# Novell
# NFS* Gateway for NetWare® 6

ADMINISTRATION GUIDE

Novell®

## Legal Notices

**Online Documentation:** To access the online documentation for this and other Novell products, and to get updates, see www.novell.com/documentation.

## Novell Trademarks

ConsoleOne is a registered trademark of Novell, Inc in the United States and other countries.

eDirectory is a trademark of Novell, Inc.

NetWare is a registered trademark of Novell, Inc., in the United States and other countries.

Novell Cluster Services is a trademark of Novell, Inc.

NetWare Core Protocol and NCP are trademarks of Novell, Inc.

NetWare Loadable Module and NLM are trademarks of Novell, Inc.

Novell is a registered trademark of Novell, Inc., in the United States and other countries.

Novell Client is a trademark of Novell, Inc.

Novell Directory Services and NDS are registered trademarks of Novell, Inc., in the United States and other countries.

Novell Storage Services is a trademark of Novell, Inc.

## Third-Party Trademarks

All third-party trademarks are the property of their respective owners.

# Contents

# About This Guide

This guide describes how to install and use the NFS\* Gateway on NetWare® 6. The guide is intended for both users and network administrators and is divided into the following sections:

**Documentation Conventions**

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

A trademark symbol (®, ™, etc.) denotes a Novell trademark. An asterisk (\*) denotes a third-party trademark.

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

**User Comments**

We want to hear your comments and suggestions about this manual and the other documentation included with NFS Gateway on NetWare 6. To contact us, send e-mail to proddoc@novell.com.

# 1 Overview

The NFS Gateway enables NetWare® servers to mount NFS file systems as virtual NetWare Novell Storage Services™ (NSS) volumes. Using the NFS Gateway, NetWare clients can transparently access files and directories on any NFS server system on the network.

The NFS Gateway is a Loadable Storage Services (LSS) module for NSS 3.0 file systems on NetWare 6. The NFS Gateway mounts a shared UNIX directory as an NSS volume for NetWare users.

The NFS Gateway for NetWare 6 has been redesigned to take advantage of the file system interface provided by NSS. This file system interface is crucial to the functioning of the NFS Gateway.

The following figure illustrates the NFS Gateway functionality:

**Figure 1    NFS Gateway File Sharing Process**
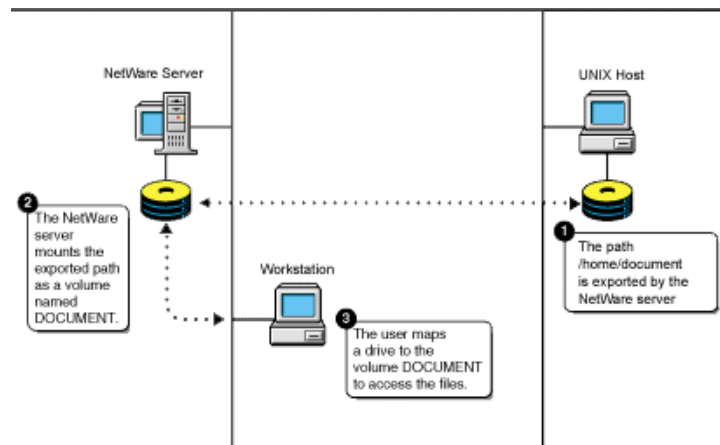


The communication between NFS Gateway and UNIX machines is over the NFS protocol. Both NFS version 2 and NFS version 3 are supported over UDP.

## What's New

- The NFS Gateway for NetWare 6 has been completely redesigned for better performance and reliability.

  For details of performance and performance tuning, see Chapter 7, "Interoperability and Performance Data," on page 47 and Chapter 6, "Performance Tuning," on page 41.

  For this release, the default values are tuned for NFS version 3 performance. However, if you use NFS version 2, then you must tune gymount parameters to avoid delays and timeout failures. For more details, see "Tuning for NFS Version 2" on page 41.

- It has better scalability when compared to the existing NFS Gateway on NetWare 5.1.
- It has a new install. The install provides:
  - A prompt to accept the product license.
  - File backup.
  - Novell® eDirectory™ schema extension.
  - The uninstall provides for file restore.

  For details, see "Installing the NFS Gateway" on page 13.
- It incorporates the changes in the LSS interface for NSS 3.0.
- It is now SMP enabled.
- It provides dynamic mounting and dismounting of Gateway volumes over the UDP protocol.
- NFS Gateway volumes can be accessed through CIFS clients.

  For details, see "Accessing NFS Gateway Volumes as CIFS Users" on page 35.
- It provides interoperability with different flavors of NFS servers that are widely used in various user environments.

  For details, see "Interoperability" on page 47.
- File I/O handling is improved. All file I/O errors are now reported to the users connected through NCP™.
- Symbolic and hard links are now supported.
- Unicode* character support is enabled.
- The gateway is cluster-enabled for high availability and load balancing.

  For details, see Chapter 5, "Cluster-Enabling the NFS Gateway for NetWare 6," on page 37.
- The logging feature enables viewing errors, information on the current operation, and warning messages.

  The log messages specific to each volumes are saved as *shadowVolume*/gateway/*volumename*.log, where the shadowVolume is the volume used to store the shadow files and *volumename* is the volume specified in the gymount.

  The general log messages for NFS Gateway are saved as *shadowVolume*/gateway/system.log, where the shadowVolume is the volume specified in the -shadowVolume parameter of nfsgy.

  For details, see "logFileSize" on page 17, "logLevel" on page 17, "logVerbose" on page 17, and and "logFlushImmediate" on page 18.

# What's Not Supported

- NFS Gateway does not support NFS and mount protocol over TCP.
- NFS Gateway does not support the Network Lock Manager protocol and sparse files, so database files are also not supported.
- SUID is not supported.

For example, if the SUID bit is set for the executable file, then the files/directories created using this executable will not have the UID of the executable, but they will have the UID of the user who executes the executable file.

# 2 Setting Up the NFS Gateway

Perform the following tasks to set up the NFS Gateway:

## Meeting System Requirements

❑ Install NetWare 6 Support Pack 3, available at Novell Support Web site (http://support.novell.com/filefinder).

❑ Install post-SP3 NSS modules for NetWare 6 available as nw6nss3c.exe from the Novell Support Web site (http://support.novell.com/filefinder).

❑ Make sure there is a minimum of 32 MB RAM to load NFS Gateway with default parameter values.

❑ Make sure there is adequate free space on the volume where the shadow files are to be stored.

   To determine free space requirements, refer to Step 3c on page 15 in "Configuring NFS Gateway for the First Time" on page 14.

❑ To list a large directory (typically with more than 30,000 entries), increase the shadowCacheSize parameter value.

   For more information, refer to "Setting NFS Gateway Parameters" on page 16.

## Installing the NFS Gateway

After meeting the system requirements, you can proceed to install NFS Gateway.

If you have a previous version of the gateway already installed, you still need to reinstall the NFS Gateway for NetWare 6 because an NFS Gateway upgrade from NetWare 5.1 to NetWare 6 is not supported.

To install the NFS Gateway:

**1** If Native File Access for UNIX is not installed on the server, skip to Step 2.

   or

   If Native File Access for UNIX is installed on the NetWare server:

**1a** Stop the NFS services by entering the `nfsstop` command at the console prompt.

**1b** Unload nfsadmin and pkernel by entering the following commands at the console prompt:

**`unload nfsadmin`**

**`unload pkernel`**

**2** Install the NFS Gateway using either NWCONFIG or the GUI install utility.

**2a** Select Install a Product Not Listed.

**2b** From the options displayed, select Press <F3> to Specify a Different Path.

**2c** Specify the directory path where you extracted the NFS Gateway package and where the product.ni is present. Wait while the required installation files are copied.

**2d** In the Welcome page, click Next to display the License agreement.

**2e** Read and accept the license agreement.

**2f** Install the product license by browsing or specifying the NFS Gateway license filename (*.nlf), then click Next.

or

Check the Install without Licenses check box to proceed with the installation and install the license later. You can install the license later using either the nwadmin utility or iManager.

**2g** Click Next. Make sure that NFS Gateway for NetWare 6 is displayed, then click Finish.

Wait while the install copies new files and also backs up the existing files if Native File Access for UNIX is installed.

**NOTE:** To understand and resolve error messages displayed during the install, refer to install.txt located in the product installation directory.

**2h** In the authentication screen, provide the User Name (administrator or admin equivalent), password, and context.

This authenticates the administrator to the eDirectory™ tree where license is to be installed, the eDirectory schema is extended (if not already extended), and the NIS_*Server* object is created.

**2i** Click View to read the Readme file, or click Close.

The NFS Gateway for NetWare 6 installation is now complete.

## Uninstalling the NFS Gateway

**1** Stop the NFS Gateway using gystop.

**2** Uninstall the NFS Gateway using either NWCONFIG or the GUI install utility.

## Configuring NFS Gateway for the First Time

After you have installed the NFS Gateway, you need to configure it before using it. This section describes how to configure certain system settings for the NFS Gateway for the first time.

