](#).

2.7.2 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 SP3: Novell CIFS for Linux Administration Guide](#).

2.7.3 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 SP3: Domain Services for Windows Administration Guide](#).

2.8 What's New (OES 2)

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

- ♦ [Section 2.8.1, “Files and Folders Plug-In to Novell iManager 2.7,” on page 15](#)
- ♦ [Section 2.8.2, “Novell Client,” on page 16](#)
- ♦ [Section 2.8.3, “Samba Plug-In to Novell iManager 2.7,” on page 16](#)
- ♦ [Section 2.8.4, “Novell Distributed File Services,” on page 17](#)
- ♦ [Section 2.8.5, “Extended Attributes Support for Backing Up Trustee Information for NSS Volumes on Linux,” on page 17](#)

2.8.1 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 and NCP (NetWare Core Protocol) volumes on OES 2 Linux and later.

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)

2.8.2 Novell Client

See the following resources for the latest release of the Novell Client, which provides 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)

2.8.3 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 SP3: Samba Administration Guide](#).

2.8.4 Novell Distributed File Services

Novell Distributed File Services is supported on OES 2 Linux. Replica sites for the DFS management context can run on OES 2 Linux or NetWare 6.5 SP8, 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 2.7x 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 SP3: Novell Distributed File Services Administration Guide for Linux](#).

2.8.5 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](#)” in the [OES 2 SP3: NSS File System Administration Guide for Linux](#).

3 Coexistence and Migration Issues

This section discusses the issues involved in the coexistence of NSS and Linux POSIX file systems in Novell Open Enterprise Server 2. It also identifies some differences in how the Novell Trustee Model is managed on Linux as compared to NetWare 6.5 SP8.

- ♦ [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 23](#)
- ♦ [Section 3.4, “Acquiring eDirectory Security Equivalence Vectors for NSS Users,” on page 23](#)

3.1 Comparison of NSS to Other File Systems

The *OES 2 SP3: NSS File System Administration Guide for Linux* provides the following comparisons of the Novell Storage Services (NSS) file system on NetWare and Linux and of the NSS file system to NCP volumes on Linux POSIX file systems:

Comparison	NSS on NetWare	NSS on Linux	Linux POSIX File Systems with NCP
“Comparison of NSS on NetWare and NSS on Linux”	X	X	
“Comparison of NSS on Linux and NCP Volumes on Linux POSIX File Systems”		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 19](#)
- ♦ [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
- ♦ File system access control, such as NSS file and directory attributes

See the following sections for an overview of these issues:

- ♦ [“Novell eDirectory Users” on page 20](#)
- ♦ [“Local-Only Users” on page 21](#)
- ♦ [“Core Linux Utilities” on page 21](#)

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: based on the access method:

File System	NCP Server for Linux	Other Protocols (such as NFS or Samba)	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. They include:

- ◆ 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`)

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 SP3: Novell Linux User Management Administration Guide](#).

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 the NSS file system for Linux:

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

Management Tool	NSS File System on Linux		
	NCP	NFS or Samba	Core Linux Utilities
NSS rights utility	Yes	Yes	Yes

Management Tool	NSS File System on Linux		
	NCP	NFS or Samba	Core Linux Utilities
Novell NetStorage	Yes	Yes	Yes, for NetStorage with SSH support
Novell Client for Windows XP/2003 and for Windows Vista	Yes	Not applicable	Not applicable
Novell Client for Linux	Yes	Not applicable	Not applicable
ConsoleOne	Yes	No	No

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

Management Tool	Linux POSIX File Systems		
	NCP	NFS or Samba	Core Linux Utilities
NSS <code>rights</code> utility	Yes	Not applicable	Not applicable
Novell NetStorage	Not supported by NetStorage	Not applicable	Not applicable
Novell Client for Windows XP/2003 and for Windows Vista	Yes	Not applicable	Not applicable
Novell Client for Linux	Yes	Not applicable	Not applicable
ConsoleOne	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:

- ◆ Ensure that 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 the NSS file system and NCP volumes on Linux POSIX file systems. These are the same rights that exist for NSS file system on NetWare. The trustee rights include:

- ◆ Read
- ◆ Write
- ◆ Create
- ◆ Erase
- ◆ Modify
- ◆ File Scan
- ◆ Access Control
- ◆ Supervisor

For information, see [Section 5.1, “Understanding the Novell Trustee Model for File System Access,” on page 33](#).

NCP Server supports all NSS file system attributes. For information about attributes, see [Section 5.7, “Understanding Directory and File Attributes for NSS Volumes,” on page 54](#).

NCP volumes created on Linux POSIX file systems (such as Ext3, XFS, and Reiser) support only the Read Only, Hidden, and Shareable file system 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 Linux, SEVs are acquired differently for NSS on Linux than they are for NSS on NetWare.

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”](#) in the *OES 2 SP3: NSS File System Administration Guide for Linux*.

4 Management Tools for Files and Folders Management

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 29](#)
- ♦ [Section 4.3, “Novell NetStorage,” on page 31](#)
- ♦ [Section 4.4, “Novell Client,” on page 32](#)

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, “Using the Files and Folders Role in iManager,” on page 27](#)
- ♦ [Section 4.1.4, “Using the Tree, Browse or Search View in iManager,” on page 28](#)

4.1.1 Files and Folders Plug-In Quick Reference

The Files and Folders plug-in for iManager 2.7 (or later) provides the Files and Folders role in *Roles and Tasks*. It is also integrated in iManager as the *View Objects* option in the iManager toolbar. File browsing in iManager is available for file systems that have a Volume object defined in eDirectory, such as for NSS volumes on Linux and for NCP volumes on Linux.

The Files and Folders Manager NPM file (`fileman.npm`) is automatically installed in iManager. For information about installing NPM files for iManager, see the [Novell iManager 2.7.6 Administration Guide](#).

The Files and Folders plug-in for Novell iManager 2.7 provides the tasks described in this section. All of the tasks and actions that are available under the *Files and Folders* role are also available from the *View Objects* tree view.

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

- ♦ [“Rename” on page 27](#)
- ♦ [“Upload” on page 27](#)

Delete

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

Deleted Files

Salvage or purge deleted files 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 SP3: NSS File System Administration Guide for Linux*.

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.

Move to Folder

Move a file or folder on an NSS volume or NCP volume to a different directory in the same volume.

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
Information	<p>View information about a selected file or directory, such as:</p> <ul style="list-style-type: none"> ♦ Current size ♦ Time stamps for when the file was created, modified, accessed, and archived ♦ File attributes <p>View or modify the file or folder owner for an NSS volume. (You must be logged in as an administrator user of the server.)</p> <p>View or modify a directory quota. Directory quotas management is available only for NSS volumes where the volume’s Directory Quotas attribute is enabled.</p>

Tab	Task Description
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.

Rename

Rename a file or folder on an NSS volume or NCP volume.

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 user name 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.

To modify file or folder ownership on an NSS volume, log in as a user with the Write right to the NCP Server object. Usually, this is the administrator user or a user with rights equivalent to the administrator user. This user must additionally be assigned as a trustee of the file or folder and have the Access Control and Write trustee rights for it.

4.1.3 Using the Files and Folders Role 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*, expand the Files and Folders role to reveal its main tasks:
 - ♦ *Delete*
 - ♦ *Deleted Files* (Salvage or purge deleted files on an NSS volume where the Salvage attribute is enabled)

- ◆ *Download*
 - ◆ *Move to Folder*
 - ◆ *New Folder*
 - ◆ *Properties*
 - ◆ *Rename*
 - ◆ *Upload*
- 3 Select a task from the list.
 - 4 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 dialog box. 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.

The file or folder must be on a server that is in the same Novell eDirectory tree where you are currently logged in.
 - 5 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.
 - 6 Complete the information required for the action.
 - 7 Click *OK* to perform the action, or click *Cancel* to abandon the changes.

4.1.4 Using the Tree, Browse or Search View in iManager

The Files and Folders plug-in is also integrated in the *Tree*, *Browse*, and *Search* view of a server's eDirectory objects in the left pane. You can browse to locate the Volume object of interest, then perform actions on them.

- 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 Click the *View Objects* icon in the iManager toolbar to view the *Tree*, *Browse*, and *Search* view of a server's eDirectory objects in the left pane.
- 3 Use any of the following methods to locate the file or folder of interest:
 - ◆ In the *Tree* view, navigate the tree to locate the volume of interest, then a *Volume* object to see the hierarchical file system tree view of the volume's folders and files.

Click the plus (+) or minus (-) icon next to a directory name to expand or collapse the view of its subdirectories.
 - ◆ In the *Browse* view, select a server, volume, or folder to see a list of its folders and files beneath that object in the right pane.
 - ◆ In the *Search* view, find a volume to see a list of its folders and files beneath that object in the right pane.
- 4 Perform any of the following tasks:

Task	Action to Perform
Create a folder	Select <i>New > New Folder</i> , specify the folder name, then click <i>OK</i> twice.
Delete a file or folder	Select the check box next to the file or folder, click <i>Delete</i> , then click <i>OK</i> .

Task	Action to Perform
Download a file	Select the check box next to the file that you want to download, select <i>Actions > Download</i> , browse to select the folder on a local drive or a mapped drive where you want to save the file, then click <i>OK</i> to download the file.
Move a file or folder to a different folder on the same volume	Select the check box next to the file or folder, click <i>Edit</i> , browse to select the file or folder to move, select the target folder in the same volume, then click <i>OK</i> .
Rename a file or folder	Select the check box next to the file or folder, click <i>New > Rename</i> , browse to select the file or folder to rename, specify the new name, then click <i>OK</i> twice.
Salvage or purge deleted files	Select the check box next to the folder on an NSS volume where the Salvage attribute is enabled, select <i>Actions > Deleted Files</i> to view a list of deleted files, select the files of interest, click Salvage or Purge, then click <i>OK</i> .
Upload a file	Select the check box next to the folder where you want to upload the file, select <i>Actions > Upload</i> , browse to select the file from a local drive or a mapped drive, then click <i>OK</i> to upload the file.
View or modify the properties of a file or folder	Select the check box next to the file or folder, select <i>Actions > Properties</i> , modify the Information, Rights, or Inherited Rights, then click <i>OK</i> twice.

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. With NCP Server installed, you can create and manage NCP volumes as shares on Linux POSIX file systems. With Dynamic Storage Technology (DST) installed, you can create DST shadow volumes.

- ♦ [Section 4.2.1, “Prerequisites for Using Novell Remote Manager,” on page 29](#)
- ♦ [Section 4.2.2, “Novell Remote Manager for Linux,” on page 30](#)
- ♦ [Section 4.2.3, “Accessing Novell Remote Manager,” on page 31](#)
- ♦ [Section 4.2.4, “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 29](#)
- ♦ [“Prerequisites for Admin User Access on Linux Servers” on page 30](#)

Prerequisites for Remote Administration

Your configuration must satisfy the following prerequisites:

- ♦ Ensure that 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, ensure that 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 SP3: Novell Linux User Management Administration Guide](#).

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 SP3: 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 SP3: 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 SP3: Novell Remote Manager for Linux Administration Guide](#).

4.2.3 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, type the user name and password of the `root` user for that server, or type the user name and password of the Admin user (or equivalent user) who is an eDirectory user and who has been Linux-enabled.
- 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.

4.2.4 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 SP3: 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 user name and password to manage file system access for directories and files on NSS volumes. You can also log in as any user name 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 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 SP3 for Linux Administration Guide*](#)
- ◆ [*Novell Client 2 for Windows Vista/2008 Administration Guide*](#)
- ◆ [*Novell Client 4.91 SP5 for Windows XP/2003 Installation and Administration Guide*](#)
- ◆ [*Novell Login Scripts Guide*](#)

5 Understanding File System Access Control Using Trustees

The Novell Storage Services (NSS) volumes and NCP (Netware Control Protocol) volumes 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 control who can access a directory or file and which actions are possible.

- ♦ [Section 5.1, “Understanding the Novell Trustee Model for File System Access,” on page 33](#)
- ♦ [Section 5.2, “Configuring a Non-Admin User to be an Admin-Equivalent User,” on page 46](#)
- ♦ [Section 5.3, “Configuring \[Public\] as a File System Trustee,” on page 49](#)
- ♦ [Section 5.4, “Configuring the \[Public\] Trustee Access Rights on NSS Volumes for Daemons Running as the Nobody User,” on page 50](#)
- ♦ [Section 5.5, “Using QuickFinder with NCP Volumes and NSS Volumes,” on page 53](#)
- ♦ [Section 5.6, “Access Control for NSS on Linux,” on page 53](#)
- ♦ [Section 5.7, “Understanding Directory and File Attributes for NSS Volumes,” on page 54](#)
- ♦ [Section 5.8, “Viewing Key NSS Directory and File Attributes as Linux POSIX Permissions,” on page 56](#)
- ♦ [Section 5.9, “Troubleshooting File Attributes Issues,” on page 60](#)

5.1 Understanding the Novell Trustee Model for File System Access

The Novell Trustee Model allows you to assign Novell eDirectory objects as trustees of directories and files on NSS volumes and NCP volumes, and to assign file system rights to the trustees. The model’s inheritance function allows subdirectories and files to inherit rights from a parent directory in the directory tree, or to mask the rights that should not be inherited. The security equivalence function allows permissions to be assigned indirectly. The model also controls visibility of files and folders so that users can see only the directory paths needed to access the files where they have trustee rights.

The NSS file system natively supports the Trustee Model to control user access. The NCP Server on Linux emulates the Trustee Model’s functions for NCP volumes on traditional POSIX file systems (such as btrfs, Ext2/3, Reiser, and XFS). For NCP volumes, the actions are provided by the file access protocol and not the underlying native Linux file system. For NSS volumes, NCP Server synchronizes the emulated capabilities with the native capabilities of the NSS file system.

Before you assign trustees and set trustee rights, ensure that you have a solid understanding of the Novell Trustee Model and how its various functions can be used to control user access to data on NSS volumes and NCP volumes.

- ◆ [Section 5.1.1, “Trustees,” on page 34](#)
- ◆ [Section 5.1.2, “File System Trustee Rights,” on page 36](#)
- ◆ [Section 5.1.3, “Inherited Trustee Rights,” on page 39](#)
- ◆ [Section 5.1.4, “Security Equivalence,” on page 40](#)
- ◆ [Section 5.1.5, “Effective Rights,” on page 43](#)
- ◆ [Section 5.1.6, “Visibility,” on page 44](#)
- ◆ [Section 5.1.7, “Visibility Lists,” on page 45](#)
- ◆ [Section 5.1.8, “Security Equivalence Vector,” on page 46](#)

5.1.1 Trustees

A trustee is any Novell eDirectory object (such as a User, Group, Organizational Role, or container) that you grant rights to access a directory or file on an NSS volume or an NCP volume. Trustees and trustee rights can be assigned explicitly, or they can be assigned through inheritance and security equivalence. (These concepts are described in subsequent sections.)

Trustee assignments, and not file ownership, determine who can access a file. Administrator users can modify the ownership of files without affecting who has rights to access and use the files. Changing the file or folder ownership additionally requires that the user be the administrator user (or a user with the eDirectory Write right to the NCP Server object) for the server.

In OES, administrators, users, and network resources are represented as objects in an eDirectory database. The eDirectory structure is a flexible, hierarchical structure that can represent your business units, IT infrastructure, geographical locations, and so on.

[Figure 5-1](#) illustrates eDirectory objects and their relationship to network resources and users. 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. The YourCo container 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. In the Accounts container, Bob is a User object  for a system user who is assigned to the Accounts Department. Other OUs in the Finance container might represent Purchasing and Billing organizations. Other OUs in the YourCo container represent organizations at the same level as Finance, such as Sales, Marketing, and Manufacturing.

Figure 5-1 Example eDirectory Container and Objects



You can use the *Directory Administration* option in Novell iManager to create eDirectory objects. For information, see [“Managing Objects”](#) in the *Novell eDirectory 8.8 SP7 Administration Guide*.

Trustees can be set at multiple levels to get different results. The following sections describe how trustees work at different levels in the file system.

- ♦ [“Admin User and Admin-Equivalent Users” on page 35](#)
- ♦ [“\[Public\] Trustee” on page 35](#)
- ♦ [“Volume-Level Trustees” on page 36](#)
- ♦ [“Subdirectory-Level Trustees” on page 36](#)
- ♦ [“File-Level Trustees” on page 36](#)

Admin User and Admin-Equivalent Users

File system access for the Admin user and Admin-Equivalent users is not granted in the file system. Instead, a bit is set in the connection table to indicate that the user is an administrator and as such has full access to the server and all volumes thereon. The Admin user automatically has the Supervisor right to the Server object and can see all files and directories.

When you set a non-admin User object as security equal to the Admin user, you grant the user all the privileges of the Admin user. The Admin-equivalent privileges cannot be restricted by rights set for that User object through explicit trustee assignment, security equivalence to other groups or other users, or inheritance. For information, see [Section 5.2, “Configuring a Non-Admin User to be an Admin-Equivalent User,” on page 46](#).

Granting a user Admin-equivalence might be desired if the Admin-equivalent user has broad responsibilities for eDirectory and file system management. However, it provides more privileges than are needed if the administrator tasks you want the user to perform has limited management responsibilities.