**1** Change the bind order for the NetWare Server for NFS Gateway functionality.

Refer to TID10070570 at the Novell Support Web site (http://support.novell.com/cgi-bin/search/searchtid.cgi?/10070570.htm).

**2** Set the value for the Largest UDP Packet size parameter of NetWare based on the following guidelines:

- For the NFS Gateway, the following values are expected for Largest UDP Packet size:

  - 4096 + 512 = 4608 (minimum value expected for the NFS Gateway)

  - 8192 + 512 = 8704

  - 16384 + 512 = 16896

  - 32768 + 512 = 33280

  If you enter a value other than the valid values, but greater than 4609, then the nearest lower valid value is used.

  For example, if you enter 7000, then 4608 is used.

- For calculating read/write transfer size, the NFS Gateway subtracts 512 bytes for the header from the Largest UDP Packet size and uses the nearest $2^x$ value lesser than the result thus obtained.

  **IMPORTANT:** Because the NFS Gateway uses the nearest $2^x$ value lesser than the value obtained after subtracting 512 from the Largest UDP Packet size parameter, this can significantly reduce the read/write transfer size, if 512 is not added to the required parameter value.

  For example, if Largest UDP Packet size = 16384, then the actual read/write transfer value used is 8192. This value (8192) is the $2^x$ value, nearest to 16384- 512.

  Set the logLevel to 4 (Info, Warning and Errors) and verify the readSize and writeSize values used for a volume in the log file located at sys:\gateway\system.log.

- To modify the Largest UDP Packet size parameter, load monitor.nlm > Select Server Parameters > Communication, and then modify the parameter.

  or

  Enter the following command in the system console:

  ```
  set largest UDP packet size = <existing_value_+_512>
  ```

**3** Modify the Btrieve* settings for the NFS Gateway by editing the sys:\system\bti.cfg configuration file.

**3a** Set the parameter BalancedTrees = No.

**3b** Increase the value of the BackgroundThread parameter. This is to support large number of operations on a volume simultaneously.

For best performance, set this value based on the average number of mounted gateway volumes. A good standard to follow is to have 4 volumes for every I/O thread.

For example, if average number of mounted gateway volumes is 100, use 100/4 = 25 I/O threads.

Specifying a value higher than 64 might negatively impact performance, but that depends on the system capabilities.

**3c** Set the cacheSize parameter value in KB based on your requirements. This setting represents kilobytes (KB).

To determine your requirements:

- Estimate the maximum shadow file size of the shadow files for every volume.

**Maximum Shadow File Size:** The estimated size that the shadow file increases to, because of the directory operations.

For example, a volume with 50,000 entries will have a shadow file size of 94 MB. Use this benchmark to estimate the shadow file size.

◆ Calculate the working data set size for NFS Gateway.

**Working Data Set Size:** The sum of the maximum shadow file size of all gateway volumes active at any given time.

Refer to the following table for guidelines to set the cache size parameter based on your performance requirements.

| Performance | CacheSize Value |
| --- | --- |
| Best | 100% of the working data set size or 32768 KB (32 MB), whichever is greater. |
| Optimum | 20% to 30% of the working data set size or 32768 KB (32 MB), whichever is greater. |
| Minimum Requirement | 10% of the working data set size or 32768 KB (32 MB), whichever is greater. |

**4** Make sure that system times of the NetWare server and the corresponding UNIX server are synchronized.

**5** Restart the NetWare server for the configuration changes to take effect.

# Loading the NFS Gateway

**1** (Optional) Customize sys:\system\gystart.ncf, which is the NetWare configuration file for the NFS Gateway, by adding additional parameters.

If you do not specify additional parameters, NFS Gateway loads with default parameters.

For more information on the NFS Gateway parameters, refer to "Setting NFS Gateway Parameters" on page 16.

**2** (Optional) Enable the NFS Gateway to mount a volume on startup by editing sys:\system\gystart.ncf.

Add the entry for gymount based on the example provided in the gystart.ncf.

**3** Start the NFS Gateway services by entering **gystart** at the console prompt.

# Setting NFS Gateway Parameters

Use the following syntax to set the NFS Gateway parameters. These parameters apply to the NFS Gateway volumes mounted on the system.

```
nfsgy [-shadowCacheSize value][-pageCacheSize value]
[-shadowVolume volumeName][-logFileSize value][-logLevel value][-logVerbose]
[-logFlushImmediate]
```

The following table describes the parameters.

| Parameter | Default | Description |
|---|---|---|
| shadowCacheSize | 8 | Size of the shadow cache (in MB). |
| | | Range = 8 to 32 |
| | | For improved performance, we recommend that you set the value to 32 MB. |
| pageCacheSize | 8 | Size of the page cache (in MB). |
| | | Range = 8 to system limit |
| | | The maximum limit is based on the available system memory. |
| | | For example, 8 MB of page cache size is adequate to hold up to 50,000 entries in a single directory. If the number of entries in a single directory is greater than 50,000, we recommend that you increase the pageCacheSize value. |
| shadowVolume | sys: | Specifies the name of the volume where shadow files are to be stored. |
| | | The shadow files are stored in *shadowVolume*:\gateway directory. |
| | | The shadow volume specified with the nfsgy  commandis used if *shadowVolume* parameter is not specified with gymount command. |
| | | The NFS Gateway does not load if the specified volume is not available. |
| | | Do not use the mounted Gateway volumes as *ShadowVolume* when mounting another volume using gymount. For example, if vol1 is a mounted NFS Gateway volume, then do not execute the following: |
| | | `gymount vol2 -shadowvolume vol1` |
| | | **IMPORTANT:** Do not dismount or deactivate the volume that shadowVolume points to when the NFS Gateway is loaded. Doing so results in deactivation of volumes imported by the NFS Gateway. |
| logFileSize | 4 MB | Specifies the log file size (in MB). |
| | | The maximum value can be 32 MB. |
| | | If any invalid value is specified, then the default value is used. |
| | | After the log file size reaches the set value, the contents of the log file (.log) file are backed up as the .bak file. |
| | | The log messages specific to each volumes are saved as *shadowVolume*/gateway/volumename.log. The general log messages for the NFS Gateway are saved as *shadowVolume*/gateway/system.log. |
| logLevel | 1 | Specifies the logging level to be enabled for the volume. |
| | | 0, 1, 2, and 4 are the valid log levels. The values indicate the following: |
| | | 0 = None (Logging is disabled) |
| | | 1 = Errors |
| | | 2 = Warning, Errors |
| | | 4 = Info, Warning and Errors |
| logVerbose | Disabled | Specifies to log verbose information. |

| Parameter | Default | Description |
|---|---|---|
| logFlushImmediate | Disabled | If specified, forces the log messages to be written to file immediately. |
| | | If not set, the log messages are cached until the buffer is full. |

# Unloading the NFS Gateway

Unload NFS Gateway services by entering **gystop** at the console prompt.

**IMPORTANT:** Even if any file in any of the gateway volumes is open, the system will stop NFS Gateway services without asking any confirmation.

# 3 Managing NFS Gateway Volumes

The following topics are discussed in this section:

## Setting Volume-Specific Parameters

This section discusses the following:

### Mounting Parameters

Use the following syntax to mount a volume:

`gymount` *volumename IPAddress sharedPath* [-shadowVolume *value*] [-nfsVersion *value*] [-mountUid *value*][-mountGid *value*] [-anonUid *value*] [-anonGid *value*] [-rpcTimeOut *value*] [-rpcRetries *value*] [-dirCompFreq *value*][-umask *value*][-readOnly | -readWrite] [- tossMetadata | -noTossMetadata] [-lowerCaseUnixNames][-readSize *value*] [-writeSize *value*][-maxOutstandingPackets *value*] [-logLevel *value*] [-logVerbose | -logNonVerbose]

**IMPORTANT:** Load nfsgy with the required parameters before executing the gymount command. Otherwise, gymount auto loads nfsgy with default parameters.