To increase security or to support a distributed administration model, you can create a special User object for a specific management role and restrict file system and eDirectory rights required based on its administration responsibilities. You can set other User objects with security equal to that special User object. On Linux, ensure that you understand whether these users also need to belong to specific management groups or be enabled with Linux User Management (LUM). For an example of how to set up a special GroupWise administrator identity and assign the appropriate eDirectory rights and file system rights, see [“Assigning Rights Based on Administration Responsibilities” in the *GroupWise 8 Administration Guide*](#).

[Public] Trustee

[Public] is a special trustee; it is not an eDirectory object. The [Public] trustee represents any network user, logged in or not, for rights assignment purposes. The [Public] trustee 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.

IMPORTANT: For security reasons, you should not provide the file system Supervisor right to the [Public] trustee.

For information, see [Section 5.3, “Configuring \[Public\] as a File System Trustee,” on page 49](#).

For an example of how to use the [Public] trustee, see [Section 5.4, “Configuring the \[Public\] Trustee Access Rights on NSS Volumes for Daemons Running as the Nobody User,” on page 50](#).

Volume-Level Trustees

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 users privileges only to the specific directories they use by setting trustees explicitly or by leveraging the inheritance and security equivalence functions.

Subdirectory-Level Trustees

An assignment of trustee rights for a user at the subdirectory level can revoke rights assigned at a parent directory, or it can allow additional rights. Trustee rights granted on directories determine which rights are allowed to flow down for that trustee to the child subdirectories and files. The effective rights for a user on the current subdirectory are the combined set of explicit rights for the user plus security equivalence rights plus the filtered inherited rights.

File-Level Trustees

An assignment of trustee rights for a user at the file level can revoke rights assigned at the parent directory, or it can allow additional rights. For this user, inherited rights are ignored. The user's rights are the combined set of explicit rights for the user plus security equivalence rights. More restrictive security-equivalent rights do not revoke the explicitly set user rights.

5.1.2 File System Trustee Rights

Trustee rights are file system rights and not eDirectory rights. They govern the actions that a trustee can perform on a directory or file that resides on an NSS volume or NCP volume. Trustee rights can be granted explicitly. However, you can also leverage inheritance and security equivalence to provide effective rights to a user. (These concepts are described in subsequent sections.)

NCP Server stores the trustee IDs and rights settings on each volume in the `._NETWARE/.trustee_database.xml` file. For NSS volumes, the file system also stores each trustee's ID and rights assignment as metadata with the directory or file where the assignment is made.

- ♦ [“Rights Definitions” on page 36](#)
- ♦ [“Supervisor Right” on page 37](#)
- ♦ [“Access Control Right” on page 38](#)
- ♦ [“Default Trustee Rights” on page 38](#)
- ♦ [“Rights Needed for Typical Access Tasks” on page 38](#)

Rights Definitions

The actions for each right are described in [Table 5-1](#).

Table 5-1 File System Trustee Rights

File-System 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 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. 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
Create (C)	Grants the trustee the ability to create directories and files and salvage deleted files. Default=Off
Erase (E)	Grants the trustee the ability to delete directories and files. Default=Off
Modify (M)	Grants the trustee the ability to rename directories and files, and change file attributes. It 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, to modify the rights assigned for trustees, and set the inherited rights filters. This right does not allow the trustee to add or remove the Supervisor right for any user, nor to modify the rights granted for a trustee with the Supervisor right. Default=Off

Supervisor Right

An eDirectory trustee of a Server object is automatically granted the Supervisor right [S] to the root directory of every NSS volume attached to that server. You cannot override the file system rights of the user with the Supervisor right by applying explicit rights or masking inherited rights at the subdirectory or file level.

The Admin User object is automatically a trustee of the Server object.

The Supervisor user of the NSS 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.

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

Access Control Right

A non-Supervisor trustee must have the Access Control right [A] to make trustee assignments in a directory or file. A user with the Access Control right cannot modify the rights of a user with the Supervisor right.

Default Trustee Rights

When you assign a trustee for a directory, the default rights are Read and File Scan [RF]. 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. These are made visible by the visibility function; they are not actually set on the directories in the path.

Rights Needed for Typical Access Tasks

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

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

5.1.3 Inherited Trustee Rights

Subdirectories and files inherit rights from their parent directory. Typically, you set rights that you want to flow down to all users by assigning a Group object as the trustee of a directory located at the root of the volume. The trustee rights flow down through the file tree structure to its child subdirectories and files.

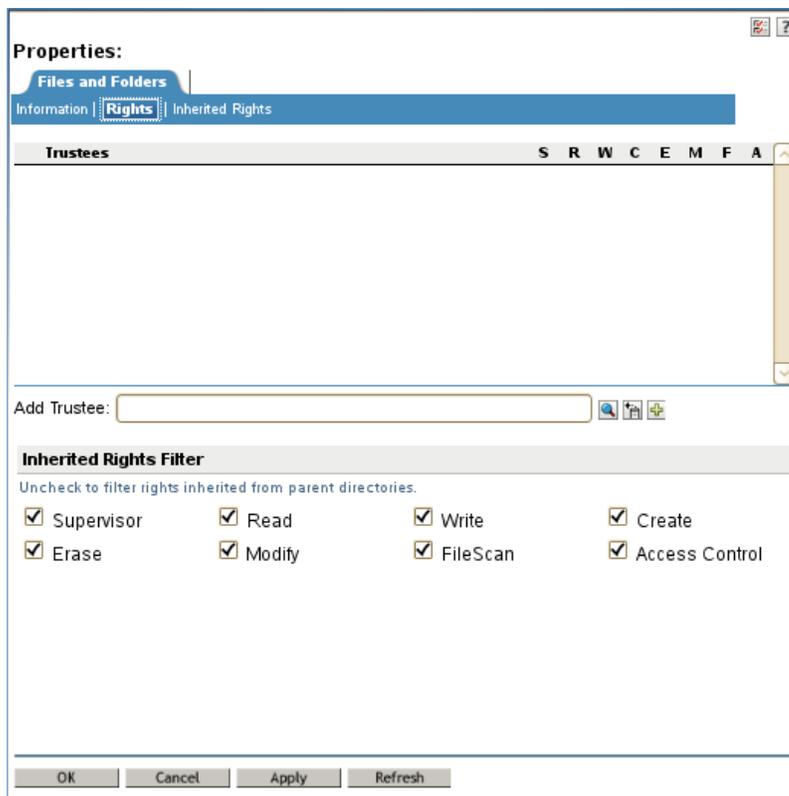
Setting rights for a trustee on a directory or a file changes inheritance in the following ways:

- ♦ **Directory:** Trustee rights granted on directories determine which rights are allowed to flow down for that trustee to the child subdirectories and files. The inherited rights filters set on child subdirectories and files are applied to the trustee's rights set on the parent directory.
- ♦ **File:** Trustee rights granted on a file determine which rights are allowed for the user. For this trustee or its security-equivalent trustees, inherited rights are ignored.

You can mask or filter what rights can be inherited. The Inherited Rights Mask (IRM) is the set of rights that you block from inheritance, while the Inherited Rights Filter (IRF) is the set of rights that you allow to be inherited. The IRM and IRF apply only to rights coming down the tree from parent directories. They do not affect any rights granted at the point where you set the IRM or IRF. The IRF settings for the file or directory apply for all trustees except users with the Supervisor right or Admin-equivalent users for the server.

For example, in iManager, the Files and Folders plug-in allows you to view or modify the Inherited Rights Filter for a selected file or folder by viewing its *Properties*, then clicking the *Rights* tab. By default, all rights (SRWCEMFA) are allowed to be inherited, as shown in [Figure 5-2](#). You deselect a right to disable it from being inherited by the file or folder. That is, the right is masked so that it cannot flow down.

Figure 5-2 Viewing or Modifying the Inherited Rights for a File or Folder



IRMs are taken into account when NSS or NCP Server 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 that NSS or NCP Server 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 that NSS or NCP Server 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.

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 the Admin user and the Admin-equivalent users, which usually have rights resulting from an eDirectory rights inheritance). In this situation, the Admin user can see all files and directories 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.

5.1.4 Security Equivalence

Security equivalence helps 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 an eDirectory object. Security equivalence granted rights are added to any rights explicitly granted for an object. For a directory, they are also added to the filtered inherited rights.

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 the NCP Server. NCP Server 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.

You can establish security equivalence by using the following methods:

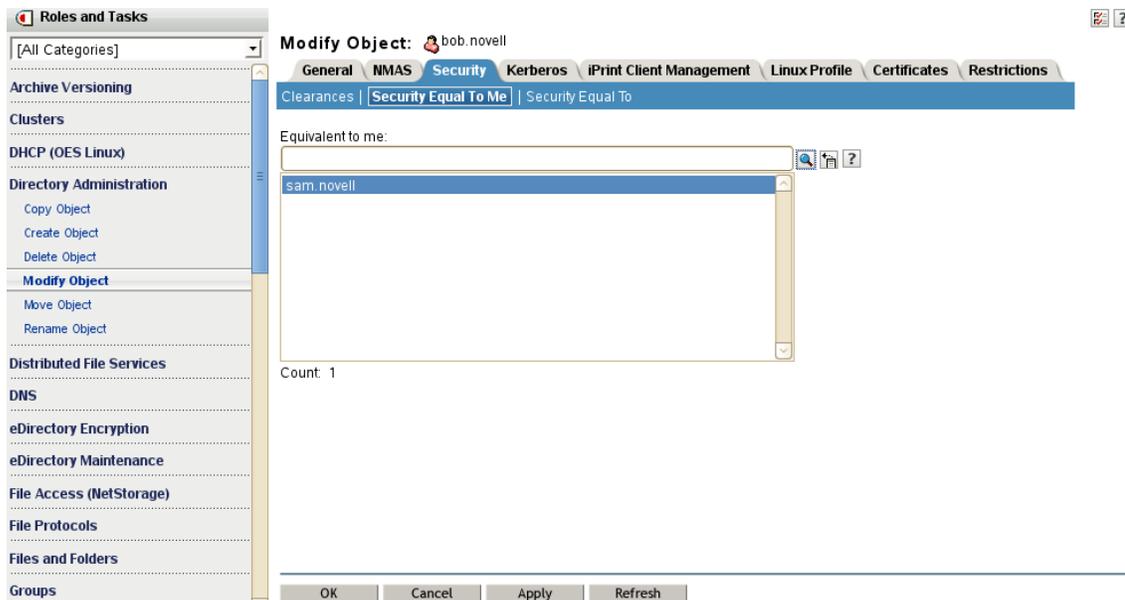
- ♦ “Explicit Security Equivalence” on page 41
- ♦ “Automatic Security Equivalence” on page 41
- ♦ “Implied Security Equivalence” on page 42

Explicit Security Equivalence

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, in iManager, you can use the *Directory Administration > Modify Object* option to make a User object named `sam` to be the security equivalent to the User object named `bob`, as shown in [Figure 5-3](#). After you create the security equivalence, `sam` effectively has the same rights to the file system tree as those explicitly assigned to `bob`.

Figure 5-3 The *Security Equal To* Property for eDirectory Objects



Automatic Security Equivalence

Security equivalence is also achieved 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 member object’s *Security Equal To* property.

For example, in iManager, you can use the *Directory Administration > Modify Object* option to add the User object named `sam` as a member of the Group object named `team`, as shown in [Figure 5-4](#). The `team` object is automatically added to the *Security Equal To* property for `sam`, as shown in [Figure 5-4](#). All members of the Group object, including `sam`, effectively have the same rights to the file system tree as those explicitly assigned to `team`.

Figure 5-4 The Membership Property for eDirectory Group Objects

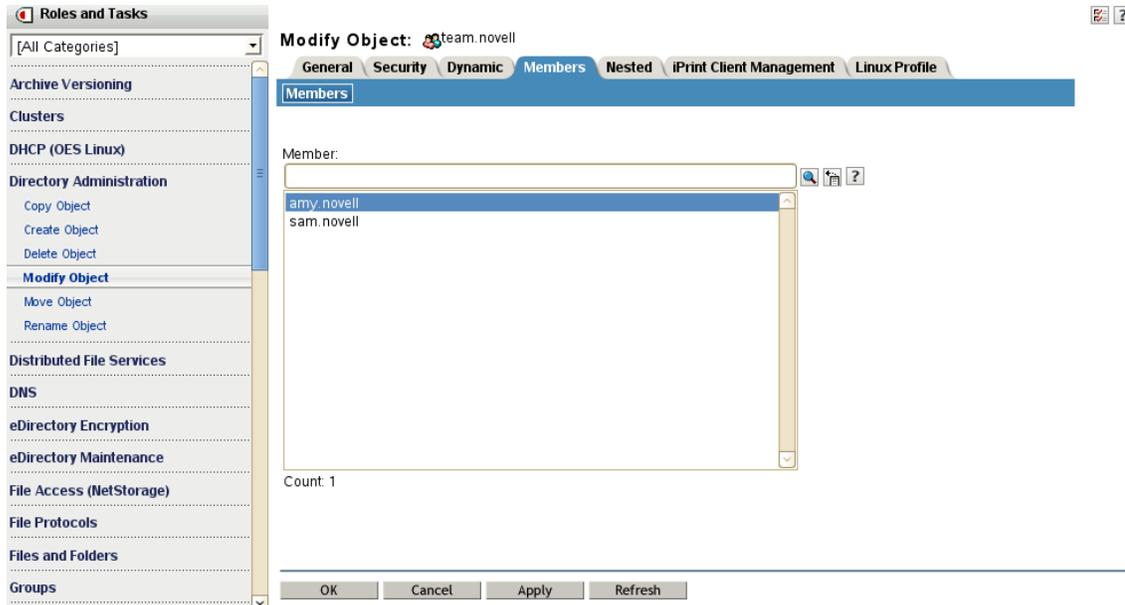
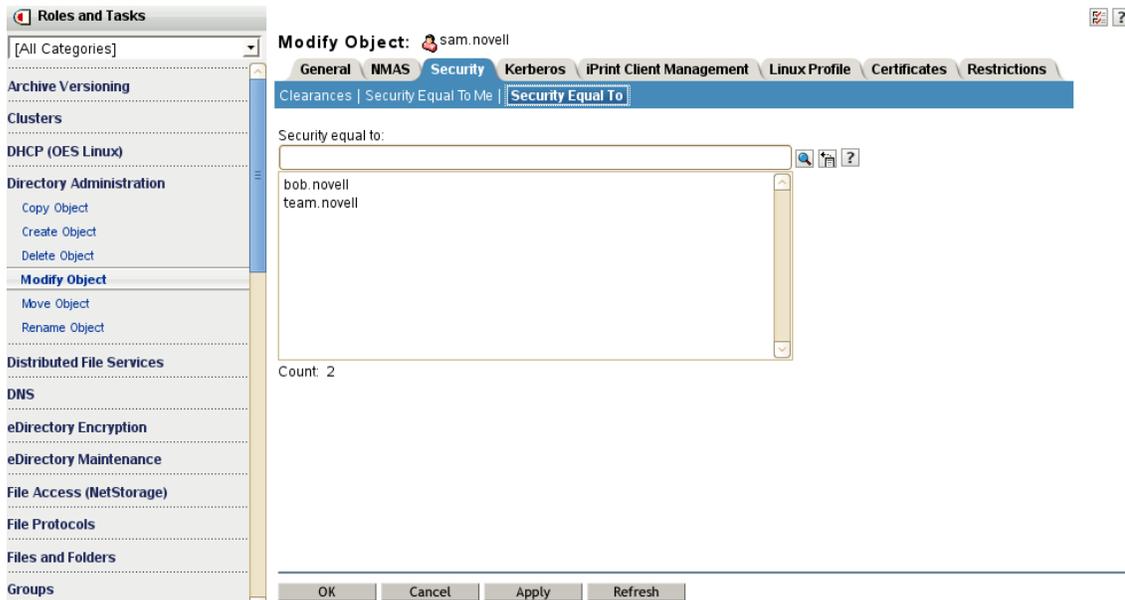


Figure 5-5 Group Memberships Added Automatically to the User's Security Equal To Property



Implied Security Equivalence

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. For information about setting rights for the [Public] trustee, see “[Public] Trustee” on page 35.

5.1.5 Effective Rights

A user's explicit rights on a directory are combined with the filtered rights inherited from its parent directory. Any rights through security equivalence are also applied.

A user's explicit rights on a file override any rights that can be inherited from its parent directory. In this case, the user has only the rights granted, and the inherited rights are ignored. If the user is a member of another group or role that also has explicit rights to the file, the user's effective rights on the file are a combination of the rights granted for the user and the rights granted for the group or role. If the rights of the group or role are more restrictive than the user's explicit rights, it has no effect on rights granted to the user.

An object's effective rights to a subdirectory are the set of distinct rights from the following:

- ◆ Rights inherited for the user from the parent directory, with consideration of the inherited rights filter set for the subdirectory.
- ◆ Rights set explicitly for the user on the directory.
- ◆ Rights set explicitly for a security-equivalent object on the directory:
 - ◆ Explicit by assignment (*Security Equal To* property)
 - ◆ Automatic by membership in a group or role
 - ◆ Implied by its parent container and by the [Public] container

More restrictive security-equivalent rights do not override rights granted for the trustee on the directory or for the trustee's filtered inherited rights.