The following table describes the mount parameters.

| Parameter | Default | Description |
|---|---|---|
| *volumename* | Must specify | Name of the volume that you are mounting. |
| | (No default) | Range: 2 to 15 characters. |
| | | This parameter is mandatory. |
| *IPAddress* | Mandatory | IP Address of the NFS Server you are importing the shared directory from. |
| | | This parameter is mandatory unless the volume was previously mounted with the required syntax, and nfsgy.nlm has not been unloaded after that. |

| Parameter | Default | Description |
|---|---|---|
| *sharedPath* | Mandatory | Absolute path of the shared directory in the NFS Server. |
| | | This parameter is mandatory if you are mounting the volume for the first time after the NFS Gateway is loaded. |
| shadowVolume | sys: | Specifies the name of the volume where shadow files are to be stored. |
| | | The shadow files are stored in *shadowVolume*:\gateway directory. |
| | | The gateway volume will not be mounted if the specified shadowVolume is not available. |
| | | If not specified, the shadow volume specified with the nfsgy command is used. |
| | | Do not use the mounted Gateway volumes as *ShadowVolume* when mounting another volume using gymount. For example, if vol1 is a mounted NFS Gateway volume, then do not execute the following: |
| | | `gymount vol2 -shadowVolume vol1` |
| | | **IMPORTANT:** Do not dismount or deactivate the volume that shadowVolume points to when NFS Gateway is loaded. Doing so results in deactivation of volumes imported by NFS Gateway. |
| *nfsVersion* | 3 | NFS protocol version with which the volume is imported. |
| | | Valid value = 2 or 3 |
| | | We recommend using NFS version 3 because NFS Gateway for NetWare 6 is optimized for this. |
| | | If NFS version 3 is not supported, then the volume is mounted with NFS version 2. |
| | | If you use NFS version 2, then you must tune the gymount parameters based on . |
| mountUid | 0 | UID used for mounting the shared path. |
| | | Valid Range: 0 to 2147483647 |
| | | The NFS Gateway also uses this parameter for UID, when NLM™ programs running on the server access the NFS Gateway volume with NCP® Connection Number = 0. |
| mountGid | 1 | GID used for mounting the shared path. |
| | | Valid Range: 0 to 2147483647 |
| anonUid | 55555 | UID used for users without a UNIX profile in eDirectory™. |
| | | Valid Range: 0 to 2147483647 |
| | | The NFS Gateway also uses this parameter for a user with UID = 0 in the UNIX profile when root access is not given to the NetWare server. |
| anonGid | 55555 | GID used for users without UNIX profile in eDirectory. |
| | | Valid Range: 0 to 2147483647 |

| Parameter | Default | Description |
|---|---|---|
| rpcTimeOut | 1 | Time interval (in seconds) that the gateway waits for a response from the remote server. |
| | | Valid Range: 1 to 2147483647 |
| | | If the network is heavily loaded or remote NFS Server is slow in responding to NFS requests, set a high value for this parameter. You might use a value of 6 seconds which is used by some of the other NFS clients. |
| | | If the network is moderately loaded or remote NFS server is fast enough to the responses to NFS queries from NFS Gateway, the default value of one second is sufficient. |
| | | We recommend you try a set of values to fine tune this parameter value for your network settings. |
| rpcRetries | 3 | Number of times each RPC request is retried, if the reply for a request does not come within the rpcTimeOut period. |
| | | Valid Range: 0 to 2147483647 |
| dirCompFreq | 0 | Time (in seconds) after which all the cached shadow file contents for this directory are invalidated. |
| | | Valid Range: 0 to 2147483647 |
| | | The default value of 0 indicates that cache is not invalidated until there is a change in the directory content in the NFS server. |
| umask | 022 | File mode creation mask for files and directories created from NFS Gateway. |
| | | Valid Range: 000 to 777 |
| | | This value must be octal. |
| readOnly \| readWrite | readWrite | Specifies if the Gateway volume is read-only or read/write. |
| tossMetaData \| noTossMetaData | noTossMetadata (retain) | Invalidates or retains file metadata immediately after the file is closed. |

| Parameter | Default | Description |
|-----------|---------|-------------|
| readSize | 32 | Specifies the read transfer buffer size in KB. |
| | | Valid values = 4, 8, 16, 32 |
| | | If you enter a value other than 4, 8, 16, or 32 but within the range of 4 - 32, then the lower valid value nearest to the value you enter is used. |
| | | For example, if you enter 10, then 8 is used. |
| | | If you enter an invalid value outside the range of 4 - 32, the default value is used. |
| | | This parameter is applicable only for NFS version 3. If the NFS version is 2, then the value 4 KB is used. |
| | | The NFS Gateway checks three values and uses the lowest to determine the actual read size to use. The three values are: |
| | | 1. Largest UDP Packet Size (Parameter in monitor.nlm > Server Parameters > Communications). |
| | | 2. The preferred read size as specified by the remote NFS Server |
| | | 3. The readSize specified on the gymount command. |
| | | To ensure that read transfer buffer size is 32 KB of data, ensure that: |
| | | ◆ NFS Server has a read preferred size = 32 KB |
| | | ◆ Set the NFS Gateway gymount parameter *readsize* = 32 KB |
| | | ◆ Set the largest UDP packet size on NetWare = 33280 (32768 for data +512 for headers) |
| writeSize | 32 | Specifies the write transfer buffer size in KB. |
| | | Valid values = 4, 8, 16, 32 |
| | | If you enter a value other than 4, 8, 16, or 32 but within the range of 4 - 32, then the lower valid value nearest to the value you enter is used. |
| | | For example, if you enter 10, then 8 is used. |
| | | If you enter any invalid value outside the range of 4 - 32,  the default value of 32 KB is used. |
| | | This parameter is applicable only for NFS version 3. If NFS version 2 is specified, then the value 4 KB is used. |
| | | The NFS Gateway checks three values and uses the lowest to determine the actual write size to use. The three values are: |
| | | 1. Largest UDP Packet Size (Parameter in monitor.nlm > Server Parameters > Communications). |
| | | 2. The preferred write size as specified by the remote NFS Server |
| | | 3. The writeSize specified on the gymount command. |
| | | To ensure that write transfer buffer size is 32 KB of data, ensure that: |
| | | ◆ NFS Server has a write preferred size = 32 KB |
| | | ◆ Set the NFS Gateway gymount parameter *writesize* = 32 KB |
| | | ◆ Set the largest UDP packet size on NetWare = 33280 (32768 for data +512 for headers) |

| Parameter | Default | Description |
|---|---|---|
| maxOutstandingPackets | 2147483647 | Specifies the maximum number of requests to an individual NFS server that can be concurrently outstanding before the NFS Gateway pauses in sending requests to that particular NFS server. An outstanding packet is an NFS request to which no reply has been received, nor has the time out period expired. |
| | | For example, if the maxOutstandingPackets = 64, then a maximum of 64 requests can be waiting for a response from an individual NFS server. |
| | | This is irrespective of the number of Gateway volumes imported from that NFS server. If two or more NFS Gateway volumes are imported from the same NFS server, then the value specified in the first gymount command is used. That value is treated as a pool and shared between the two or more gateway volumes. |
| | | If two NFS Gateway volumes refer the same NFS server, then the value specified in the volume mounted first is used between the first and second volume together. |
| | | Valid Range: 1 to 2147483647 |
| | | **IMPORTANT:** Use the value of 1 for this parameter with caution because it might negatively impact the performance of the NFS Gateway.  The value of 1 means each NFS request must be answered by the remote NFS server before the NFS Gateway sends another request.  This increases processing overhead, so use this value only when the network is highly saturated with traffic or when the remote NFS server is unusually slow in responding. |
| lowerCaseUnixNames | Not enforced | Forces the file or directory created from NetWare to have lowercase filenames on UNIX. |
| logLevel | 1 | Specifies the logging level to be enabled for the volume. |
| | | 0, 1, 2, and 4 are the valid log levels. The values indicate the following: |
| | | 0 = None (Logging is disabled) |
| | | 1 = Errors |
| | | 2 = Warning, Errors |
| | | 4 = Info, Warning, and Errors |
| | | If not specified, the logLevel specified with the nfsgy command is used. |
| logVerbose \| logNonVerbose | logNonVerbose | Specifies whether to log verbose information or not. |
| | | If not specified, the value specified with the nfsgy command is used. |

## Dismounting a Gateway Volume

Dismount and deactivate the NFS Gateway volume by entering the following syntax:

gyumount *volumename* [-forceDeactivate]

*Volumename***:** Specify the *volumename* to be dismounted. Dismounting a specific gateway volume does not disturb the state of other gateway volumes.

**forceDeactivate:** Specify to deactivate the volume without prompting for open files. This causes loss of data in unsaved files in the volume that is being dismounted. The use of this option is mandatory when you modify the cluster unload script to configure the gateway for active/active cluster mode.

By default, if any file of the specified gateway volume is open, then the gateway prompts you to confirm if the dismounting of the volume can be continued.

## Trustee Settings

You can assign trustees and modify or delete their rights to files or directories on a NFS Gateway volume using any one of the following:

- ConsoleOne®
- NetWare Administrator (nwadmn32.exe)
- Novell Client™
- Windows* Explorer
- Rights.exe by mapping a drive to the NFS Gateway volume over NCP™.

# Mounting a Gateway Volume

Before you mount a volume, we recommend that you understand the mounting process of gymount.nlm in varied scenarios.

- "Mounting Volumes for the First Time" on page 24
- "Mounting Volumes for Subsequent Times When the Nfsgy.nlm Is Still Loaded" on page 27

For the syntax and parameter information, see "Mounting Parameters" on page 19.

## Mounting Volumes for the First Time

This section describes the effect of mounting a volume for the first time with the following scenarios:

- "When Mandatory Parameters Are Specified" on page 24
- "When Mandatory and Some Optional Parameters Are Specified" on page 25
- "When Only Volumename Is Specified" on page 26

### When Mandatory Parameters Are Specified

When all the mandatory parameters are specified on the gymount command, the volume is mounted using those parameters. The rest of the parameters use default values, unless nfsgy has been loaded with non-default parameters that override the gymount default values.