An object's effective rights to a file are determined by the following:

- ◆ Rights inherited for the user from the parent directory, with consideration of the inherited rights filter set for the file.

If the user has rights set on the parent directory or is security equivalent to an object with explicit rights set there, those are the rights that flow down to the file for the user and are subject to the IRF.

Inherited rights for a file are ignored if rights are set explicitly for the object or for a security equivalent of the object. This behavior is different than for a directory.

- ◆ Rights set explicitly for the user on the file.

Inherited rights are ignored. Explicit trustee rights for a security equivalent object are added. More restrictive security-equivalent rights do not override rights set for the trustee on the file.
- ◆ Rights set explicitly for a security-equivalent object on the file:
 - ◆ Explicit by assignment (*Security Equal To* property)
 - ◆ Automatic by membership in a group or role
 - ◆ Implied by its parent container and by the [Public] container

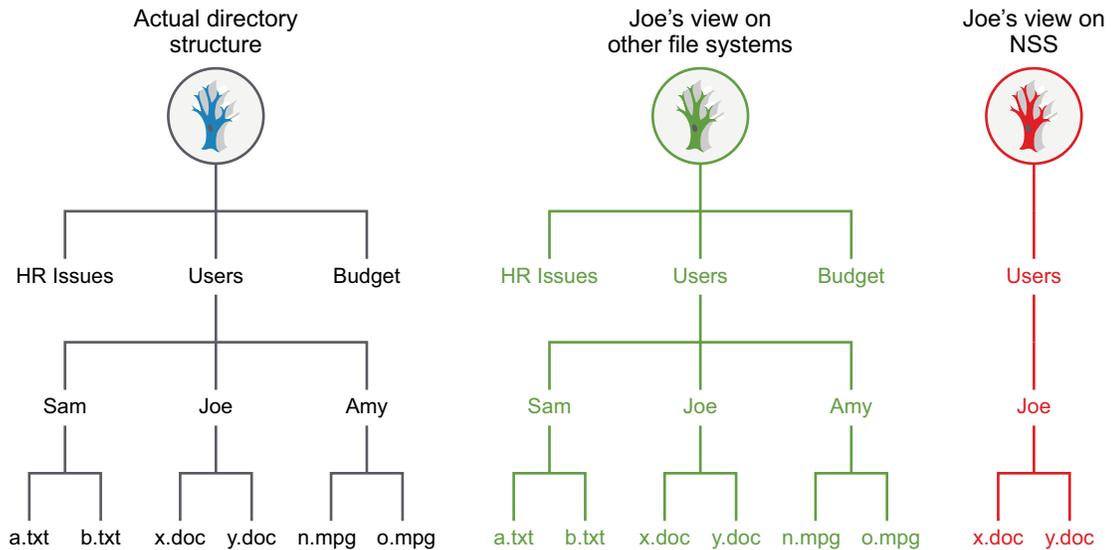
Inherited rights are ignored. Explicit trustee rights are added.

For more information, see "[How Effective Rights Are Calculated](#)" in the *Novell eDirectory 8.8 SP7 Administration Guide*.

5.1.6 Visibility

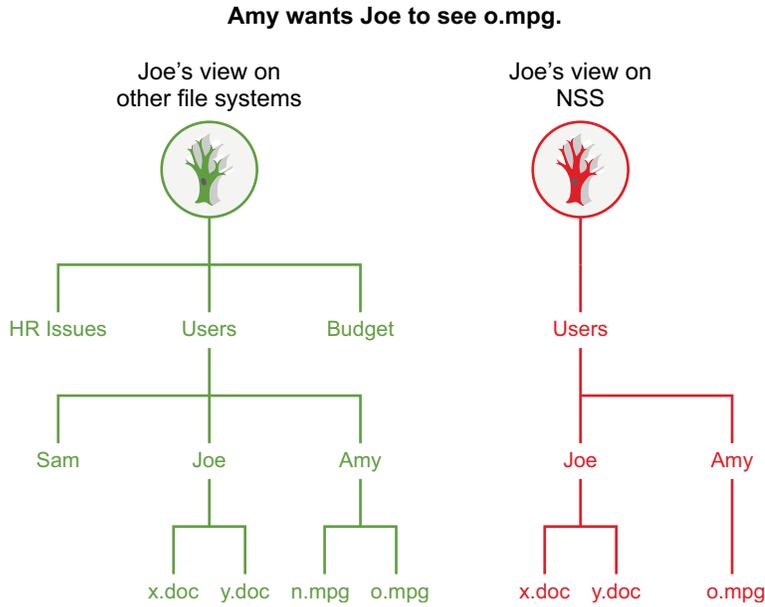
The Novell Trustee Model also controls visibility into the file system. For example, the user Joe is made a trustee of the `Joe` folder, and has access only to files in the `Joe` folder. Figure 5-6 demonstrates how Joe's view of the file system differs if the files are on a volume where the Trustee Model is applied as compared to the ACL (Access Control Lists) method on other file systems.

Figure 5-6 File System Tree View for Joe with the Trustee versus ACL Methods



A user who is a trustee with the Access Control (A) right or Supervisor (S) right can assign other users as trustees of files in directories and set rights for them. A user who has only the Access Control right cannot modify settings for a trustee with Supervisor rights. For example, the user Amy is the trustee of her home directory and has the Access Control right. Amy makes Joe a trustee of the `o.mpg` file in her personal `Amy` folder, and grants Joe the Read Only access to the file. On an NSS file system, Joe now sees the `\Amy\o.mpg` path and file in addition to his personal `Joe` folder. Joe cannot see other files in the `Amy` folder.

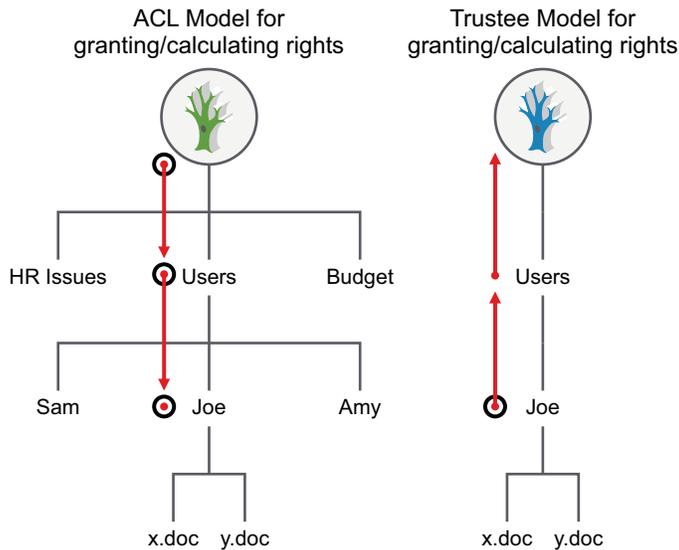
Figure 5-7 File System Tree View of a Shared File for Joe with the Trustee versus ACL Methods



5.1.7 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 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, as illustrated in [Figure 5-8](#).

Figure 5-8 Visibility for Trustee versus ACL Methods



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.

5.1.8 Security Equivalence Vector

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.

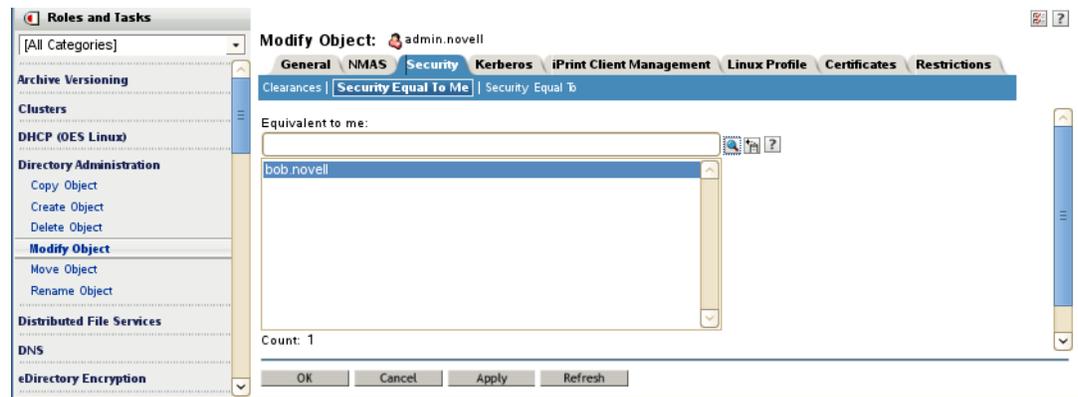
The Novell Client establishes an authenticated connection to the server through eDirectory. It does not perform periodic authentication checks, nor does it track rights. The client does not control the rights process. To do so would introduce a security flaw into the client/server relationship.

5.2 Configuring a Non-Admin User to be an Admin-Equivalent User

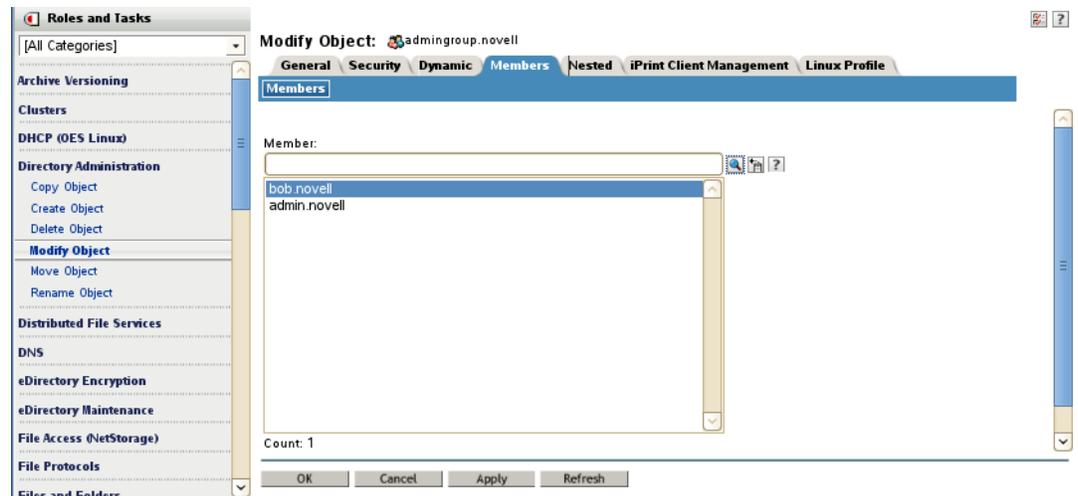
The following procedure describes how to set user bob.novell as an Admin-equivalent of the Admin user admin.novell. Ensure that you modify the context for your user according to where the object exists in your own eDirectory structure.

- 1 Log in to iManager as the Admin user in the same tree as the server you want to manage.
- 2 Set the bob.novell User object as security equal to the admin.novell User object.
 - 2a In the iManager *Roles and Tasks* list, select *Directory Administration > Modify Object*.
 - 2b On the Modify Object page, browse to locate and select the admin.novell User object, then click *OK*.
 - 2c On the Modify Object page for admin.novell, select the *Security* tab, then click the *Security Equal to Me* link.
 - 2d On the Security Equal to Me page, browse to locate and select the bob.novell User object, then click *OK*.

The bob.novell User object appears in the *Equivalent to Me* list of users who have security equal to the Admin user.

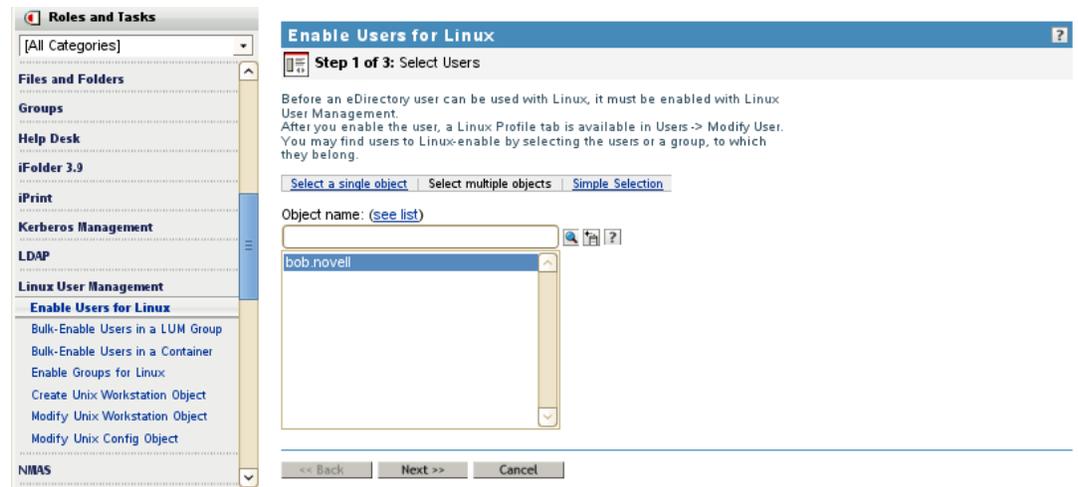


- 2e At the bottom of the page, click *Apply* or *OK*.
- 3 Add the bob.novell User object as a member of the admingroup.novell for the server you want to manage.
 - 3a In the iManager *Roles and Tasks* list, select *Directory Administration > Modify Object*.
 - 3b On the Modify Object page, browse to locate and select the admingroup.novell Group object, then click *OK*.
 - 3c On the Modify Object page for admingroup.novell, select the *Members* tab.
 - 3d On the Members page, browse to locate and select the bob.novell User object, then click *OK*.The bob.novell User object appears in the *Members* list.



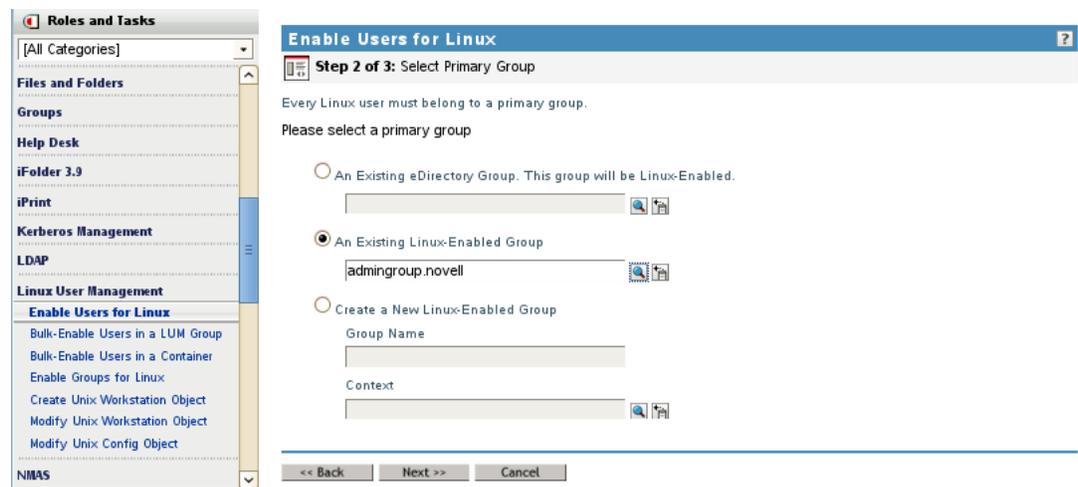
- 3e At the bottom of the page, click *Apply* or *OK*.
- 4 Enable the bob.novell User object with Linux User Management (LUM) by adding it to the existing LUM-enabled group admingroup.novell.
 - 4a In the iManager *Roles and Tasks* list, select *Linux User Management > Enable Users for Linux*.
 - 4b On the Select Users page, browse to locate and select the bob.novell User object, then click *OK*.

The bob.novell object appears in the *Object Name* list.



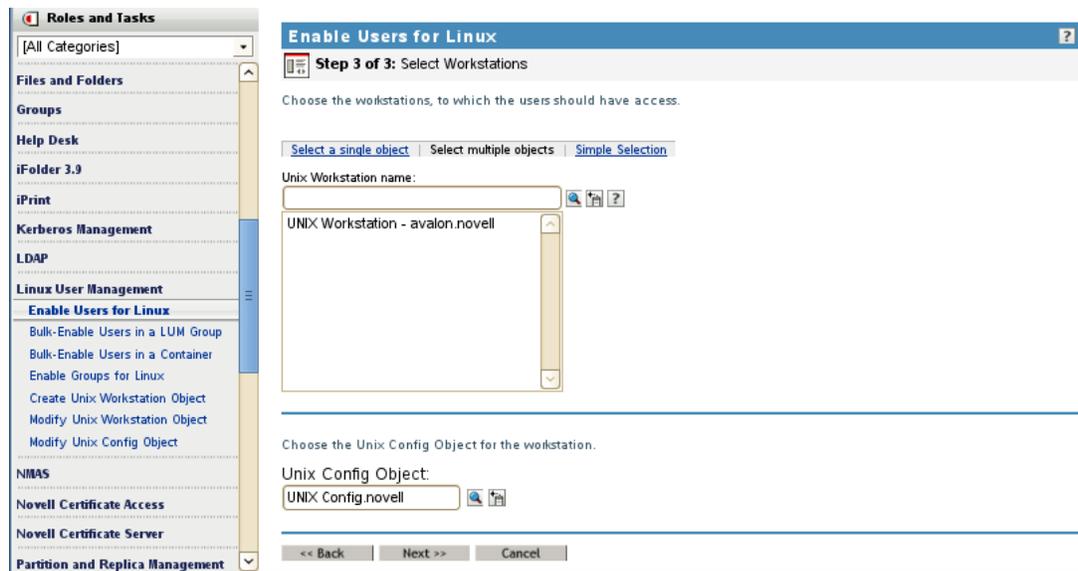
4c Click *Next*.

4d On the Select Primary Group page, select *An Existing Linux-Enabled Group*, then browse to locate and select the *admingroup.novell* Group object.



4e Click *Next*.

- 4f On the Select Workstations page, browse to select the UNIXConfig.novell *Unix Config Object* for the workstation.



- 4g Click *Next*.
- 4h On the Summary page, review the LUM settings, then click *Finish*.
- 4i Click *OK* to dismiss the confirmation message.

5.3 Configuring [Public] as a File System Trustee

The [Public] trustee is not an eDirectory object. It is a special trustee that represents any network user, logged in or not, for rights assignment purposes. By making [Public] a trustee of a directory or file, you effectively grant all objects in eDirectory the same trustee rights.

IMPORTANT: For security reasons, you should not provide the file system Supervisor right to the [Public] trustee.

To add the eDirectory [Public] trustee as a file system trustee of a directory:

- 1 Log in to iManager as a user with the *Supervisor* right or *Access Control* right on the NSS volume or NCP volume you want to manage.
- 2 Select the *View Objects* icon at the top of the page.
- 3 On the *Tree* tab, navigate to and select the NSS volume or NCP volume that you want to manage.
- 4 In the right panel, click the directory links to navigate to the directory.
- 5 Select the check box next to the directory of interest, then select *Actions > Properties* to open the directory's Properties page.
- 6 On the directory's Properties page, click the *Rights* tab to view the trustees, trustee rights, and inherited rights filter for the selected directory.

7 Add the eDirectory [Public] trustee as a file system trustee of the directory.

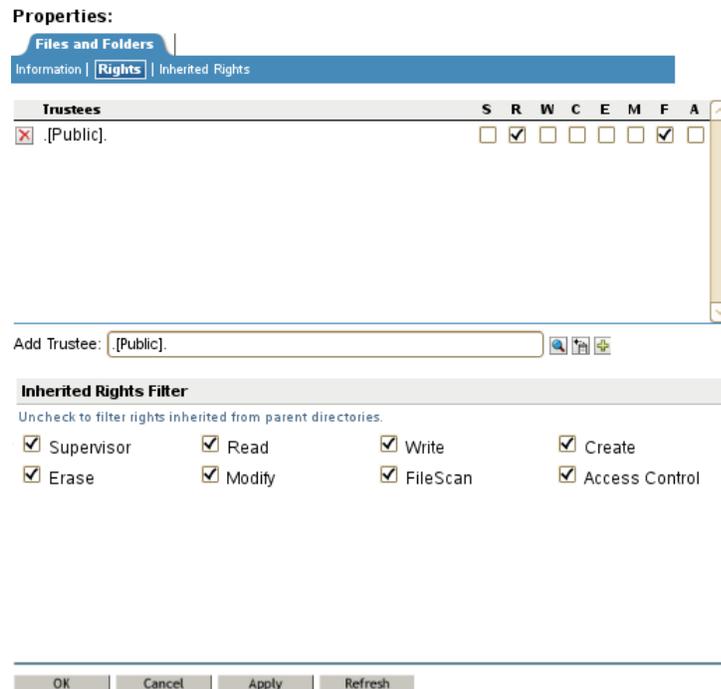
7a Scroll down to the *Add Trustees* field.

7b Type [Public] enclosed in square brackets with a dot before and after, then click the *Add (+)* icon.

For example:

. [Public] .

The name appears in the Trustees list, but it is not actually added until you click *Apply* or *OK*. The Read and File Scan trustee rights are assigned by default.



7c (Optional) Add other trustee rights for the . [Public] . trustee by clicking the check box below the right, then click *Apply*.

7d On the Properties page, click *Apply* to save the changes.

8 Click *OK* to close the Properties page.

For an example of how to use the [Public] trustee, see [Section 5.4, “Configuring the \[Public\] Trustee Access Rights on NSS Volumes for Daemons Running as the Nobody User,”](#) on page 50.

5.4 Configuring the [Public] Trustee Access Rights on NSS Volumes for Daemons Running as the Nobody User

Access rights to files and folders on NSS volumes are controlled through the NSS file system trustees and rights set for eDirectory users, not with Linux POSIX rights. The only exception to this is the `root` user, which never has an eDirectory counterpart in order to allow the server to be administered even if eDirectory is not available.

NSS maps the Linux `nobody` user ID to the eDirectory [Public] trustee. When you use daemons that run as the `nobody` user to access Linux file system volumes, you typically set the Linux POSIX rights to `777 (rwx rwx rwx)` in order to grant access to the `nobody` user. However, this does not work on the

NSS file system. NSS expects the trustee rights for the [Public] trustee to be set up on the target directory and be granted at least the Read and File Scan access rights. This allows NSS to set up the proper NSS and eDirectory authorizations for the nobody user, and to provide the nobody user ID when interacting with native Linux daemons. Otherwise, the daemon cannot store files on the NSS volume.

The [Public] trustee is not an eDirectory object. It is a specialized trustee that represents any network user, logged in or not, for rights assignment purposes. By making [Public] a trustee of a directory or file, you effectively grant all objects in eDirectory the same trustee rights.

IMPORTANT: For security reasons, you should not provide the file system Supervisor right to the [Public] trustee.

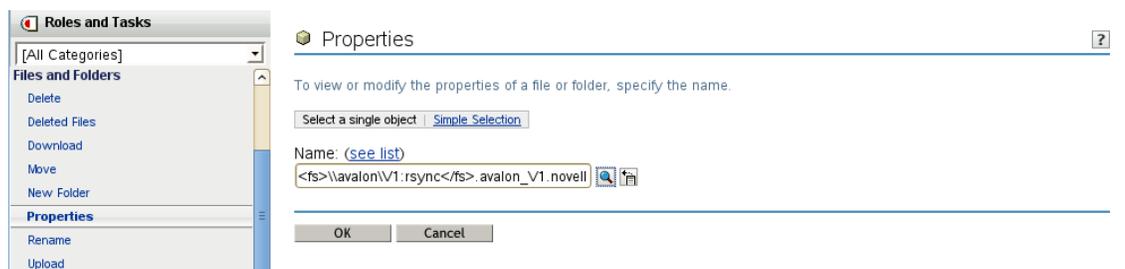
You can use the Files and Folders plug-in in iManager, or the NSS `rights` utility to configure trustees and trustee rights for volumes, directories, or files. For information about setting trustees in iManager, see [Section 6.5, “Using the Files and Folders Plug-In for iManager to Manage Trustees, Trustee Rights, and Inherited Rights,”](#) on page 66. For information about the `rights` utility, see [Section 6.9, “Using the Rights Utility to Set Trustee Rights for the NSS File System,”](#) on page 73. An example of using each method is provided below.

Example: [Public] Trustee Setup for the RSync Daemon

The `rsync` daemon runs as the `nobody` user. In the following example, you want the daemon to access files in the `/media/nss/VOL1/rsync` directory on an NSS volume named `VOL1`. You must assign the eDirectory [Public] trustee as a file system trustee of the directory, and give it the Read and File Scan access rights on that directory.

To use the Files and Folders Plug-In to iManager to set up the [Public] trustee as a file system trustee:

- 1 In iManager, click *Files and Folders*, then click *Properties* to open the Properties page.
- 2 On the Properties page, browse and select the `VOL1/rsync` directory, then click OK.



- 3 On the folder's Properties page, click the *Rights* tab to view the trustees, trustee rights, and inherited rights filter for the selected directory.
- 4 Add the eDirectory [Public] trustee as a file system trustee of the directory.
 - 4a Scroll down to the *Add Trustees* field.
 - 4b Type [Public] enclosed in square brackets with a dot before and after, then click the *Add (+)* icon.

For example:

```
. [Public] .
```

The name appears in the *Trustees* list, but it is not actually added until you click *Apply* or *OK*. The Read and File Scan trustee rights are assigned by default.

- 4c On the Properties page, click *Apply* to save the changes.
- 5 (Optional) Add other trustee rights for the `[Public]` trustee by clicking the check box below the right, then click *Apply*.



To use the Rights Utility to set up the `[Public]` trustee as a file system trustee:

- 1 Log in to the server as the `root` user, then open a terminal console.
- 2 At the console prompt, enter the following commands

```
cd /media/nss/VOL1/rsync
rights trustee "[Public]" -r rf
```

Modify the list of rights in this command to add other rights for the daemon if they are needed. For information about the options, see [Section 6.9, "Using the Rights Utility to Set Trustee Rights for the NSS File System,"](#) on page 73.

- 3 View the rights to verify that the settings are as expected by entering

```
rights show
```

The displayed response should be similar to the following:

```
Trustees and Inherited Rights Filter
-----
File: /media/nss/VOL1/rsync
-----
Trustees:
(1) [Public]
    [read, scan]

Inherited Rights Filter:
    [supervisor, read, write, create, erase, access control, scan, modify]
```

5.5 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.

5.6 Access Control for NSS on Linux

For an OES 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 SP3: NSS File System Administration Guide for Linux*](#)

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 5.8, “Viewing Key NSS Directory and File Attributes as Linux POSIX Permissions,” on page 56](#).

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.

5.7 Understanding Directory and File Attributes for NSS 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 5-2](#) describes directory and file attributes and whether they apply to directories, files, or both.

Table 5-2 Directory and File Attributes for NSS 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	Copy Inhibit prevents users from copying a file. This attribute works only for clients using Macintosh operating systems to access NSS volumes on NetWare. 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.	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.	Files only
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 attribute to allow the directory or file to be deleted.	Directories and files
Dm	Do Not Migrate prevents directories and files from being migrated from the server's disk to another storage medium.	Directories and files
Ds	Do Not Suballocate prevents data from being suballocated.	Files only
Ex	The Execute attribute indicates program files such as .exe or .com.	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
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

Attribute Code	Description	Applies to
T	Transactional allows a file to be tracked and protected by the Transaction Tracking System (TTS). This option works only on NetWare.	Files only

5.8 Viewing Key NSS Directory and File Attributes as Linux POSIX Permissions

On Linux, NSS displays its eDirectory Read Only (Ro), Read/Write (Rw), Execute (X), and Hidden (H) attributes for directories and files in the Linux POSIX permission fields. 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. 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 5.7, “Understanding Directory and File Attributes for NSS Volumes,”](#) on page 54.

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`.

NSS Directory and File Attributes Set in eDirectory	Displayed as POSIX Permissions (User, Group, Other)	Description
Read Only is enabled. Execute is disabled. Hidden is disabled.	<code>r-- r-- r--</code>	<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> <pre>r-- r-- r--</pre> <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.	<code>--- --- ---</code>	<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> <pre>--- --- ---</pre> <p>The binary value for octal 0 is 000, which corresponds to Read=Off, Write=Off, and Execute=Off.</p>

NSS Directory and File Attributes Set in eDirectory	Displayed as POSIX Permissions (User, Group, Other)	Description
Read Only is disabled.	rw- rw- rw-	NSS enables the Write permission bit to indicate that Read Only is disabled. All users can read and modify the file or directory.
Execute is disabled.		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.
Hidden is disabled.		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.
		Example 1: <code>chmod 620</code> or <code>chmod 644</code> has the same result as <code>chmod 666</code>
		<code>rw- rw- rw-</code>
		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.
		Example 2: <code>chmod 420</code> or <code>chmod 466</code> has the same result as <code>chmod 444</code>
		<code>r-- r-- r--</code>
		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.

NSS Directory and File Attributes Set in eDirectory	Displayed as POSIX Permissions (User, Group, Other)	Description
Read Only is enabled.	r-x r-x r-x [XXX]	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>
		r-x r-x r-x
		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>
		rwx rwx rwx
		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>
		r-x r-x r-x
		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.
Read Only is disabled.	rwx rwx rwx	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.		

5.9 Troubleshooting File Attributes Issues

See the following Technical Information Documents in the Novell Knowledgebase for information about issues with the Delete Inhibit and Rename Inhibit file attributes.

- ♦ *TID 7000323: Unable to Set the Delete Inhibit or Rename Inhibit Flags on OES NSS Directories* (<http://www.novell.com/support/>)
- ♦ *TID 3796587: Cannot Rename or Delete Files that Were Migrated to OES Linux* (<http://www.novell.com/support/>)

6 Configuring Trustees and File System Attributes

Novell Open Enterprise Server 2 for Linux provides the Novell Trustee Model to control user access to data on Novell Storage Services (NSS) volumes and NCP (NetWare Control Protocol) volumes. This section discusses how to configure trustees, trustee rights, inherited rights and filters, and file system attributes for directories and files.

For an explanation of the Novell Trustee Model, see [“Understanding File System Access Control Using Trustees”](#) on page 33.

- ♦ [Section 6.1, “Viewing a Trustee Report for a Directory or File,”](#) on page 61
- ♦ [Section 6.2, “Viewing a Trustee Report for All Directories in a Volume,”](#) on page 61
- ♦ [Section 6.3, “Viewing Properties of a File or Folder in iManager,”](#) on page 62
- ♦ [Section 6.4, “Viewing Properties for a File or Folder with Novell Client,”](#) on page 64
- ♦ [Section 6.5, “Using the Files and Folders Plug-In for iManager to Manage Trustees, Trustee Rights, and Inherited Rights,”](#) on page 66
- ♦ [Section 6.6, “Using Novell NetStorage to Manage Trustees, Trustee Rights, and Inherited Rights,”](#) on page 70
- ♦ [Section 6.7, “Using the Novell Client to Manage Trustees and Trustee Rights,”](#) on page 71
- ♦ [Section 6.8, “Using the Novell Client to Manage Inherited Rights and Filters,”](#) on page 72
- ♦ [Section 6.9, “Using the Rights Utility to Set Trustee Rights for the NSS File System,”](#) on page 73

6.1 Viewing a 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.

6.2 Viewing a Trustee Report for All Directories in a Volume

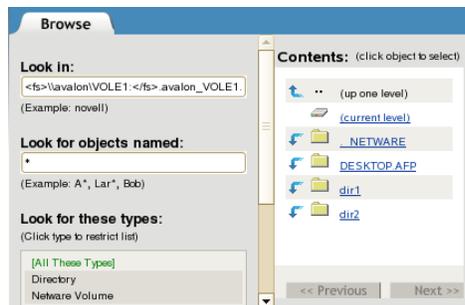
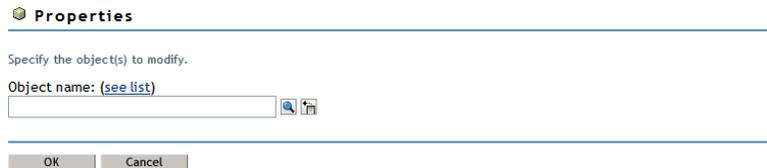
There are currently no supported tools that can generate a trustee report for all directories in a volume. Check the [Novell Support](http://www.novell.com/support/) (<http://www.novell.com/support/>) Web site and the [Novell Cool Solutions](http://www.novell.com/cool solutions/) (<http://www.novell.com/cool 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>).

6.3 Viewing Properties of a File or Folder in iManager

1 In iManager, use either of the following methods to select a file or folder and open its Properties page:

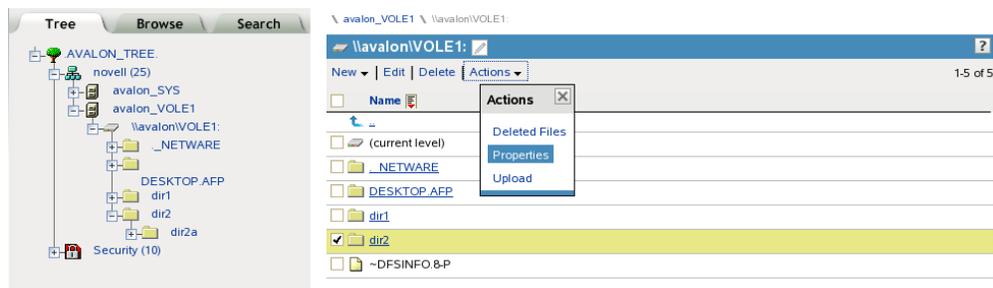
- ◆ **Files and Folders Role:** In the iManager toolbar, select the *Roles and Tasks* icon. In the left panel, select *Files and Folders > Properties*.

On the Properties page, click the *Search* icon, browse to locate and select the folder you want to manage on an NSS volume, then click *OK* to open the Properties page for the selected folder.



- ◆ **Tree View:** In the iManager toolbar, click *View Objects* icon. In the left panel, browse the Tree to locate and select the folder you want to manage on an NSS volume.

In the right panel, select the check box next to the folder, then select *Actions > Properties*.