For example, the following syntax mounts GWVol3 with mandatory parameters:

```
gymount GWVOLv3 172.16.0.0 /home/xyz
```

This mounts the GWVol3 with the mandatory parameters that are specified and it uses the default values for the parameters that have not been specified.

The following table lists the volume attributes for each parameter.

| Parameters | Volume Attributes |
|---|---|
| *Volumename* | GWVOLv3 |
| *IPAddress* | 172.16.0.0 |
| *sharedPath* | /home/xyz |
| shadowVolume | Default = sys: |
| nfsVersion | Default = 3 |
| mountUID | Default = 0 |
| mountGid | Default = 1 |
| anonUid | Default = 55555 |
| anonGid | Default = 55555 |
| rpcRetries | Default = 3 |
| rpcTimeOut | Default = 1 |
| dirCompFreq | Default = 0 |
| umask | Default = 022 |
| readOnly | readWrite | Default = readWrite |
| tossMetaData | noTossMetaData | Default = noTossMetadata |
| lowerCaseUnixNames | Default = Not enforced |
| readSize | Default = 32 |
| writeSize | Default = 32 |
| maxOutstandingPackets | Default = Infinite |
| logLevel value | Default = 1 (Errors) |
| logVerbose | logNonVerbose | Default = logNonVerbose |

### When Mandatory and Some Optional Parameters Are Specified

When you specify some of the optional parameters, the rest of the optional parameters use their default values, unless nfsgy has been loaded with non-default parameters that override the gymount defaults.

For example, the following syntax mounts Volume22 with some of the optional parameters:

```
gymount Volume22 172.16.0.0 /home/xyz –nfsVersion 3 –rpcTimeOut 8
–lowerCaseUnixNames –readSize 16 –writeSize 16 –maxOutstandingPackets 64
–logLevel 4
```

The following table lists the volume attribute for each parameter.

| Parameters | Volume Attributes |
| --- | --- |
| *Volumename* | volume22 |
| *IPAddress* | 172.16.0.0 |
| *sharedPath* | /home/xyz |
| shadowVolume | Default = sys: |
| nfsVersion | 3 |
| mountUID | Default=0 |
| mountgid | Default = 1 |
| anonUid | Default = 55555 |
| anonGid | Default = 55555 |
| rpcRetries | Default = 3 |
| rpcTimeOut | 8 |
| dirCompFreq | Default = 0 |
| umask | Default = 022 |
| readOnly | readWrite | Default = readWrite |
| tossMetaData | noTossMetaData | Default = noTossMetadata |
| lowerCaseUnixNames | Enforced |
| readSize | 16 |
| writeSize | 16 |
| maxOutstandingPackets | 64 |
| logLevel | 4 (Info, Warning and Errors) |
| logVerbose | logNonVerbose | Default = logNonVerbose |

### When Only Volumename Is Specified

If you specify only the *Volumename,* the volume does not mount because the IPAddress and sharedPath parameters are mandatory when mounting the volume for the first time.

For example, the volume does not mount if you use the following syntax to mount GWVol12 without specifying the IP Address or the shared path:

```
gymount GWVol2
```

## Mounting Volumes for Subsequent Times When the Nfsgy.nlm Is Still Loaded

This section describes the effect of mounting a volume after the first when nfsgy.nlm is still loaded:

- ◆ "When Mandatory Parameters Are Specified" on page 27
- ◆ "When Mandatory and Some Optional Parameters Are Specified" on page 27
- ◆ "When Only Volumename Is Specified" on page 27
- ◆ "When Mandatory and All Optional Parameters Are Specified" on page 27

For a description of the mount parameters, refer to "Mounting Parameters" on page 19.

### When Mandatory Parameters Are Specified

The volume is mounted with other parameters than the earlier mount.

However, the mounting is unsuccessful if the IPAddress or the sharedPath parameter values are not the same as in the earlier mount.

### When Mandatory and Some Optional Parameters Are Specified

The volume is mounted with the new values of parameters that are specified. The parameters that are not specified in this mount but were specified in the first mount remain unchanged.

However, the mounting is unsuccessful if either the IPAddress or the sharedPath parameter values are not the same as in the earlier mount.

### When Only Volumename Is Specified

The volume is mounted successfully with the same parameter values as specified in the previous mount.

The parameter values specified in the previous mount are retained, when the NFS Gateway is still loaded. However, if you unload and reload the NFS Gateway, then the parameter values are not retained, and you must specify the mandatory parameters along with the volume name.

### When Mandatory and All Optional Parameters Are Specified

The parameters specified in the previous mount are overwritten and the volume is mounted with the new set of mount parameters.

However, the mounting is unsuccessful if either the *IPAddress* or the *sharedPath* parameter values are not same as in the earlier mount.

# Viewing NFS Gateway Volume Parameters

To view volume parameters of gateway volumes, enter the following at the system console prompt:

```
load gymount -d -volparams
```

This prints the volume parameters of all the gateway volumes on the logger screen.

# 4 User Settings

This section describes how to set the required UNIX profile for NFS Gateway users who are eDirectory™ Users or Groups.

You can use either the migration utility or ConsoleOne® to set the UNIX profile.

The following topics are discussed:

## Migration Utility

The migration utility reads in text files and creates NIS maps in eDirectory. This can be useful to populate UNIX profiles for large numbers of users and groups, even if having an NIS server on NetWare® is not the goal.

The migration utility does the following, while migrating users and groups into the eDirectory tree:

The migration utility does the following:

1. Creates Organizational Units (OU) named *domainname*_U and *domainname*_G.

2. Searches for existing eDirectory users and groups under the containers specified by the SEARCH_ROOT configuration parameter (specified in nfs.cfg).

3. Modifies the UNIX information of those objects based on the migration option specified.

   Maps can be migrated using any one of the following three options:

   **Update:** (Default) Updates all existing objects' information with the new information. If no objects exist, it creates new ones in the Organizational Units from Step 1.

   **Replace:** Deletes all existing objects and creates new ones. For passwd and group maps, the old objects are not deleted. The UNIX profile of the objects does not change. If a matching user or group object does not exist, new ones are created in the Organization Units from Step 1.

   **Merge:** Retains all existing objects' information and logs them as conflicting records in the makenis.log file. If no objects exist, it creates new ones in the Organizational Units from step 1.

4. If the objects are not found, the users are migrated to *domainname*_U and the groups are migrated to *domainname*_G.

**IMPORTANT:** The User and Group objects aren't created under the passwd and group Map object. They spread across the eDirectory tree, *domainName*_U, and *domainName_G*, depending upon the SEARCH_ROOT configuration parameter.

# Migration Using Makenis at the System Console

Migration by default uses the makefile sys:etc/nis/nismake, which contains the location of the text file for every map.

The syntax of the migration utility is

```
makenis [-r resultfilename -[r]d domainname[-x context]
[-f nismakefilename]{[mapname -l|b]p line or byte object in
mapname]...}
```

**NOTE:** Use all options only in the specified order.

The following table describes the makenis options.

| Option | Description |
| --- | --- |
| -d *domainname* | Creates a domain and migrates data, or use the existing domain object. |
| | This parameter is mandatory. |
| -r *resultfilename* | Captures the results of the migration. |
| -rd | Removes the existing domain data and then migrates. |
| -x *contextname* | Specifies the context where you want to create your Domain object and data. |
| | Edit the context parameter by prefixing each of the dots (.) in the Relative Distinguished Names with a backslash (\) to distinguish them from eDirectory names. |
| -f  *makefilepath* | Specifies a NIS makefile other than the default sys:etc/nis/ nismake. |
| | To specify the text files that you want to migrate, modify the NIS makefile. The NIS makefile is in the following format: |
| | *map_name     full_path     parameters* (if any) |
| | The comment character is the pound sign (#). |
| | If you do not specify anything, all the files in the makefile are migrated. |
| | For each map, specify the *secure* parameter so that only requests coming from secure ports are able to access the data. You can also specify the migration options: Update, Replace, or Merge. |
| | For the Password map, you can specify two additional parameters: -u *uid* (which restricts users with a UID less than a particular value from migrating to eDirectory) and AUTOGEN (which generates a UID from the program itself). |
| | You must specify the text file in the full path in DOS name format. |
| mapname1, mapname2 | Migrates specific maps. |

| Option | Description |
|---|---|
| *mapname* -lp *lineoffset*<br><br>or<br><br>*mapname*, -bp *byteoffset* | Migrates a map from a particular offset in a specified map text file.<br><br>Line offset is used to start migration from a particular line from the map text file. If the migration fails while migrating large maps, instead of migrating it again from the beginning, you can specify the byteoffset to start from the offset specified in the migration log file. For more details on this offset, refer to the description of the configuration parameter filemark_log_freq in nis.cfg.<br><br>Makenis adds users to the Members attribute, gives the user the rights equivalent to that of the group, and updates its Group Membership attribute. |

## Migration Using Makenis through ConsoleOne

1 In the left panel of ConsoleOne, click The Network.

2 Select the server tree where you want to manage the domains and maps.

3 Click the toolbar M icon.

A panel similar to the following displays:

**Figure 2    Migration Panel**
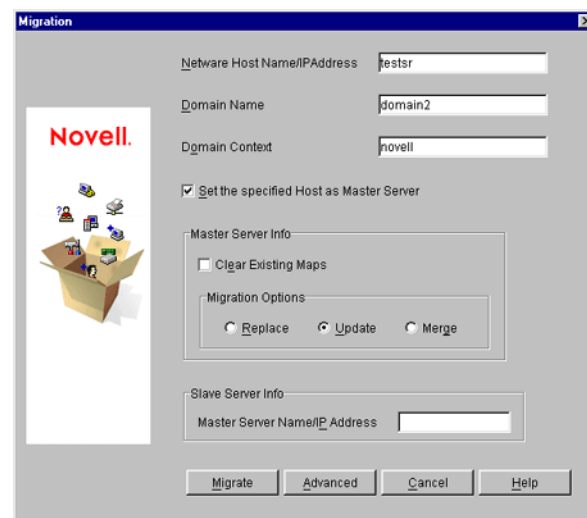


4 Specify the required information.

4a Type the NetWare Host Name/IP Address, Domain Name, and Domain Context, to migrate a domain.