2 Use one of the following methods to specify the volume, folder, or file that you want manage:

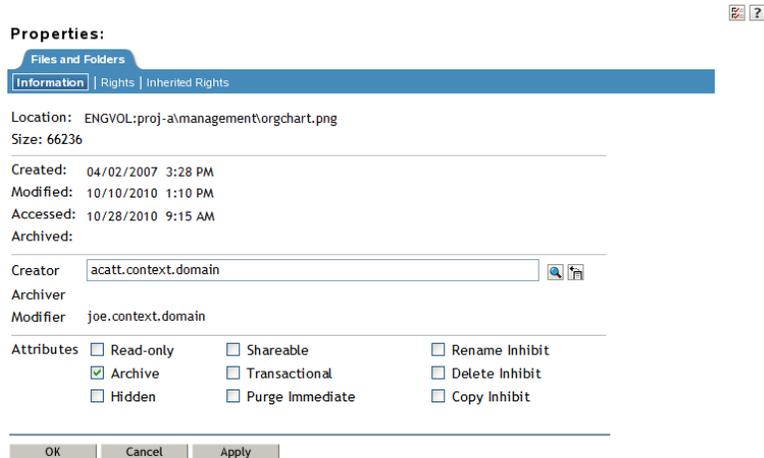
- ◆ Click the *Search* icon to browse and locate volume, folder or file from the Storage objects, then click the name link of the object to select it.
- ◆ Click the *History* icon to select a volume, folder, or file from the list of Storage objects that you recently accessed.

The path name of the object appears in the *Name* field.

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

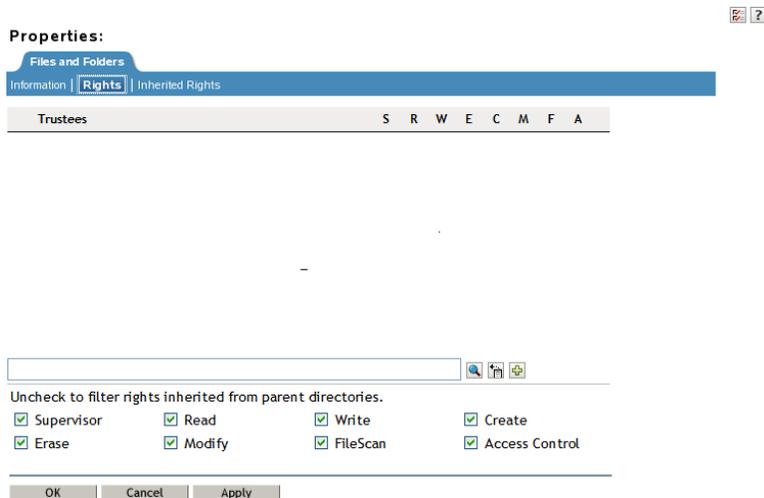
The properties are displayed in three *Files and Folders* tabs: *Information*, *Rights*, and *Inherited Rights*.

- 4 (Optional) Select the *Information* tab to perform the following tasks:
- ◆ View details about the selected volume, folder, or file.
 - ◆ Configure directory quotas for folders on NSS volumes where the Directory Quotas attribute is enabled.
 - ◆ Modify the file owner.
 - ◆ Configure file or directory attributes.



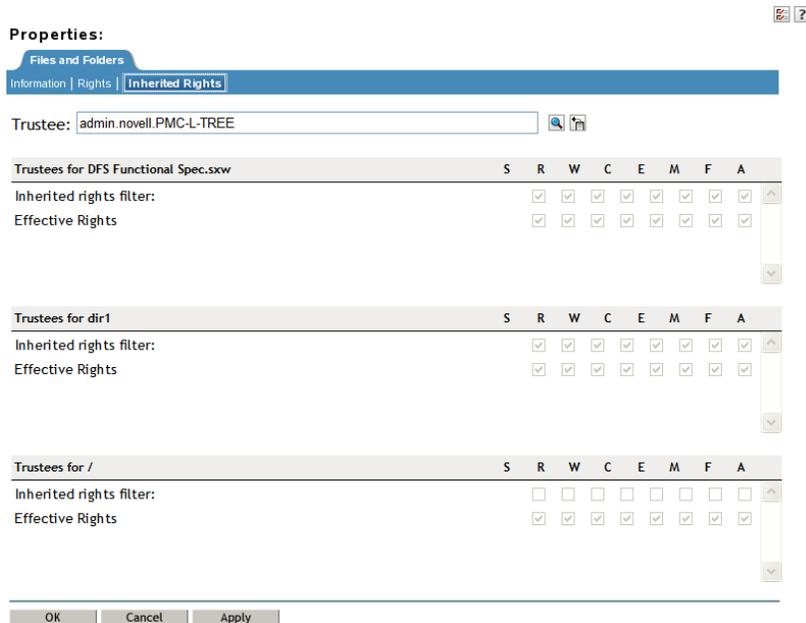
See also [Section 11.3, “Viewing or Modifying File System Attributes for NSS Volumes,”](#) on page 110.

- 5 (Optional) Select the *Rights* tab to perform any of the following tasks:
- ◆ View details about trustees, trustee rights, and inherited rights filter for the selected volume, folder, or file.
 - ◆ Add or remove trustees.
 - ◆ Grant or revoke trustee rights for one or multiple trustees.
 - ◆ Configure the inherited rights filter.



See also [Section 6.5, “Using the Files and Folders Plug-In for iManager to Manage Trustees, Trustee Rights, and Inherited Rights,”](#) on page 66.

- 6 (Optional) Select the *Inherited Rights* tab to perform the following tasks:
- ♦ View details about explicitly assigned trustee rights and inherited rights at all levels along the path from the selected file or folder to the root of the volume.
 - ♦ View the effective rights for a given trustee for the selected volume, folder, or file.

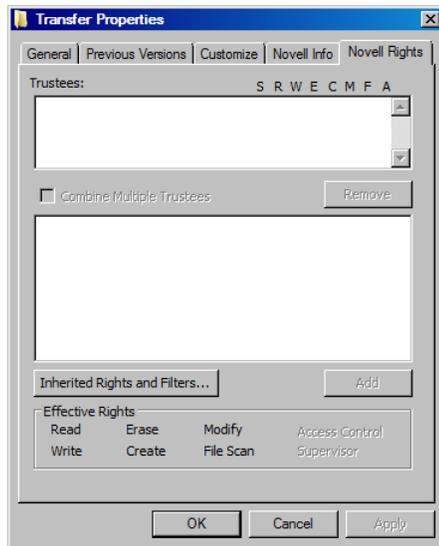


See also [Section 6.5.5, “Viewing Effective Rights for a Trustee,”](#) on page 70.

6.4 Viewing Properties for a File or Folder with Novell Client

If the Novell Client is installed on a computer, the file browser is modified to add tabs for Novell Rights. When you select a file or folder that resides on an NSS volume or NCP volume, the fields on the page are populated with its information.

- 1 In a file browser, right-click the file or folder and select *Properties*.
- 2 Click the *Novell Rights* tab to view its *Trustees*, *Trustee Rights*, *Inherited Rights and Filters*, and *Effective Rights*.



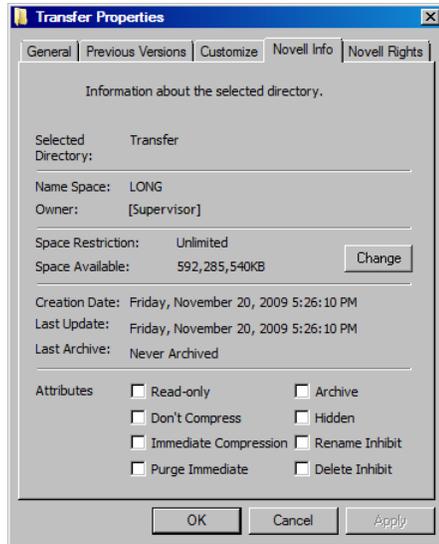
Use this page to do any of the following tasks:

- ◆ **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.

- ◆ **Inherited Rights:** Select *Inherited Rights* to open a dialog where you can do 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 Click the *Novell Info* tab to view file system attributes.



For information about the file system properties on this page, see [Step 2 in Section 11.3, “Viewing or Modifying File System Attributes for NSS Volumes,”](#) on page 110.

6.5 Using the Files and Folders Plug-In for iManager to Manage Trustees, Trustee Rights, and Inherited Rights

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 for 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.

File system trustees, trustee rights, and inherited rights filters are used to determine access and usage for directories and files on NSS volumes and NCP volumes on OES 2 Linux.

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 are lost.

- ♦ [Section 6.5.1, “Prerequisites,”](#) on page 67
- ♦ [Section 6.5.2, “Viewing, Adding, or Removing File System Trustees,”](#) on page 67
- ♦ [Section 6.5.3, “Viewing, Granting, or Revoking File System Trustee Rights,”](#) on page 68
- ♦ [Section 6.5.4, “Configuring the Inherited Rights Filter for a File or Directory,”](#) on page 69
- ♦ [Section 6.5.5, “Viewing Effective Rights for a Trustee,”](#) on page 70

6.5.1 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 or an NCP volume (an NCP share on Ext3, XFS, or Reiser file system) on OES 2 Linux.

6.5.2 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, then click *OK*.
For instructions, see [Section 6.3, “Viewing Properties of a File or Folder in iManager,” on page 62](#).
- 3 Click the *Rights* tab to view the trustees, trustee rights, and inherited rights filter for the selected volume, folder, or file.
- 4 To add trustees:
 - 4a Scroll down to the *Add Trustees* field.
 - 4b Use one of the following methods to add user names as trustees:
 - ♦ Click the *Search* icon, browse to locate the user names 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 user names from a list of users, groups, or roles that you recently accessed.
 - ♦ Type the typeless distinguished user name (such as `username.context`) in the *Add Trustees* field, then click the *Add (+)* icon.
 - ♦ To add the [Public] trustee, type [Public] with a dot before and after it in the *Add Trustees* field, then click the *Add (+)* icon. For example:

. [Public] .

You might need to explicitly assign the [Public] trustee as a file system trustee on a directory in an NSS volume and grant it the Read right and File Scan right if you use daemons that run as the nobody user to access files in the directory. Granting file system rights to the [Public] trustee is also required to allow anonymous access to the file system.

The [Public] trustee is not an eDirectory object. It is a specialized trustee that represents any network user, logged in or not, for rights assignment purposes. By making [Public] a trustee of a volume, directory, or file, you effectively grant all objects in eDirectory the same file system rights.

IMPORTANT: For security reasons, you should not provide the file system Supervisor right to the [Public] trustee.

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

- 4c** On the *Properties* page, click *Apply* to save the changes.
- 5** To grant or revoke rights for a trustee:
For information about the rights, see [Section 6.5.3, “Viewing, Granting, or Revoking File System Trustee Rights,” on page 68](#).
 - 5a** In the check boxes next to the trustee name, select the rights you want to grant.
 - 5b** In the check boxes next to the trustee name, deselect the rights you want to revoke.
 - 5c** On the *Properties* page, click *Apply* to save the changes.
- 6** To remove trustees:
 - 6a** Scroll down to locate and select the user name of the user, group, or role that you want to remove as a trustee.
 - 6b** Click the *Remove* (red X) icon next to the user name to remove it as a trustee.
The user name disappears from the list, but it is not actually removed until you click *Apply* or *OK*.
 - 6c** On the *Properties* page, click *Apply* to save changes.

6.5.3 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 6.3, “Viewing Properties of a File or Folder in iManager,” on page 62](#).
- 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 user name 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

Trustee Right	Description
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.

6.5.4 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 6.3, "Viewing Properties of a File or Folder in iManager," on page 62.](#)

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.

6.5.5 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 6.3, “Viewing Properties of a File or Folder in iManager,” on page 62.](#)
- 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 user name 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 user name of the trustee you want to manage, then select the user name 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.

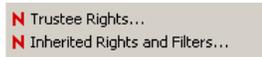
6.6 Using Novell NetStorage to Manage Trustees, Trustee Rights, and Inherited Rights

- 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:
 - ♦ **Add Trustees:** Click the *Novell Rights* tab, click the *eDirectory Object* viewer and brows to select the trustee you want to add, then click *Plus (+)*.
 - ♦ **Remove Trustees:** Click the *Novell 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 *Novell 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 5.1, “Understanding the Novell Trustee Model for File System Access,” on page 33.](#)
 - ♦ **Modify Inherited Rights Filter:** Click the *Novell Rights* tab, select or deselect *Inherited Rights*, then click *Apply*.
For information, see [Section 5.1, “Understanding the Novell Trustee Model for File System Access,” on page 33.](#)

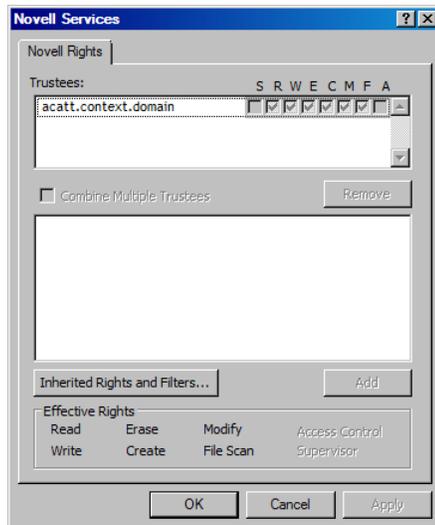
6.7 Using the Novell Client to Manage Trustees and Trustee Rights

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 user name 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.

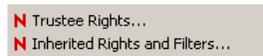
Select one or more trustees from the *Trustees* list, select *Combine Multiple Trustees*, then click *Apply*. The trustees' rights are combined and applied to all selected directories and files. All selected trustees become trustees of all selected directories and files.

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

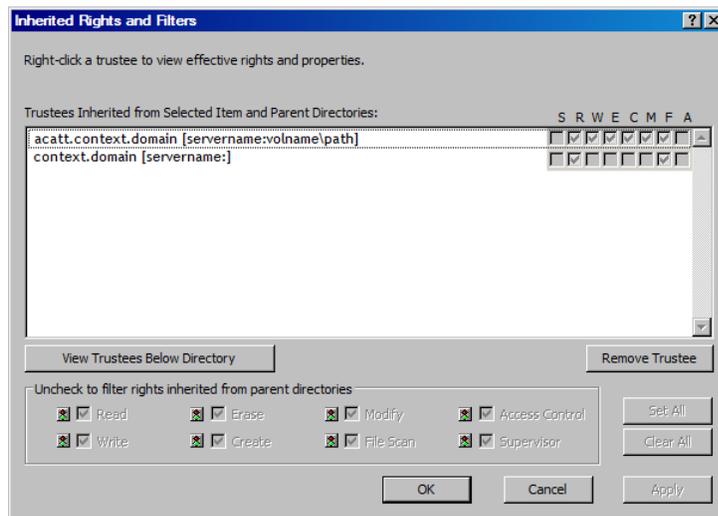
6.8 Using the Novell Client to Manage Inherited Rights and Filters

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 5.1.3, "Inherited Trustee Rights,"](#) on page 39.

- 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*.

6.9 Using the Rights Utility to Set Trustee Rights for the NSS File System

The NSS Rights Utility (`rights`) for Linux allows you to specify trustee rights for directories and files in the NSS file system. 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 NetWare. The trustee information is saved in the file and directory metadata in the NSS volume and works seamlessly with NetWare if the volume is moved to a NetWare server.

- ♦ [Section 6.9.1, “Syntax,” on page 73](#)
- ♦ [Section 6.9.2, “Options,” on page 73](#)
- ♦ [Section 6.9.3, “Example,” on page 76](#)
- ♦ [Section 6.9.4, “See Also,” on page 77](#)

6.9.1 Syntax

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

6.9.2 Options

ACTIONS

The first argument indicates the action to be taken.

Option	Description
<code>trustee</code>	Adds or modifies a trustee on a file or directory.
<code>delete</code>	Removes a trustee from a file or directory.
<code>irf</code>	Sets the inherited rights filter on a directory.
<code>effective</code>	Displays a user's effective rights.
<code>show</code>	Displays the trustees and inherited rights filter.

OPTIONS

Option	Description
<code>-v, --version</code>	Displays the program version information.
<code>-h, --help</code>	Displays the help screen.

TOPTIONS

Option	Description
<code>-r, --rights=MASK</code>	<p>Specifies the rights to be given to this trustee. For more information, see "MASK" on page 76.</p> <p>If the No Rights (n) option is assigned, the trustee is removed.</p> <p>If rights are not specified, the default assignment is Read and File Scan rights.</p>
<code>-f, --file=filename</code>	<p>Specifies the name of file or directory to assign trustees to. <i>Filename</i> is the path for the file or directory. For example:</p> <pre>-f /users/username/userfile.sxi</pre> <pre>--file=/designs/topsecret</pre> <p>If a file or directory is not specified, the current directory is used.</p>
<code>-S, --softlink</code>	Do not follow link option.

DOPTIONS

Option	Description
<code>-f, --file=filename</code>	<p>Specifies the name of file or directory to delete trustees from. <i>Filename</i> is the path for the file or directory.</p> <p>If a file or directory is not specified, the current directory is used.</p>
<code>-S, --softlink</code>	Do not follow link option.

IOPTIONS

Option	Description
<code>-r, --rights=MASK</code>	Specifies the rights to be passed through the filter. For more information, see "MASK" on page 76 . If rights are not specified, the default assignment is All Rights.
<code>-f, --file=filename</code>	Specifies the name of the directory where the filter is to be applied. <i>Filename</i> is the path for the directory. If a directory is not specified, the current directory is used.
<code>-S, --softlink</code>	Do not follow link option.