4b To clear the existing maps, check the Clear Existing Maps in the Master Server Info section.

4c Click the radio button for the type of the migration you want to perform: Replace, Update, or Merge.

4d To migrate the domain for default maps, click Migrate.

The available default maps are ethers, hosts, networks, protocols, RPC, services, passwd, group, netgroup, and bootparams. By default, these files should be present in sys:\etc\nis.

**5** To migrate the domain for specific maps, click Advanced to go to the Map Information panel.

**Figure 3     Map Information Panel**
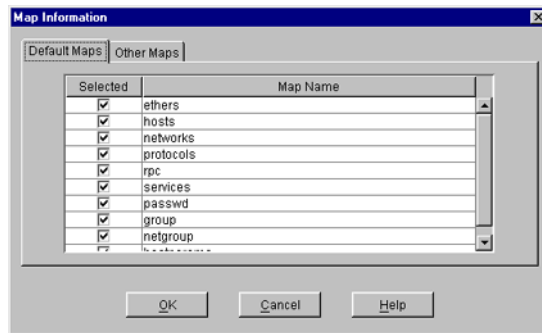


**5a** Click either Default Maps or Other Maps.

**5b** Check the maps you want to migrate, uncheck the maps you do not want to migrate, then click OK.

**6** To modify an existing map or add a new map, click Add to go to the Add Map panel.

**Figure 4     Add Map Panel**
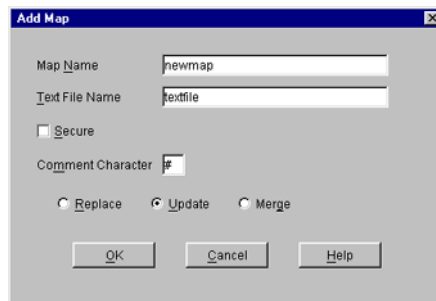


**6a** Type the Map Name and the Text File name.

**6b** (Conditional) If you want to enable secure access to the map, click Secure.

**6c** In the Comment Character box, type the comment character present in the specified text file, then click OK.

The default comment character is the pound sign (#).

**7** Click Migrate.

## Managing Migration Utility Log Files

When you execute makenis, the log file, makenis.log, is created by default in sys:\etc\nis. This file records messages that provide following information:

- The containers added, such as domainname container, *domainname_U* (for users), *domainname_G* (for groups).

- The maps added and attached to the container.

- Parsing statistics for each map. For example, the number of records read, the number migrated, and conflict and invalid records.

- Conflicting record details are logged.

# Setting a UNIX Profile Using ConsoleOne

You can add and modify the information of a User or Group object that already exists in eDirectory.

## Adding a New User or Group

To add a new user:

**1** In the left panel of the ConsoleOne main menu, click the context where you want to add the new user.

**2** Click File > New > User.

**3** Specify the user information.

To add a new group:

**1** In the left panel of the ConsoleOne main menu, click the context where you want to add the new group.

**2** Click File > New > Group.

**3** Specify the group information.

## Modifying User Information

**1** In the left panel of the ConsoleOne main menu, click the eDirectory tree where the object resides.

If you do not find the tree, click Novell Directory Services, select the tree, then log in to it.

**2** Double-click the container where the User objects reside.

**3** Right-click the User object whose properties you want to change and then click Properties.

The following panel appears, displaying the various forms that should be specified to add and modify the user information in eDirectory.

**Figure 5   UNIX Profile Tab of User Properties Panel**
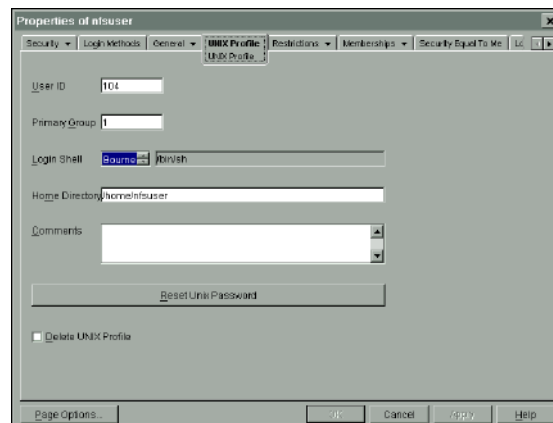
**4** Click UNIX Profile to modify the UNIX user profile, then specify the information in the following fields:

**User ID:** The UNIX UID of the user.

**Primary Group:** The group ID (GID) of the group this user belongs to. To specify the GID of the user, click Browse and select the appropriate group.

**Login Shell:** The preferred login shell of the user.

**Home Directory:** The home directory the user wants to be placed in while logging in to the system.

**Comments:** Any other comments that the user might want to specify.

**Reset UNIX Password:** Use to clear the user's UNIX Password.

**5** Click Apply, then click OK.

## Modifying Group Information

**1** In the left panel of the ConsoleOne main menu, click the eDirectory tree where the object resides.

If you do not find the tree, click Novell Directory Services, select the tree, then log in to it.

**2** Double-click the container where the Group objects reside.

**3** Right-click the Group object whose properties you want to change, then click Properties.

The following panel appears, displaying the various forms that should be specified to add and modify the group information in eDirectory.

**Figure 6     UNIX Profile Tab of Group Properties Panel**
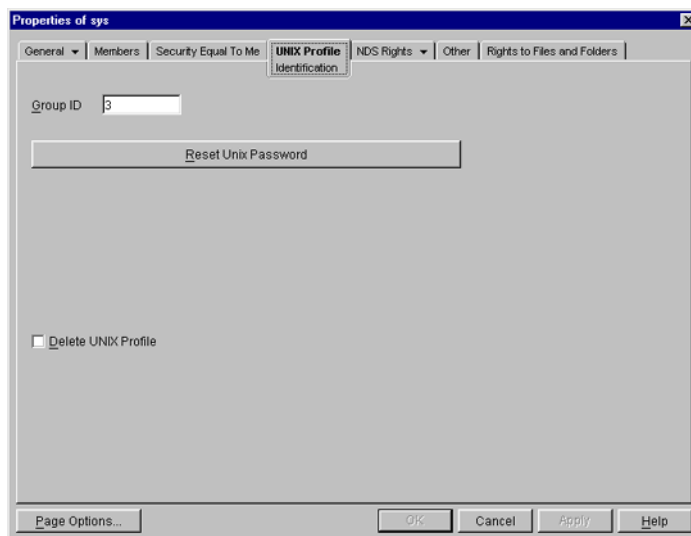


**4** Click the UNIX Profile tab and specify the Group ID to modify the UNIX group profile.

**5** Click Apply, then click OK.

# Accessing NFS Gateway Volumes as CIFS Users

To allow a CIFS user to access an NFS Gateway volume, you need to set the simple password for the users.

To do this, go to NFAP Security in Remote Manager and set the simple password.

For more details, see the *Novell Native File Access Protocols Installation and Administration Guide* (http://www.novell.com/documentation/lg/nw6p).

# 5 Cluster-Enabling the NFS Gateway for NetWare 6

You can configure the NFS Gateway for NetWare® 6 in either active/passive or active/active modes of Novell® Cluster Services™.

## Prerequisites

❑ Install and set up Novell Cluster Services.

For step-by-step information on setting up Novell Cluster Services, refer to Installation and Setup (http://www.novell.com/documentation/lg/ncs6p/index.html) in the *Novell Cluster Services Administration Guide*.

❑ The NFS Gateway for NetWare 6 is installed on every node in the cluster.

For details on installing NFS Gateway for NetWare 6, see Chapter 2, "Setting Up the NFS Gateway," on page 13.

## Active/Passive Mode

In the active/passive cluster mode, the NFS Gateway for NetWare 6 runs on a single cluster node at a time.

For example, if the node where the NFS Gateway for NetWare 6 is installed fails, the gateway starts on another specified node in the cluster, and gateway volumes on the failed server fail over to other nodes in the cluster.

Cluster enabling in this mode has the following advantages:

◆ High availability of gateway volumes.

◆ The shadow files for the entire cluster are located in *shared_volume_name* (the NSS volume that is mounted on a shared disk where you will store the shadow files), so, the user access control is common across the cluster.

### Configuring in Active/Passive Mode

**1** Copy the files sys:/system/gystart.ncf and sys:/system/gystop.ncf to *shared_volume_name*:/ system directory where shared_volume_name is in the same pool where the shadow volume is pointing to.

**2** Edit *shared_volume_name:*/system/gystart.ncf, and enter the *shared_volume_name* in the shadowVolume parameter of the `nfsgy` command to store shadow files on the a shared volume.

Use the following command syntax:

```
nfsgy -shadowVolume shared_volume_name [-shadowCacheSize value]
[-pageCacheSize value][-logFileSize value][-logLevel value][-logVerbose]
[-logFlushImmediate]
```

For details on nfsgy parameters, see "Setting NFS Gateway Parameters" on page 16.

**3** Make sure of the following:

◆ There is at least a single NSS volume on the resource.

◆ All the volumes to be mounted using gymount are present in the gystart.ncf file.

**4** Bring the resource status to offline, then add the following at the end of the existing load script:

```
shared_volume_name:/system/gystart
```

The load script specifies the commands to start the resource or service on a server, or to mount the volume on a server.

**HINT:** Use NetWare Remote Manager or ConsoleOne® to modify the load / unload script.

**5** Add the following at the beginning of the unload script:

```
shared_volume_name:/system/gystop
```

The unload script specifies how the application or resource should terminate.

**6** Bring the cluster resource online.

The NFS Gateway is now configured to work in the active/passive cluster mode.

**IMPORTANT:** In cluster-enabled environment, make sure that the NFS Gateway volumename (*volumename* parameter of gymount and gyumount) does not exceed eight characters.

# Active/Active Mode

In active/active cluster mode, services of the NFS Gateway for NetWare 6 are available on all nodes in a cluster.

For example, when a server hosting the NFS Gateway volume on a specific server fails, it will transparently fail over to any other node in the cluster.

Cluster enabling in this mode has the following advantages:

◆ Provides faster recovery after a failure.

◆ Effective load balancing.

## Configuring in Active/Active Cluster Mode

Active/active mode is the recommended configuration because it provides faster recovery after a failure. Active/active mode signifies that the NFS Gateway is running simultaneously on multiple servers in the cluster. When a server fails, the cluster volumes mounted on that server fail over to other servers in the cluster and users retain access to files and directories.

**1** In individual cluster nodes/servers that will run NFS Gateway, edit the autoexec.ncf file and add the following to the end of the file:

```
nfsgy [options...]
```

For details on nfsgy options, "Setting NFS Gateway Parameters" on page 16.

**2** Bring the shared resource status to offline.

**3** Make sure of the following:

  ◆ There is at least a single NSS volume on the resource.

  ◆ All nodes have uniform NFS Gateway (nfsgy) parameters.

**4** Modify the load and unload scripts of the shared resource to contain the list of mounted NFS Gateway volumes whose shadow files are to be stored on any of the NSS volumes of this shared resource.

**5** Add the following syntax to the end of load script of shared resource:

```
gymount volumename IPAddress sharedPath -shadowVolume shared_volume_name
[options…]
```

For details on gymount options, see "Mounting Parameters" on page 19.

**6** Add the following at the beginning of unload script of the shared resource:

```
gyumount volumename -forceDeactivate
```

**IMPORTANT:** The -forceDeactivate option is mandatory.

**7** Bring the cluster resource online.

The NFS Gateway is now configured to work in the active/active cluster mode.

**IMPORTANT:** In cluster-enabled environment, make sure that NFS Gateway volumename (*volumename parameter* of gymount and gyumount) does not exceed eight characters.

# 6 Performance Tuning

You can optimize the NFS Gateway performance by tuning the mount parameters to suit the requirements of your network and machine configuration.

- If you are using NFS version 2, tune the gymount parameters based on "Tuning for NFS Version 2" on page 41.

- Complete the steps in "Configuring NFS Gateway for the First Time" on page 14.

- Configure the NFS Gateway parameters ShadowCacheSize and PageCacheSize based on "Setting NFS Gateway Parameters" on page 16.

- Tune the mount parameter combination of rpcTimeOut, MaxOutstandingPackets, readSize, and writeSize based on "Mount Parameters Combinations" on page 41.

- Tune the readSize and writeSize for the NFS Gateway read and write directory operations based on "Mounting Parameters" on page 19.

- Tune for NFS Gateway usage based on "NFS Gateway Usage" on page 44.

- Tune the NSS parameters based on "Modifying NSS Settings" on page 44.

## Tuning for NFS Version 2

For this release, the default values are tuned for NFS version 3 performance. If you use NFS version 2, tune the following gymount parameters to avoid delays and timeout failures:

- Decrease the value of the maxOutstandingPackets parameter to 4.

- Increase the value of the rpcTimeOut parameter higher than the default value of 1. A useful starting value for the parameter is 4.

### Using Linux NFS Server

When you use NFS version 2 on Linux, NFS Server needs tuning in particular. Apart from the above guidelines, we recommend that you increase the number of NFS server threads.

For more information on increasing NFS server threads, refer to the **nfsd (8)** man page of Linux.

## Mount Parameters Combinations

Tuning the mount parameter combination of rpcTimeOut, MaxOutstandingPackets, readSize and writeSize based on the network load, UNIX machines, and, the hardware gives a significant increase in NFS Gateway performance.

You can vary the combination of mount parameters based on your network resources:

- **Optimal Network:** Retain the default values of rpcTimeout, maxOutstandingPackets, readSize, and writeSize parameters.

- **Highly Used Network/Slow UNIX machine:** Increase the values of the rpcTimeout parameter and decrease the values of maxOutstandingPackets, readSize, and writeSize parameters.

For example, consider the following network setup:

- UNIX OS Solaris* 8.0 installed
- UNIX machine with the following attributes:
  - Solaris 8.0
  - Compaq* ProLiant* 7000, P II, Xeon at 450 Mhz, RAM = 1GHz
- NetWare® machine:
  - Compaq ProLiant 7000, P II, Xeon at 450 Mhz, RAM = 1GHz
  - NetWare 6 Pack Support Pack 3 with Nw6nss3c.exe installed.
- NetGear HUB 100 MBPS
- NFS Version 3
- Windows workstation with following attributes:
  - Dell* Optiplex* GX240, P4, 512 MB RAM
  - Windows XP
  - Novell Client™ Version 4.90

In this network setup, you can tune the combination of mount parameters in the following ways:

### Read Performance

- Change the maxOutstandingPacket parameter value and leave the readSize and writeSize parameter values constant at 32.

  The following table shows the performance time of read operation for a 100 MB file in seconds.

| readSize | writeSize | maxOutstandingPackets | Time in Seconds |
| --- | --- | --- | --- |
| 32 | 32 | 2147483647 | 30 |
| 32 | 32 | 1 | 135 |
| 32 | 32 | 10 | 24 |
| 32 | 32 | 20 | 25 |
| 32 | 32 | 12 | 25 |
| 32 | 32 | 11 | 25 |
| 32 | 32 | 9 | 31 |
| 32 | 32 | 8 | 44 |

- Change the maxOutstandingPacket parameter and leave the readSize constant at 32 KB.

  The following table shows the performance time.

| File Size | maxOutStandingPackets at 10 (Time in seconds) | maxOutStandingPackets at 2147483647 (Time in seconds) |
|---|---|---|
| 500 MB | 146 | 157 |
| 1GB | 344 | 333 |
| 2 GB | 653 | 582 |

◆ Change the readSize parameter value, set maxOutstandingPackets set to 10 (the optimal value) and set the writeSize value to 32.

The following table shows the read operation performance for 100 MB file in seconds:

| readSize | Average Time in Seconds |
|---|---|
| 32 | 25 |
| 16 | 40.5 |
| 8 | 29 |
| 4 | 35 |

**Write Performance**

◆ Change the maxOutstandingPackets parameter value and leave readSize and writeSize parameter values constant at 32.

The following table shows the write operation performance for a 100 MB file in seconds:

| readSize | writeSize | maxOutstandingPackets | Time in Seconds |
|---|---|---|---|
| 32 | 32 | 2147483647 | 25 |
| 32 | 32 | 1 | 37 |
| 32 | 32 | 10 | 25 |
| 32 | 32 | 50 | 25 |
| 32 | 32 | 12 | 28 |
| 32 | 32 | 9 | 28 |
| 32 | 32 | 6 | 30 |

◆ Change the maxOutstandingPackets parameter and leave the writeSize parameter value constant at 32 KB.

| File Size | maxOutStandingPackets at 10 (Time in seconds) | maxOutStandingPackets at 2147483647 (Time in seconds) |
|---|---|---|
| 500 MB | 118 | 107 |

| File Size | maxOutStandingPackets at 10 (Time in seconds) | maxOutStandingPackets at 2147483647 (Time in seconds) |
|-----------|----------------------------------------------|-------------------------------------------------------|
| 1GB | 236 | 227 |

◆ Change the writeSize parameter value, set maxOutstandingPackets and readSize parameter values constant at 10 (the optimal value) and 32 respectively.

| writeSize | Average Time in Seconds |
|-----------|-------------------------|
| 32 | 25 |
| 16 | 31 |
| 8 | 28.6 |
| 4 | 31 |

# Read/Write Operations

◆ To improve the performance of read operations such as listing, or copying from the gateway volumes, increase the value of the readSize parameter when executing read operations.