EROPTIONS

Option	Description
<code>-f, --file=filename</code>	Specifies the name of file or directory where effective rights are to be calculated. <i>Filename</i> is the path for the file or directory. If a file or directory is not specified, the current directory is used.
<code>-S, --softlink</code>	Do not follow link option.

SOPTIONS

Option	Description
<code>-f, --file=filename</code>	Specifies the name of the file or directory to display a list of trustees for that file or directory. If a file or directory is not specified, the current directory is used.
<code>-S, --softlink</code>	Do not follow link option.

USERNAME

The `username` parameter is the Fully Distinguished Name of a Novell eDirectory object, including the tree name. Use the `username.context.treename` format, such as

```
joe.engineer.acme_tree
```

If you use special characters in a user name, you must escape those special characters in the command line.

For example, the \$ (dollar sign) 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.

The user name can also be the [Public] trustee. NSS expects the [Public] trustee to be configured on directories that are accessed by daemons that run as the `nobody` user. For information, see [Section 5.4, “Configuring the \[Public\] Trustee Access Rights on NSS Volumes for Daemons Running as the Nobody User,”](#) on page 50.

MASK

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

Right	Letter	Description
Supervisor	s	Has all rights to the file or directory. Also can grant or revoke the Access Control right.
Read	r	Grants the right to open and read files in the directory.
Write	w	Grants the right to open and write to files in the directory.
Create	c	Grants the right to create files and subdirectories. The user can also salvage (undelete) deleted files.
Erase	e	Grants the right to erase files and directories. The user can also purge deleted files.
Modify	m	Grants the right to modify the content of files and directories, and change file attributes.
File Scan	f	Grants the right to display and search on file and directory names in the file system structure.
Access Control	a	Grants the right to add and remove trustees, and change trustee rights to files and directories.
No Rights	none	Revokes all rights.
All Rights	all	Grants all rights except Supervisor (rwcmfa)

6.9.3 Example

The following 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.

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

The following commands allow the `rsync` daemon, which run as the `nobody` user, to access the `/media/nss/VOL1/rsync` directory. It makes the [Public] user a trustee of the directory, and gives it the Read and File Scan access rights on that directory.

```
cd /media/nss/VOL1/rsync
rights trustee "[Public]" -r rf
```

6.9.4 See Also

For information about setting file system directory and file attributes, see [“Using the Attrib Utility to Set NSS File System Attributes”](#) on page 113.

7 Understanding Directory Structures for the NSS File System

This section describes the following key concepts for the Novell Storage Services (NSS) File System for Novell Open Enterprise Server (OES) 2 Linux:

- ♦ [Section 7.1, “Directory Structures,” on page 79](#)
- ♦ [Section 7.2, “Directory Path,” on page 80](#)
- ♦ [Section 7.3, “Root Directory,” on page 80](#)
- ♦ [Section 7.4, “Drive Map,” on page 80](#)

7.1 Directory Structures

The NSS file system provides 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.

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.

Volumes are similar to drawers in an office filing cabinet that contain related information. For example, volumes might contain applications, corporate data, or user home directories and files.

To control who can access directories and files on your NSS file system, you must assign file system trustees, trustee rights, and inherited rights filters. For information, see [Section 5.1, “Understanding the Novell Trustee Model for File System Access,” on page 33](#).

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

- ♦ [Section 5.7, “Understanding Directory and File Attributes for NSS Volumes,” on page 54](#)
- ♦ [Section 5.8, “Viewing Key NSS Directory and File Attributes as Linux POSIX Permissions,” on page 56](#)

7.2 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. 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.

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.

7.3 Root Directory

The root directory is the base directory in the volume. The root directory of a volume typically contains only directories and only the administrator has rights at that level.

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 33](#).

7.4 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, or use the mapping functionality of your client operating system. The network drive map is valid only until you log out.

8 Managing Files and Folders

This section discusses how to create, modify, or remove files and folders for Novell Storage Services (NSS) volumes and NCP (NetWare Core Protocol) volumes on Novell Open Enterprise Server 2 for Linux.

IMPORTANT: The instructions in this section focus primarily on the Files and Folders role in Novell iManager. Many of the tasks can be performed natively in a file browser if you map the volume or a network share on the volume to a local drive letter on your computer.

- ♦ [Section 8.1, “Creating a Folder on an NSS Volume or NCP Volume,” on page 81](#)
- ♦ [Section 8.2, “Moving a File or Folder to a Different Folder on the Same Volume,” on page 83](#)
- ♦ [Section 8.3, “Renaming a File or Folder on an NSS Volume or NCP Volume,” on page 84](#)
- ♦ [Section 8.4, “Deleting a File or Folder on an NSS Volume or NCP Volume,” on page 84](#)
- ♦ [Section 8.5, “Uploading Files to an NSS Volume or NCP Volume,” on page 85](#)
- ♦ [Section 8.6, “Downloading Files from an NSS Volume or NCP Volume,” on page 86](#)
- ♦ [Section 8.7, “Mapping Network Drives,” on page 87](#)

8.1 Creating a Folder on an NSS Volume or NCP Volume

- ♦ [Section 8.1.1, “Prerequisites for Creating Folders,” on page 81](#)
- ♦ [Section 8.1.2, “Tools for Creating Folders,” on page 82](#)
- ♦ [Section 8.1.3, “Creating a Folder with iManager,” on page 82](#)

8.1.1 Prerequisites for Creating Folders

Before you can create a folder (directory) on an NSS 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 the Volume object and have the Create right for it. For information about assigning trustees and trustee rights, see [Chapter 6, “Configuring Trustees and File System Attributes,” on page 61](#).

8.1.2 Tools for Creating Folders

For OES Linux servers, you can create folders by using the following management tools for NSS volumes and NCP volumes:

Table 8-1 Tools for Creating Folders on NSS and NCP Volumes

Management Tool	NSS on Linux	NCP Volumes on Linux POSIX File Systems
Files and Folders plug-in for Novell iManager 2.7	Yes	Yes
Novell Client for Linux	Yes	Yes
Novell Client for Windows XP/2003 and for Windows Vista/7	Yes	Yes
Novell NetStorage	Yes	Yes
Novell Remote Manager for Linux	No	No

8.1.3 Creating a Folder with iManager

As an administrator, you can use the Files and Folders plug-in to iManager to create a folder on NSS volumes and NCP volumes (NCP shares on Linux POSIX file systems such as Ext3, XFS, and Reiser).

- ♦ [“Prerequisites” on page 82](#)
- ♦ [“Procedure” on page 82](#)

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 path name 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.

8.2 Moving a File or Folder to a Different Folder on the Same Volume

You can use the Files and Folders plug-in for iManager to move a file or folder to a different folder on the same volume.

- ♦ [Section 8.2.1, “Prerequisites,” on page 83](#)
- ♦ [Section 8.2.2, “Procedure,” on page 83](#)

8.2.1 Prerequisites

You must have the Create and Modify trustee rights for the file or folder that you want to move and for the target folder where you want to move it. You must also have the Erase right to the source directory, because moving files includes deleting them from the source directory.

8.2.2 Procedure

- 1 In iManager, select *Files and Folders > Move*.

- 2 Use one of the following methods to select the file that you want to move:
 - ♦ Click the *Search* icon to browse and locate the file or folder, then click its *Name* link to select it.
 - ♦ Click the *History* icon to select a file or folder from the list of files or folders that you recently accessed.
- 3 Click *Browse* to open a local *File Browser* dialog box. Browse to locate and select the folder where you want to move the file, then click *Open*.
The path name for the selected folder appears in the *Folder Name* field.
- 4 Click *OK* to begin the move, or click *Cancel* to discard the changes.
A message confirms that the file has been successfully moved. Wait until the move completes before proceeding to other tasks.

8.3 Renaming a File or Folder on an NSS Volume or NCP Volume

You can use the Files and Folders plug-in for iManager to rename a file or folder on an NSS volume.

- ◆ [Section 8.3.1, “Prerequisites,” on page 84](#)
- ◆ [Section 8.3.2, “Procedure,” on page 84](#)

8.3.1 Prerequisites

You must have the Create and Modify trustee rights for the file or folder in order to be able to find and rename it. You must also have the Erase right to the source directory, because renaming a file includes deleting the old filename from the source directory.

8.3.2 Procedure

- 1 In iManager, select *Files and Folders > Rename*.



Rename ?

Specify a file or folder to rename.

File Name:  

New name

- 2 Use one of the following methods to select the file that you want to rename:
 - ◆ Click the *Search* icon to browse and locate the file or folder, then click its *Name* link to select it.
 - ◆ Click the *History* icon to select a file or folder from the list of files or folders that you recently accessed.

The path name appears in the Path field.

- 3 Type the new name in the *New Name* field.
- 4 Click *OK* to rename the file, or click *Cancel* to discard the changes.

A message confirms that the file has been successfully renamed. Wait until the rename completes before proceeding to other tasks.

8.4 Deleting a File or Folder on an NSS Volume or NCP 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.

- ◆ [Section 8.4.1, “Prerequisites,” on page 85](#)
- ◆ [Section 8.4.2, “Procedure,” on page 85](#)

8.4.1 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 or folder that you want to delete. The Erase right is required to delete the file.

8.4.2 Procedure

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



- 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 path name 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.

8.5 Uploading Files to an NSS Volume or NCP 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.

- ♦ [Section 8.5.1, “Prerequisites,” on page 85](#)
- ♦ [Section 8.5.2, “Procedure,” on page 85](#)

8.5.1 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.

8.5.2 Procedure

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

- 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 path name 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 path name 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.

8.6 Downloading Files from an NSS Volume or NCP Volume

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

- ♦ [Section 8.6.1, "Prerequisites," on page 86](#)
- ♦ [Section 8.6.2, "Procedure," on page 86](#)

8.6.1 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.

8.6.2 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 path name 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, ensure that 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.

8.7 Mapping Network Drives

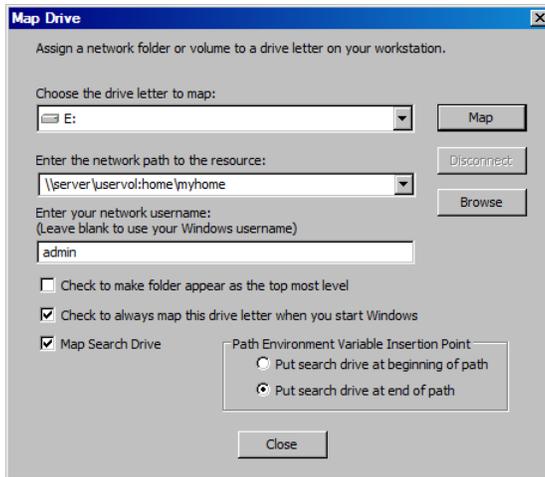
You can map a network drive to your local computer in order to create, modify, and remove files in your file browser. Mapping a drive with the Novell Client additionally provides the ability to set trustees, trustee rights, and file system attributes for NSS and NCP volumes.

- ♦ [Section 8.7.1, "Using Novell Map Network Drive," on page 88](#)
- ♦ [Section 8.7.2, "Using Map Network Drive in Windows Explorer," on page 89](#)

8.7.1 Using Novell Map Network Drive

The Novell Client provides a tool to map drives on NSS and NCP volumes for NCP access.

- 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 user name. If necessary, the client later prompts you for the password that matches the server login user name 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*.

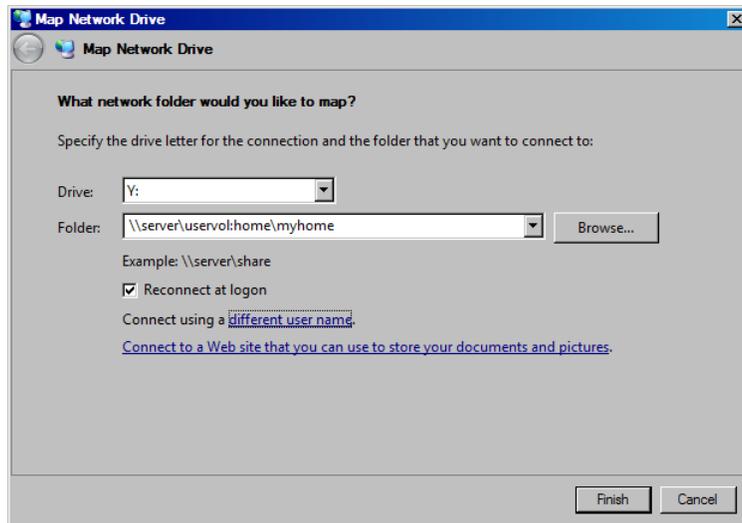
For more information, see the following:

- ♦ [“Configuring Map Settings”](#) in the *Novell Client 2.0 SP3 for Linux Administration Guide*
- ♦ [Novell Login Scripts Guide](#)

8.7.2 Using Map Network Drive in 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*.

9 Managing Directory Quotas on NSS Volumes

A directory quota limits the amount of space on a Novell Storage Services (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.

This section discusses how to configure directory quotas for folders on NSS volumes.

- ◆ [Section 9.1, "Setting the Directory Quotas Attribute for an NSS Volume," on page 91](#)
- ◆ [Section 9.2, "Setting a Directory Quota in iManager," on page 92](#)
- ◆ [Section 9.3, "Setting a Directory Quota with Novell NetStorage," on page 94](#)
- ◆ [Section 9.4, "Setting a Directory Quota with the Novell Client," on page 94](#)
- ◆ [Section 9.5, "Removing a Directory Quota," on page 95](#)
- ◆ [Section 9.6, "Removing All Directory Quotas for an NSS Volume," on page 96](#)
- ◆ [Section 9.7, "Using the Quota Utility to Set Directory and User Space Quotas on NSS Volumes," on page 96](#)

9.1 Setting 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*.

- If you enabled or disabled the *Directory Quotas* attribute, restart NCP2NSS by entering the following at a terminal console prompt:

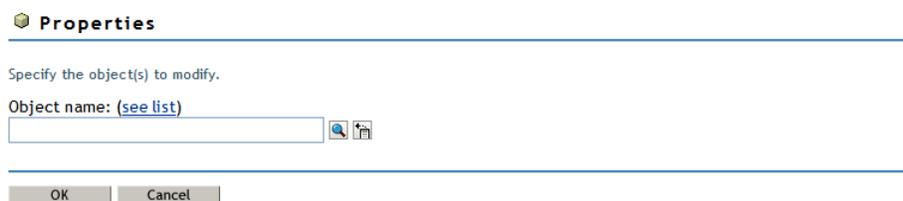
```
/etc/init.d/ncp2nss restart
```

9.2 Setting a Directory Quota in iManager

- In iManager, use either of the following methods to select a file or folder and open its Properties page:

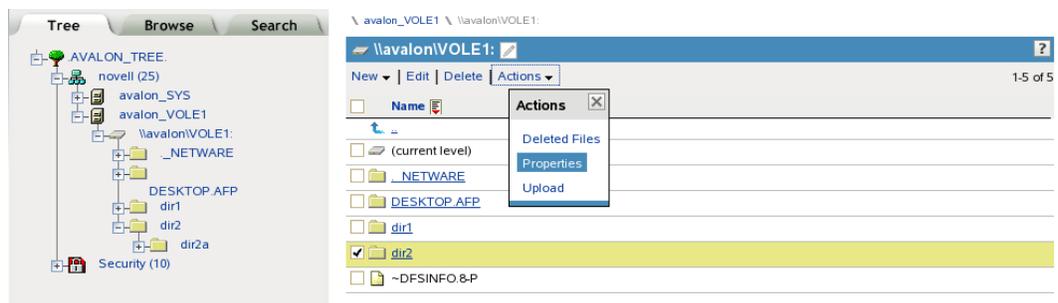
- ♦ **Files and Folders Role:** In the iManager toolbar, select the *Roles and Tasks* icon. In the left panel, select *Files and Folders > Properties*.

On the Properties page, click the *Search* icon, browse to locate and select the folder you want to manage on an NSS volume, then click *OK* to open the Properties page for the selected folder.



- ♦ **Tree View:** In the iManager toolbar, click *View Objects* icon. In the left panel, browse the Tree to locate and select the folder you want to manage on an NSS volume.

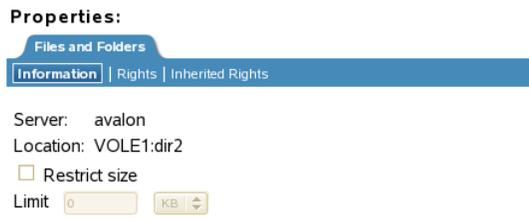
In the right panel, select the check box next to the folder, then select *Actions > Properties*.



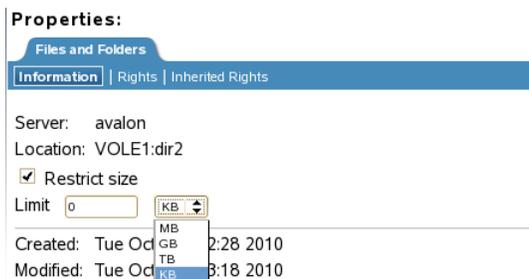
- On the Properties page, view the current status of the Directory Quota on the selected folder.
If a Directory Quota is set, the *Restrict Size* field is selected and the *Limit* fields show the quota size in KB, MB, GB, or TB.