◆ To improve the performance of write operations such as copying to the gateway volume, increase the value of the writeSize parameter when executing write operations.

**IMPORTANT:** Setting the readSize or writeSize parameter to a high value might negatively impact the network performance. If you see any such negative impact, set the readWrite or writeSize parameter to a lower value.

# NFS Gateway Usage

◆ If there are more frequent directory operations than there are file operations, you can improve the performance of directory operations by increasing the value of the ShadowCacheSize parameter.

◆ If there are more frequent file operations than there are directory operations, you can improve the performance of file operations by increasing the value of the PageCacheSize parameter.

# Modifying NSS Settings

To optimize the performance, modify the following NSS settings using the system console before you start using the NFS Gateway.

◆ Set the BufferFlushTimer parameter = 1.

This forces NSS to flush the buffer cache to the NFS server after one second, which is the earliest possible time.

◆ Set the ClosedFileCacheSize parameter based on the system memory.

For example, if the ClosedFileCacheSize parameter value = 50,000 then the memory can hold up to 50,000 metadata of files, or directories at any point of time.

If there are more than 50,000 entries in a directory, we recommend that the ClosedFileCacheSize parameter value be increased.

# Enhancing Directory Operations and File Read/Write Performance

The size of pageCache directly impacts the file read/write performance. To increase the value of the pageCachesize parameter:

**1** Unload NFS gateway by executing `gystop`.

**2** Set the value of the pageCachesize parameter based on the requirement. For more details, refer to the pageCachesize parameter description in "Setting NFS Gateway Parameters" on page 16.

The following parameters have an impact on the directory operations:

- ◆ **pageCacheSize:** When pageCache is set to 8 MB, a directory containing 50,000 entries can be listed. Use this example to calculate the size of pageCache required to operate on your largest directory. For more details, refer to the pageCachesize parameter description in "Setting NFS Gateway Parameters" on page 16.

- ◆ **shadowCacheSize:** Refer to the guidelines mentioned in "Setting NFS Gateway Parameters" on page 16 to tune this parameter.

- ◆ **Btrieve CacheSize:** Refer to the guidelines mentioned in "Configuring NFS Gateway for the First Time" on page 14.

**3** Reload nfsgy.nlm.

Import the volume using NFS version 3.

# 7 Interoperability and Performance Data

This section provides interoperability details for the NFS Gateway for NetWare® 6. It also compares the performance data of NFS Gateway for NetWare 6 to the NFS Gateway on NetWare NFS Services 3.0 Support Pack 4 over NetWare 5.1 Support Pack 5.

## Interoperability

The NFS Gateway for NetWare 6 interoperates with the following NCP™ /CIFS clients and remote NFS servers:

### NCP / CIFS Clients

| Protocol | Clients |
|---|---|
| NCP over IP | Windows NT* |
| | Windows 2000 |
| | Windows XP |
| NCP over IPX | Windows NT |
| | Windows 98 |
| CIFS | Windows 95 |
| | Windows 2000 |

### Remote NFS Servers

**NOTE:** The NFS Gateway usage is not limited to the NFS Servers listed there. Those are simply the NFS Servers tested by Novell.

| NFS Version | Remote NFS Server |
|---|---|
| Versions 2 and 3 | Solaris 8 for Intel |
| Versions 2 and 3 | Solaris 8 for SPARC* |
| Versions 2 and 3 | Red Hat* Linux* 7.3 |
| Versions 2 and 3 | HP-UX* 11.0 |
| Versions 2 and 3 | FreeBSD* 4.5 |
| Versions 2 and 3 | NetApp F87 |
| Version 2 | IBM* - AIX* |
| Version 2 | UnixWare* 7.1.0 |

# Performance Data

The following table compares the performance data of the NFS Gateway for NetWare 6 to gateway performance on NetWare NFS Services 3.0 Support Pack 4 over NetWare 5.1 Support Pack 5.

NFS Gateway for NetWare 6 performance was assessed from the Windows XP client using NCP over IP for a volume imported from Solaris 8 for Intel* over NFS Versions 2 and 3.

| NFS Version | Performance Area | Improvement in Performance |
|---|---|---|
| Version 2 | File Read | 1.2 times better |
| Version 3 | File Read | 1.1 times better |
| Version 3 | File Write | 1.8 times better |
| Version 3 | File Read/Write | 1.5 times better |
| Version 2 | Directory Write | 15 times better |
| Version 3 | Directory Write | 15 to 20 times better |
| Version 2 | Directory Listing | 6 to 7 times better |
| Version 3 | Directory Listing | 6 to 8 times better |
| | | **NOTE:** The performance over V2 and V3 improves as the number of entries increase. |
| Version 2 and Version 3 | Recursive Directory Listing | 3 times better |

# 8 Troubleshooting

## Troubleshooting the NFS Gateway for NetWare 6

### Reducing mounting time

Problem:    The gymount operation can take some time to finish retrying and might time out before giving the final results. During retry, the NFS Gateway displays the following messages

```
GYMOUNT for volume volume name is experiencing a problem with Mount
Version MountVersion. Retrying with Mount version MountVersion -1...
```

Explanation:    While mounting a volume, gymount uses twice the value specified for rpcRetries and rpcTimeOut parameters.

Action:    Decrease the values for the rpcTimeOut and rpcRetries parameters to speed up the mount.

After the problem is resolved, reset the values as before to ensure good fault tolerance.

### Maximum NFS Gateway volumes that can be mounted at a time

Problem:    Error code 4099 might display.

Explanation:    At one time, the NetWare® Server can have 255 mounted volumes that include the NFS Gateway, NSS, and traditional volumes.

### Unable to mount volumes although several volumes have been mounted /dismounted previously. No error message is displayed on the logger screen.

Possible Cause:    After installing the NFS Gateway, over a period of time, 1024 volumes have been mounted and dismounted.

Action:    The following steps will clear the metadata that NetWare stores for the files and directories on the gateway volumes. This information will be automatically rebuilt except for NetWare file system trustee rights. Reassign these trustee rights

1 Execute **gystop.ncf**.

2 Delete voltable.shw and the directories in *shadowVolume*:\Gateway.

3 Execute **gystart.ncf** to load nfsgy and mount the volumes using gymount. (Manually execute **gymount** for any additional volumes that are not handled by gystart.ncf).

4 Reassign file system trustees to Gateway volumes.

## Handling Server abends

Explanation:     NFS Gateway shadow files can get corrupted when a Server abend happens.

Action:     The following steps will clear the metadata NetWare stores for the files and directories on the Gateway volumes. This information will be automatically rebuilt except for NetWare file system trustee rights. You will need to reassign these.

**1** Execute `gystop.ncf`.

**2** Delete all files and directories in *shadowVolume*:\Gateway.

**3** Execute `gystart.ncf` to load nfsgy.nlm and gymount volumes. (Manually execute `gymount` for any additional volumes that are not handled by `gystart.ncf`).

**4** Reassign file system trustees to Gateway volumes.

## The NFS Gateway hangs on loading without any error message

Explanation:     The NFS Gateway hangs if you load it when port 111 is being used by another application.

Action:     Verify that port 111 is not being used by any application before loading the NFS Gateway, because the NFS Gateway requires port 111 for the Port Mapper.

**HINT:** Port 111 can safely be in use by Native File Access for UNIX before starting NFS Gateway, because both use the same Port Mapper (pkernel.nlm). However, if pkernel is not loaded, then nothing should be listening on TCP or UDP port 111.

## Dismounting a Gateway volume takes a long time when network connectivity to the UNIX Server is lost.

Explanation:     The dismount is slow because during dismount, the gateway tries to save file/directory metadata information to the UNIX server for files that are accessed through the gateway volume.

## When using an NFS Gateway volume, the client times out with the message "The specified network name is no longer available."

Possible Cause:     The directory that is in use might have a large number of entries (about 100,000).

Action:     List the contents of the directory. After listing, you can execute the required operations.

Action:     If the problem persists, edit sys:\system\bti.cfg, increase the value of the BackgroundThread parameter, then restart NetWare Server for the new value to take effect.

## Even after renaming the target directory from UNIX, the symbolic link directory continues to display previous contents.

Action:     On a NetWare server, complete the following:

**1** Go to the parent directory of the symbolic link directory.

**2** Execute `dir`.

**3** Execute `cd` to the symbolic link directory.

The symbolic link directory must display the updated contents.

If the updated contents do not display even now, retry the Step 1 through Step 3.