If the Directory Quota is not set, the *Restrict Size* field is deselected and the *Limit* fields are dimmed (not available).



- (Optional) Set or modify a Directory Quota on the selected folder:
 - Add a Quota:** Select the *Restrict Size* check box to enable space restrictions for the selected directory. In the *Limit* field, type the quota value, then select whether this is KB, MB, GB, or TB from the Units drop-down list.
 - Modify an Existing Quota:** In the *Limit* field, type the new directory quota, then select whether this is KB, MB, GB, or TB from the Units drop-down list.



- (Optional) Remove a directory quota by deselecting the *Restrict Size* check box.
This disables space restrictions for the selected folder. The *Limit* fields are automatically dimmed (not available).
- At the bottom of the *Properties Information* page, click *Apply* or *OK* to apply the changes.

9.3 Setting 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 [OES 2 SP3: NetStorage Administration Guide](#).

To create or modify NSS directory quotas with NetStorage:

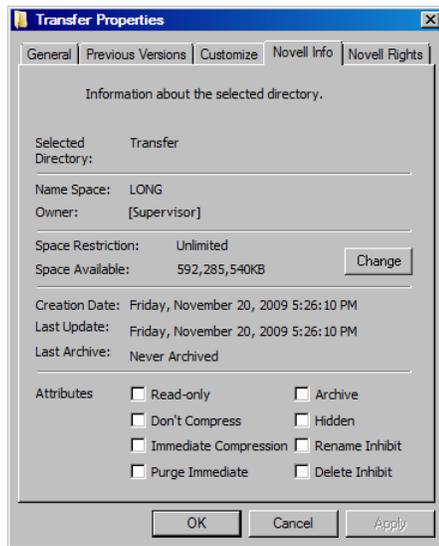
- 1 In a Web browser, connect to NetStorage.
- 2 Log in to NetStorage with the user name and password of the Admin user or equivalent user.
- 3 Navigate to the directory you want to manage.
- 4 Right-click the directory, then select *Properties*.
- 5 Click the *Novell Info* tab.
- 6 Do one of the following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

9.4 Setting a Directory Quota with the Novell Client

The Novell Client allows the admin user to manage directory quotas for directories in an NSS volume.

- 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 user name 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 > Novell Info*.



- 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.

9.5 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.

9.6 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 Restart NCP2NSS by entering the following at a terminal prompt:

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

9.7 Using the Quota Utility to Set Directory and User Space Quotas on NSS Volumes

Use this utility to set or get the user space quota and directory quota on NSS volumes and files.

- ♦ [Section 9.7.1, "Syntax," on page 96](#)
- ♦ [Section 9.7.2, "Options," on page 96](#)
- ♦ [Section 9.7.3, "Examples," on page 97](#)

9.7.1 Syntax

Command	Description
<code>quota</code> <code><USERQUOTAOPTIONS></code>	It is used to set or get user space quota on NSS volumes and files.
<code>quota</code> <code><DIRECTORYQUOTAOPTIONS></code>	It is used to set or get directory quota on NSS volumes and files.

9.7.2 Options

Usage Options

Option	Description
<code>-h, --help</code>	Displays the help information.
<code>-v, --version</code>	Displays the program version information.

USERQUOTAOPTIONS

Option	Description
-U, --userquota	To set the user quota options.
s, --size=quota (in KB/MB/GB)	Storage space allowed for the specified user. The default unit is MB.
-V, --volumename=volumename	Name of the volume for which quota has to be set.
-u, --username	Specify the user name.
-g, --getquotas	Gets the user quota.

DIRECTORYQUOTAOPTIONS

Option	Description
-D, --directoryquota	To set the directory quota options.
-s, --size=quota (in Multiples of 4KB/MB/GB)	Size of the quota. The default unit is KB.
-d, --directoryname	Directory name.
-g, --getquotas	Gets the directory quota.

9.7.3 Examples

```
quota -U -V VOL1 -u wwrn.novell -s 30GB
```

This example is for user quota.

```
quota -D -d /media/nss/VOL/test -s 4GB
```

This example is for directory quota.

```
quota -g -V VOL1
```

This example is for viewing user quota.

```
quota -g -d /media/nss/VOL/test
```

This example is for viewing directory quota.

10 Salvaging or Purging Deleted Files and Folders on NSS Volumes

The Novell Storage Services (NSS) file system provides a mechanism for recovering deleted files and folders. The Salvage attribute must be enabled on the NSS volume.

- ♦ [Section 10.1, “Salvaging or Purging Deleted Files with iManager,” on page 99](#)
- ♦ [Section 10.2, “Salvaging or Purging Deleted Files with Other Tools,” on page 102](#)

10.1 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 10.1.1, “Prerequisites,” on page 99](#)
- ♦ [Section 10.1.2, “Salvaging a Deleted File,” on page 100](#)
- ♦ [Section 10.1.3, “Purging Deleted Files,” on page 101](#)

10.1.1 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.

- ♦ If the deleted file resided in a directory that has been deleted, you must first salvage the deleted directories in the path. Salvage each lower directory in turn until you have salvaged the deleted directory that contained the file. You can then search for the deleted file in the salvaged directory.
- ♦ The files must have been deleted by a trustee from an NCP-aware tool, such as an NCP client, Novell Remote Manager, the iManager Files and Folders plug-in, or NetStorage. Files and folders deleted by the `root` user from a native Linux file browser are not salvageable.

10.1.2 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 10.1.1, “Prerequisites,” on page 99](#) 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.

Deleted Files

Object name:  

Name	Size	Date	Deleted By
------	------	------	------------

- 2 If the folder that contained the file has also been deleted, salvage the deleted directories in the path to that folder.
 - 2a On the *Deleted File* page, click the *Search* icon to browse and locate the folder that contains a deleted folder in the path, then click the name link of the folder to select it.
 - 2b Browse the list of deleted files and folders in the selected directory, and locate the version of the folder you want to salvage.

Deleted Files 

Select a Directory path to list deleted files. You can recover deleted files by salvaging them, or purge them to remove them completely.

|

<input type="checkbox"/>	Name	Size	Date	Deleted By
<input type="checkbox"/>	gconf.d	0	Wed 24 Apr 2013 03:13:22 PMMDT	admin.novell

- 2c Select the check box next to the deleted folder, then click *Salvage*.
 - 2d Repeat the process to salvage each lower directory in turn until you salvage the directory of interest.
- 3 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.

- 4 Browse the list of deleted files to locate the version of the file you want to salvage.
- 5 Select the deleted file that you want to salvage, then click *Salvage*.
- 6 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.
- 7 Click *Repeat Task* to salvage or purge other deleted files, or click *OK* to dismiss the confirmation message.

10.1.3 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 10.1.1, “Prerequisites,”](#) on page 99 to understand when deleted files are available.

You can purge a single deleted file, purge all deleted files in a folder, or purge a deleted folder and all of the deleted subfolders and files it contains.

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

Deleted Files

Object name:  

Name	Size	Date	Deleted By
<input type="button" value="OK"/> <input type="button" value="Cancel"/>			

- 2 If the folder that contained the file has also been deleted, salvage the deleted directories in the path to that folder.
 - 2a On the *Deleted File* page, click the *Search* icon to browse and locate the folder that contains a deleted folder in the path, then click the name link of the folder to select it.
 - 2b Browse the list of deleted files and folders in the selected directory, and locate the version of the folder you want to salvage.

Deleted Files ?

Select a Directory path to list deleted files. You can recover deleted files by salvaging them, or purge them to remove them completely.

Salvage | Purge

<input type="checkbox"/>	Name	Size	Date	Deleted By
<input type="checkbox"/>	gconf.d	0	Wed 24 Apr 2013 03:13:22 PMMDT	admin.novell

- 2c** Do one of the following:
- ♦ To continue in the path to purge one or multiple deleted files in a salvaged folder, select the check box next to the deleted folder, click *Salvage*, then continue to [Step 2d](#).
 - ♦ To purge a deleted folder and all of the deleted subfolders and files it contains, select the check box next to the deleted folder, click *Purge*, then continue to [Step 6](#).
- 2d** Repeat the process to salvage each lower directory in turn until you salvage the directory of interest.
- 3** 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.
- 4** Browse the list of deleted files to locate the version of the file you want to purge.
- 5** Select one or multiple deleted files that you want to purge, then click *Purge*.
A confirmation message confirms that the file was successfully purged.
- 6** Click *Repeat Task* to salvage or purge other deleted files, or click *OK* to dismiss the confirmation message.

10.2 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 10.2.1, "Using NetStorage," on page 102](#)
- ♦ [Section 10.2.2, "Using the Novell Client," on page 103](#)

10.2.1 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 server.

- 1** Access NetStorage.
- 2** In the left column, select the directory where the deleted files were located when they were deleted.
If the directory was also deleted, you must salvage all of the deleted directories in turn in the path to the file before you can search for the deleted file.
- 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*.

10.2.2 Using the Novell Client

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

- 1 Right-click the Novell Client icon (the red N) in the notification area to display the menu.
- 2 If the directory was also deleted, you must salvage all of the deleted directories in turn in the path to the file before you can search for the deleted file.
- 3 If you want to salvage a deleted file, click *Novell 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*.

- 4 If you want to purge a deleted file, click *Novell 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*.
- 5 When you are done, click *OK*.

11 Configuring File System Attributes for NSS Files and Folders

Novell Storage Services (NSS) provides file system attributes for folders and files that allow you to specify how the file or folder behaves when accessed by any user. If the *Directory Quotas* option is enabled on the NSS volume, you can also specify space quotas on folders. If you and the Supervisor right, you can modify the file owner. You might want to do this if you have set user space restrictions.

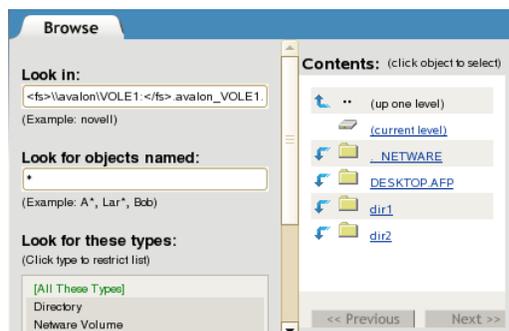
- ♦ Section 11.1, “Viewing Properties of a File or Folder in iManager,” on page 105
- ♦ Section 11.2, “Viewing or Modifying File Ownership,” on page 109
- ♦ Section 11.3, “Viewing or Modifying File System Attributes for NSS Volumes,” on page 110
- ♦ Section 11.4, “Using the Novell Client to Configure File System Attributes,” on page 111
- ♦ Section 11.5, “Using Novell NetStorage to Configure File System Attributes,” on page 112
- ♦ Section 11.6, “Using the *Attrib* Utility to Set NSS File System Attributes,” on page 113

11.1 Viewing Properties of a File or Folder in iManager

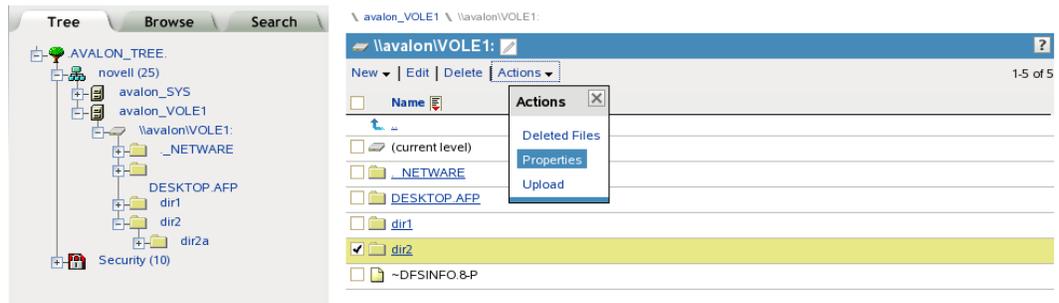
1 In iManager, use either of the following methods to select a file or folder and open its Properties page:

- ♦ **Files and Folders Role:** In the iManager toolbar, select the *Roles and Tasks* icon. In the left panel, select *Files and Folders > Properties*.

On the Properties page, click the *Search* icon, browse to locate and select the folder you want to manage on an NSS volume, then click *OK* to open the Properties page for the selected folder.



- ♦ **Tree View:** In the iManager toolbar, click *View Objects* icon. In the left panel, browse the Tree to locate and select the folder you want to manage on an NSS volume.
In the right panel, select the check box next to the folder, then select *Actions > Properties*.



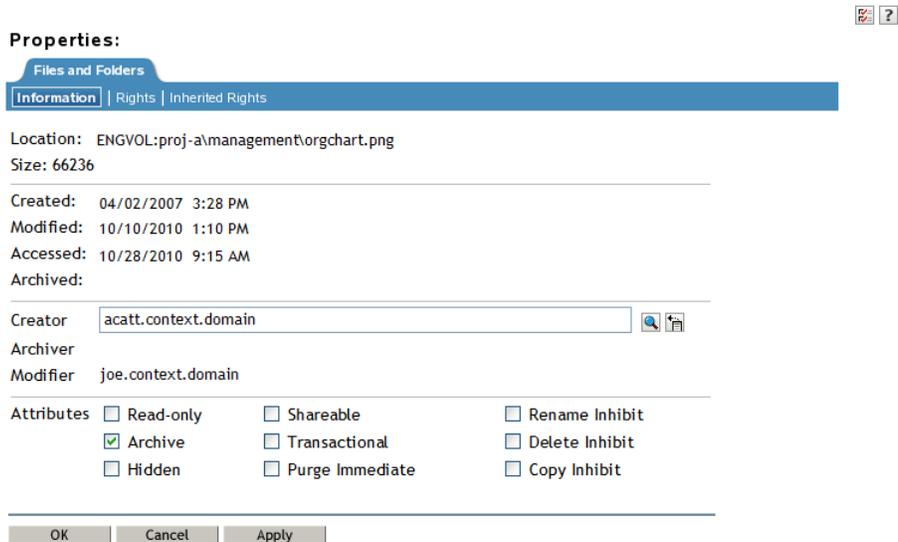
- 2 Use one of the following methods to specify the volume, folder, or file that you want manage:
 - ♦ Click the *Search* icon to browse and locate volume, folder or file from the Storage objects, then click the name link of the object to select it.
 - ♦ Click the *History* icon to select a volume, folder,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

The path name 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: *Information*, *Rights*, and *Inherited Rights*.

- 4 Select the *Information* tab to perform the following tasks:
 - ♦ View details about the selected volume, folder, or file.
 - ♦ Configure directory quotas for folders on NSS volumes. This option is available only when the Directory Quotas attribute is enabled on the NSS volume.
 - ♦ Modify the file owner.
 - ♦ Configure file or directory attributes.



The Information page displays the following properties:

Property	Description
Location	The path name of the selected volume, folder, or file. For example: <code>VOL1:dir1\dirB\filename.ext</code>
Restrict Size (Enable or Disable a Directory Quota on a Folder)	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. If this option is enabled, you must also specify a value for the quota in the Limit field. 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. 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> . Deselect <i>Restrict Size</i> to disable a directory quota for the selected folder, then click <i>Apply</i> .
Limit (Set Limit for a Directory Quota on a Folder)	The maximum size allowed for the specified directory and its contents. Default: Disabled (not available unless <i>Restrict Size</i> is enabled). 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. If the value you specify exceeds the volume quota, the volume quota overrides the directory quota. 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. 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.
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.

Property	Description
Creator (View or Modify Ownership)	<p>The typeless distinguished Novell eDirectory user name (such as <code>username.context</code>) of the user who created the file or folder. If the user name becomes invalid, such as if an employee leaves the company, the GUID of the user name is reported. For NSS, any number of files or folders can be represented by GUIDs instead of valid user names.</p> <p>To modify the ownership of file or folder, you must be logged in as an administrator user of the server. Specifically, you need the eDirectory Write right on the NCP Server object for the server. You also need to be assigned as a trustee of the file or folder and have the Access Control and Write rights for it.</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 and NCP volumes on Linux, 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 Section 6.5, "Using the Files and Folders Plug-In for iManager to Manage Trustees, Trustee Rights, and Inherited Rights," on page 66.</p> <p>Changing the ownership of the file or folder does not modify who can access it, but it does modify whose user name is charged for the space it consumes. If you modify the ownership, you must click Apply or OK to save the changes.</p>

Archiver	The distinguished user name (such as <code>username.context</code>) of the user who modified the version of the file or folder that was last archived.
----------	---

Modifier	The distinguished user name (such as <code>username.context</code>) of the user who last modified the current version of the file or folder.
----------	---

Attributes	<p>File system 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

Attribute	Description	Files	Folders
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 (NetWare)	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. 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.	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	Prevents users from deleting a directory or file. 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.	Yes	Yes
Copy Inhibit	Prevents users from copying a file. This attribute works only for clients using Macintosh operating systems to access NSS volumes on NetWare. 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.	Yes	No

11.2 Viewing or Modifying File Ownership

The owner of a file is assigned by default to be the identity of the user who creates the file. Ownership does not determine who can access a file because the NSS file system uses the Novell trustee model to control access. However, 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. Changing the ownership of the file or folder does not modify who can access it, but it does modify whose user name is charged for the space it consumes.

The Creator field shows the typeless distinguished Novell eDirectory user name (such as `username.context`) of the user who owns the file or folder. If the user name becomes invalid, such as if an employee leaves the company, the GUID of the user name is reported. For NSS, any number of files or folders can be represented by GUIDs instead of valid user names.

To modify the ownership of file or folder, you must be logged in as an administrator user of the server. Specifically, you need the eDirectory Write right on the NCP Server object for the server.

- 1 In iManager, click *Files and Folders*, then click *Properties* to open the *Properties* page.
- 2 Click the *Search* icon to browse and locate file from the Storage objects, click the name link of the file to select it.

The path name of the file or folder appears in the *Name* field.

- 3 Click *OK* to open the file's Properties page.

Properties:

Files and Folders

Information | Rights | Inherited Rights

Location: VOL1:mytestdir1\schema.log
Size: 8192

Created: Tue Sep 23 17:27:48 2008
Modified: Tue Sep 23 17:27:48 2008
Accessed: Tue Sep 23 00:00:00 2008
Archived:

Creator: admin.novell  

Archiver:

Modifier: admin.novell

Attributes

<input type="checkbox"/> Read-only	<input type="checkbox"/> Shareable	<input type="checkbox"/> Rename Inhibit
<input checked="" type="checkbox"/> Archive	<input type="checkbox"/> Transactional	<input type="checkbox"/> Delete Inhibit
<input type="checkbox"/> Hidden	<input type="checkbox"/> Purge Immediate	<input type="checkbox"/> Copy Inhibit

OK Cancel Apply Refresh

- 4 On the Information page, the *Creator* field shows the typeless distinguished user name of the current owner, such as `username.context`.

Creator: admin.novell  

- 5 If you want to modify the owner, click the *Search* icon to open the *Object Browser* dialog box, then locate and select the user name of the new owner.
- 6 If you modified the owner, click *Apply* or *OK* on the Information page in order to save the change.

11.3 Viewing or Modifying File System Attributes for NSS Volumes

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

For instructions, see [Section 6.3, "Viewing Properties of a File or Folder in iManager," on page 62](#).

- 2 Click the *Information* tab to view or modify the following attributes 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.

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

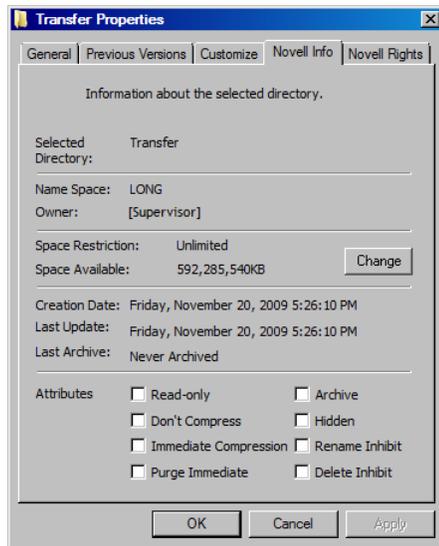
Attribute	Description	Files	Folders
Archive	Identifies files and folders that have been modified since the last backup. This attribute is assigned automatically.	Yes	Yes
Hidden	Hides directories and files so they do not appear in a file manager or directory listing.	Yes	Yes
Shareable	Allows more than one user to access the file at the same time. This attribute is usually used with Read Only.	Yes	No
Transactional (NetWare)	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. 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.	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	Prevents users from deleting a directory or file. 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.	Yes	Yes
Copy Inhibit	Prevents users from copying a file. This attribute works only for clients using Macintosh operating systems to access NSS volumes on NetWare. 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.	Yes	No

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

11.4 Using the Novell Client to Configure File System Attributes

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 *Novell Info*.



- 2 In the *Attributes* area, select an 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 volumes.
- ◆ The attribute must be enforceable by NCP or NSS in the current network configuration.

- 3 Click *OK*.

11.5 Using Novell NetStorage to Configure File System Attributes

- 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 *Novell Info* tab, select or deselect attributes for the selected directory or file, then click *Apply*.

Select from the following attributes:

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

For information, see [Section 5.7, “Understanding Directory and File Attributes for NSS Volumes,”](#) on page 54

11.6 Using the Attrib Utility to Set NSS File System Attributes

Use the Attribute (`attrib`) utility to set NSS file system directory and file attributes on Linux.

- ◆ [Section 11.6.1, “Syntax,” on page 113](#)
- ◆ [Section 11.6.2, “Options,” on page 113](#)
- ◆ [Section 11.6.3, “Attributes,” on page 113](#)
- ◆ [Section 11.6.4, “Example,” on page 115](#)
- ◆ [Section 11.6.5, “See Also,” on page 115](#)

11.6.1 Syntax

```
attrib [options] [filename]
```

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

11.6.2 Options

Option	Description
<code>-s, --set=ATTRIBUTES</code>	Set the attributes on the file.
<code>-c, --clear=[ATTRIBUTES all]</code>	Clear the attributes on the file.
<code>-l, --long</code>	Displays a long version of the file attributes.
<code>-q, --quiet</code>	Does not display any normal output.
<code>-d, --dos</code>	Use DOS compatible attributes (that is, ro=ro,di,ri)
<code>-v, --version</code>	Displays the program version information.
<code>-h, --help</code>	Displays the ATTRIB help screen.
<code>-S, --softlink</code>	Do not follow link option.
<code>-r, --recursive</code>	Set the attributes recursively on the directory.

11.6.3 Attributes

Multiple attributes are separated with commas.

Attribute	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

Attribute	Description	Applies to Files	Applies to Directories
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 Read and File Scan trustee rights. This attribute works only for clients using Macintosh operating systems to access NSS volumes on NetWare.	Yes	No
cm	Compressed (status display only) indicates whether the file is currently stored in compressed format.	Yes	No
dc	Don't 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 Erase trustee 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 files.	Yes	No
hi	Hidden hides directories and files so they do not appear in a file manager or directory listing.	Yes	Yes
ic	Immediate Compression 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 file or directory 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	Shareable 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. This attribute is normally used with system files.	Yes	Yes

Attribute	Description	Applies to Files	Applies to Directories
tr	Transactional allows a file to be tracked and protected by the Transaction Tracking System (TTS).	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

11.6.4 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.

11.6.5 See Also

For information about setting Novell Trustee Rights, see [“Using the Rights Utility to Set Trustee Rights for the NSS File System”](#) on page 73.

12 Understanding Directory Structures in Linux POSIX File Systems

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

- ♦ [Section 12.1, “Linux Filesystem Hierarchy,” on page 117](#)
- ♦ [Section 12.2, “Default Directories,” on page 117](#)
- ♦ [Section 12.3, “Linux File Types,” on page 118](#)
- ♦ [Section 12.4, “POSIX Access Control Lists,” on page 118](#)

For information about OES Linux file systems, see the *SUSE Linux Enterprise Server 10 SP3 Installation and Administration Guide* (http://www.novell.com/documentation/sles10/book_sle_reference/data/book_sle_reference.html).

12.1 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) (<http://www.tldp.org>).

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

12.2 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

Linux Directory	Description
<code>/home/username</code>	A user's personal home directory
<code>/tmp</code>	System temporary files
<code>/usr</code>	Applications software
<code>/usr/bin</code>	Executable files for programs with user permission
<code>/var</code>	System variables
<code>/lib</code>	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 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.

12.3 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 <code>/dev</code>
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

12.4 POSIX Access Control Lists

For information, see "Access Control Lists in Linux" (http://www.novell.com/documentation/sles10/book_sle_reference/data/cha_acls.html) in the *SUSE Linux Enterprise Server 10 SP3 Installation and Administration Guide* (http://www.novell.com/documentation/sles10/book_sle_reference/data/book_sle_reference.html).

A Documentation Updates

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.

This document was updated on the following dates:

- ♦ [Section A.1, “May 31, 2013,” on page 119](#)
- ♦ [Section A.2, “May 3, 2013,” on page 119](#)
- ♦ [Section A.3, “March 8, 2013,” on page 121](#)
- ♦ [Section A.4, “January 31, 2013,” on page 121](#)
- ♦ [Section A.5, “November 21, 2011,” on page 121](#)
- ♦ [Section A.6, “June 28, 2011,” on page 121](#)
- ♦ [Section A.7, “December 2010 \(OES 2 SP3\),” on page 122](#)
- ♦ [Section A.8, “November 2009 \(OES 2 SP2\),” on page 123](#)
- ♦ [Section A.9, “December 2008 \(OES 2 SP1\),” on page 124](#)
- ♦ [Section A.10, “January 4, 2008,” on page 125](#)

A.1 May 31, 2013

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

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

Location	Change
Section 2.1, “What’s New (May 2013 Patches),” on page 11	This section is new.

A.2 May 3, 2013

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

- ♦ [Section A.2.1, “Salvaging or Purging Deleted Files and Folders on NSS Volumes,” on page 120](#)
- ♦ [Section A.2.2, “What’s New or Changed for Novell Cluster Services,” on page 120](#)

A.2.1 Salvaging or Purging Deleted Files and Folders on NSS Volumes

Location	Change
Section 10.1.1, "Prerequisites," on page 99	<p>If the deleted file resided in a directory that has been deleted, you must first salvage the deleted directories in the path. Salvage each lower directory in turn until you have salvaged the deleted directory that contained the file. You can then search for the deleted file in the salvaged directory.</p> <p>The files must have been deleted by a trustee from an NCP-aware tool, such as an NCP client, Novell Remote Manager, the iManager Files and Folders plug-in, or NetStorage. Files and folders deleted by the root user from a native Linux file browser are not salvageable.</p>
Section 10.1.2, "Salvaging a Deleted File," on page 100	A new step was added to salvage a deleted folder.
Section 10.1.3, "Purging Deleted Files," on page 101	<p>You can purge a single deleted file, purge all deleted files in a folder, or purge a deleted folder and all of the deleted subfolders and files it contains.</p> <p>A new step was added to salvage a deleted folder so you can purge one or multiple deleted files in it, or to purge a deleted folder and all of the deleted subfolders and files in it.</p>
Section 10.2.1, "Using NetStorage," on page 102	If the directory was also deleted, you must salvage all of the deleted directories in turn in the path to the file before you can search for the deleted file.
Section 10.2.2, "Using the Novell Client," on page 103	If the directory was also deleted, you must salvage all of the deleted directories in turn in the path to the file before you can search for the deleted file.

A.2.2 What's New or Changed for Novell Cluster Services

Location	Change
Section 2.2, "What's New (April 2013 Patches)," on page 11	This section is new.

A.3 March 8, 2013

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

- ♦ [Section A.3.1, “Understanding File System Access Control Using Trustees,”](#) on page 121

A.3.1 Understanding File System Access Control Using Trustees

Location	Change
Section 5.1, “Understanding the Novell Trustee Model for File System Access,” on page 33	This section was revised for clarity.
Section 5.2, “Configuring a Non-Admin User to be an Admin-Equivalent User,” on page 46	This section is new.
Section 5.3, “Configuring [Public] as a File System Trustee,” on page 49	This section is new.

A.4 January 31, 2013

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

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

Location	Change
Section A.4, “January 31, 2013,” on page 121	This section is new.

A.5 November 21, 2011

The following section is new: [Section 2.4, “What’s New \(September 2011 Patches\),”](#) on page 13.

A.6 June 28, 2011

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

- ♦ [Section A.6.1, “Configuring Trustees and File System Attributes,”](#) on page 122
- ♦ [Section A.6.2, “Understanding File System Access Control Using Trustees,”](#) on page 122

A.6.1 Configuring Trustees and File System Attributes

Location	Change
Section 6.5, "Using the Files and Folders Plug-In for iManager to Manage Trustees, Trustee Rights, and Inherited Rights," on page 66	An example was added for configuring the [Public] trustee as a file system trustee.

A.6.2 Understanding File System Access Control Using Trustees

Location	Change
Section 5.4, "Configuring the [Public] Trustee Access Rights on NSS Volumes for Daemons Running as the Nobody User," on page 50	An example was added using the Files and Folders plug-in to iManager.

A.7 December 2010 (OES 2 SP3)

This guide was updated to conform with Novell documentation standards. Information specific to the NetWare 6.5 SP8 operating system was removed. For NetWare file systems management information, see the *NW 6.5 SP8: File Systems Management Guide*.

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

- ♦ [Section A.7.1, "Configuring File System Attributes for NSS Files and Folders," on page 122](#)
- ♦ [Section A.7.2, "Managing Files and Folders," on page 122](#)
- ♦ [Section A.7.3, "Understanding File System Access Control Using Trustees," on page 123](#)
- ♦ [Section A.7.4, "What's New for File System Management and Access," on page 123](#)

A.7.1 Configuring File System Attributes for NSS Files and Folders

Location	Change
Creator in Section 11.2, "Viewing or Modifying File Ownership," on page 109	To modify the ownership of file or folder, you must be logged in as an administrator user of the server. Specifically, you need the eDirectory Write right on the NCP Server object for the server.

A.7.2 Managing Files and Folders

Location	Change
Section 8.2, "Moving a File or Folder to a Different Folder on the Same Volume," on page 83	This section is new.

Location	Change
Section 8.3, "Renaming a File or Folder on an NSS Volume or NCP Volume," on page 84	This section is new.

A.7.3 Understanding File System Access Control Using Trustees

Location	Change
Section 5.1.1, "Trustees," on page 34	Changing the file or folder ownership additionally requires that the user be the administrator user (or a user with the eDirectory Write right to the NCP Server object) for the server.
Section 5.4, "Configuring the [Public] Trustee Access Rights on NSS Volumes for Daemons Running as the Nobody User," on page 50	This section is new.

A.7.4 What's New for File System Management and Access

Location	Change
Section 2.5, "What's New (OES 2 SP3)," on page 13	This section is new.

A.8 November 2009 (OES 2 SP2)

This guide was updated to the Novell documentation standards for OES 2 SP2. In addition, updates were made to the following section. The changes are explained below.

- ♦ [Section A.8.1, "Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes," on page 124](#)
- ♦ [Section A.8.2, "Managing Folders and Files on NSS Volumes," on page 124](#)
- ♦ [Section A.8.3, "What's New for File System Management and Access," on page 124](#)

A.8.1 Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes

Location	Change
Section 6.9, "Using the Rights Utility to Set Trustee Rights for the NSS File System," on page 73	In addition, the user running the rights command must have sufficient permissions to be able to set a new trustee or trustee rights to the user or group object for the file or directory specified. This and other NSS utilities are located in the <code>/opt/novell/nss/sbin</code> directory.

A.8.2 Managing Folders and Files on NSS Volumes

Location	Change
"Deleting a File or Folder on an NSS Volume or NCP Volume" on page 84	Beginning in OES 2 SP2, it is possible to delete a non-empty folder. Previously, you had to delete all of the folder's contents before deleting the folder.
Step 3 in Section 9.2, "Setting a Directory Quota in iManager," on page 92	Beginning in OES 2 SP2, the Files and Folders plug-in to iManager allows directory quotas to be specified in KB, MB, GB, or TB. Previously and in other tools, directory quotas must be specified in KB.

A.8.3 What's New for File System Management and Access

Location	Change
Section 2.6, "What's New (OES 2 SP2)," on page 14	This section is new.

A.9 December 2008 (OES 2 SP1)

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

- ♦ [Section A.9.1, "Coexistence and Migration Issues," on page 125](#)
- ♦ [Section A.9.2, "Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes," on page 125](#)
- ♦ [Section A.9.3, "Managing Folders and Files on NSS Volumes," on page 125](#)
- ♦ [Section A.9.4, "Understanding File System Access Control Using Trustees," on page 125](#)

A.9.1 Coexistence and Migration Issues

Location	Change
“Core Linux Utilities” on page 21	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.

A.9.2 Configuring File System Trustees, Trustee Rights, Inherited Rights Filters, and Attributes

Location	Change
Section 6.9, “Using the Rights Utility to Set Trustee Rights for the NSS File System,” on page 73	The Copy Inhibit attribute works only for Macintosh clients to access NSS volumes on NetWare.

A.9.3 Managing Folders and Files on NSS Volumes

Location	Change
Section 8.4, “Deleting a File or Folder on an NSS Volume or NCP Volume,” on page 84	A folder must be empty before it can be deleted.

A.9.4 Understanding File System Access Control Using Trustees

Location	Change
Section 5.7, “Understanding Directory and File Attributes for NSS Volumes,” on page 54	Read only prevents a file from being modified.

A.10 January 4, 2008

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

- ♦ [Section A.10.1, “What’s New for File System Management and Access,” on page 126](#)
- ♦ [Section A.10.2, “Management Tools for Files and Folders Management,” on page 126](#)

A.10.1 What's New for File System Management and Access

Location	Change
Section 2.8.1, "Files and Folders Plug-In to Novell iManager 2.7," on page 15	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.10.2 Management Tools for Files and Folders Management

Location	Change
"Deleted Files" on page 26	Salvage and purge of deleted files and directories is available only for NSS volumes where the volume's Salvage attribute is enabled.
"Properties" on page 26	Directory quotas management is available only for NSS volumes where the volume's Directory Quotas attribute is enabled.