**Unable to create a directory from the NFS Gateway side using a name that was deleted from the UNIX side. A message indicates "directory _directory_name_ already exists."**

Action: From the NetWare server or NetWare client, get a refreshed listing of the parent directory. Then you can create a new subdirectory with the required name.

**Trustee information is lost when using a gateway volume in cluster enabled environment, or using a newly mounted NSS volume as shadowVolume.**

Explanation: Btrieve does not support more than eight characters for gateway volumename when the shadowVolume is a NSS volume which is mounted after loading btrieve.nlm.

Action: Make sure that the volumename parameter does not exceed eight characters.

# 9 NFS Gateway for NetWare 6 FAQs

This section discusses the frequently asked questions (FAQs) that the users and system administrators might have while using the NFS Gateway for NetWare® 6.

## Installing / Uninstalling the NFS Gateway

**During installing / uninstalling, I view several setDateErrors on the logger screen. What do these errors imply?**

Action:       You can ignore these errors. They do not affect functionality in any way.

**What should be the version of Nfsgy.nlm in this release?**

Explanation:       The version should be 20.0.4.

**I have upgraded to the NFS Gateway for NetWare 6 from NetWare NFS Services 3.0. The installed products list in the NetWare server continues to display the previous NFS Gateway product. What does this imply?**

Explanation:       The entry NFS-GWY 1.0.5 for the previous product in the products list is not removed, but the product is upgraded.

Action:       You can make sure that the product is upgraded by verifying that there is an entry for the NFS Gateway for NetWare 6 in the product list.

**Although gymount failed for a volume, a directory with the name *volume_name* is created in sys:\gateway. What should I do?**

Action:       You can delete the directory named *volumename* located at sys:\gateway.

# Loading / Unloading the NFS Gateway

**What should I do when the message "Could not get license for NFS Gateway" displays when I try to load NFS Gateway?**

Action:   Use iManager or the Novell® Client™ to install the NFS Gateway license that comes with the product.

**What should I do when the NFS Gateway fails to load with the message "The module NFSGY has an invalid version number of <x>. It should be <y>" ?**

Action:   Make sure to install NetWare 6 Support Pack 3 from the Novell Support Web site (http://support.novell.com/filefinder).

**What do I need to do when the NFS Gateway fails to load with the message "The module NFSGY has an incompatible API version number of <x>. It should be <y>"?**

Action:   Make sure to install NetWare 6 Support Pack 3 from the Novell Support Web site (http://support.novell.com/filefinder).

**What do I need to do when the NFS Gateway fails to load with the message "The module NFSGY has an incompatible snap date of <x>. It should be <y>"?**

Explanation:   The nfsgy.nlm and nss.nlm are tightly integrated. This release of NFS Gateway for NetWare 6 requires NetWare 6 Support Pack 3 and the additional NSS updates in nw6nss3c.exe.

In the future, as additional NetWare 6 Support Packs update NSS further, NFS Gateway will also require those Support Pack updates, otherwise this error will recur.

Action:   Make sure to install NetWare 6 Support Pack 3 and also install the post-SP3 NSS modules for NetWare 6 available as nw6nss3c.exe from the Novell Support Web site (http://support.novell.com/filefinder).

**Why does the NFS Gateway fail to load with the message "Could not create directory <dirname>"? What do I need to do?**

Possible Cause:   The volume specified for the shadowVolume parameter is not mounted.

Possible Cause:   The volume specified for the shadowVolume parameter does not have enough space.

Possible Cause:   The volume specified for the shadowVolume parameter is read-only.

Action:   Provide a different volume name for the shadowVolume parameter of nfsgy.

**Why is the system hanging when I attempt to unload the NFS Gateway? Can I avoid this?**

Possible Cause:   Directory I/O or File I/O operations are taking place.

Action:   Before unloading nfsgy.nlm, disconnect Gateway users from the NetWare server.

**Why do I receive a message such as "Module did not release <n> resources" when I try to load the NFS Gateway?**

Possible Cause:   The NIS_ADMIN_OBJECT_CONTEXT parameter might not be set in the sys:/etc/nfs.cfg configuration file.

Action:   Run the schinst.nlm administration utility, or manually set the parameter.

**When I unload the NFS Gateway, it gives a memleak. Why does this happen?**

Possible Cause:   The contents of nfs.cfg might be lost and the file size displays 0 bytes.

Action:   Restore the nfs.cfg file by manually running the schinst utility.

The syntax is schinst -n. The schinst takes the administrator's FDN and password as input for extending the schema.

If Native File Access for UNIX was running, then restart the services by executing nfsstop and nfsstart commands at the server console.

# General Issues

**What can I do if the Server abends because of a CPU hog or hangs when I list files/directories of an NFS Gateway volume**

Action:   Complete the following steps:

**1** Increase the value of the CacheSize parameter in sys:/system/bti.cfg.

For details, refer to .

**2** Increase the value of the shadowCacheSize parameter of nfsgy.

For details, refer to .

**3** Restart the server for the change to take effect.

# Importing and Mounting a Volume

**Even though I have specified shadowVolume different from sys:, the NFS Gateway continues to create shadow files in the sys:\Gateway directory. Why?**

Possible Cause:   This happens if the shadowVolume specified is _ADMIN.

Action:   Specify any volume other than _ADMIN for the shadowVolume parameter.

**Why does importing a volume using gymount fail with the message "Error while mounting the volume <*volume_name*>"?**

Possible Cause:   There might be a network error.

Possible Cause:   The mount daemon might not be running on the remote server.

Possible Cause:   The IP address provided for importing might be invalid.

Possible Cause:   The path to be imported might not have been shared from remote server.

Possible Cause:   If the NFS server is running on a FreeBSD OS, the path must be shared with root access to this NetWare machine.

**I tried mounting a large number of NFS Gateway volumes through gystart.ncf. However, only a few volumes are mounted and error messages are displayed for remaining volumes. How do I mount all the volumes?**

Action:   Mount the NFS Gateway volumes manually using the system console, or edit gystart.ncf and introduce a delay between each gymount command. For example,

```
gymount gwvol1 222.223.224.225 /home1
```

```
delay 6  (This introduces a delay of 6 seconds)

gymount gwvol2 222.223.224.225 /home2
```

**How can I verify the mount parameters of the gateway volumes?**

> Action: View the volume parameters of all gateway volumes on the logger screen by entering the following at the system console prompt:

> **`load gymount -d -volparams`**

**The file in gateway volume that I have edited is displaying 0 contents. Why does this happen and can it be resolved?**

> Explanation: The gateway volume might have been imported using Native File Access for UNIX over NFS version 2.

> Action: When working with Native File Access for UNIX, use xnfs.nlm version 1.01.05 (dated August 14, 2003) or later.

# UNIX Profile, Permissions, and Root Access Issues

**At times, exporting from UNIX does not work with DNS names. Can I resolve this?**

> Explanation: This happens because the UNIX machine is unable to resolve the DNS name of the NetWare server.

> Action: In the /etc/hosts file of UNIX machine, verify whether the corresponding entry for the DNS name is present.

**When I do directory listing, I cannot view the contents of the directory and the directory size is displayed as 0 bytes. Can I resolve this?**

> Explanation: The user might not have adequate UNIX permissions to list the directory.

> Action: Modify the UNIX permissions to view the directory contents.

**Why do the files and subdirectories that the user is creating have the UID = 55555 and GID = 55555?**

> Possible Cause: The Novell eDirectory™ user's UNIX profile is not updated with the UID/GID.

> Possible Cause: If the UID = 0 in the UNIX profile, then the root access to the NetWare server might not have been given from the remote server while sharing the path over NFS.

> Action: Verify if an NFS Gateway volume has the root access by entering the gymount -d -volparams command at the system console prompt.

> Along with the parameters of all the NFS Gateway volumes displayed in the logger screen, you can also view the Root Access parameter with its value Yes or No.

**Even though I have shared a path with root access to the NetWare machine, the files created by the user with UID = 0 continue to have the UID = 55555. What should I do?**

> Explanation: Most of the UNIX NFS servers require the machine name specified for root access to be present in /etc/hosts.

> Action: Complete the following steps:

**1** Add the NetWare machine name along with its DNS name and IP address in the /etc/hosts file of the machine where the NFS server is hosted.

**2** Reshare the path from NFS server.

**3** Dismount and remount the volume on the NetWare machine using gyumount.nlm and gymount.nlm respectively.

### Why do the NFS Gateway volumes mounted with anonUID=-2 /60001(nobody) and anonGID=-2 / 60001(nobody) deactivate upon execution of certain directory I/O operations?

Possible Cause:   Some NFS servers have access check problems with UID=-2/60001 and GID=-2/60001.

Action:   Do not use -2 or 60001 for the anonUID and anonGID parameters.

### Even though I have updated the UNIX profile for a user, the NFS Gateway is creating directory entries with UID = 55555 and GID = 55555 or previous UID/GID. What should I do?

Possible Cause:   You might have updated the UNIX profile after loading `nfsgy`.

Explanation:   NFS Gateway uses the ndsilib to access eDirectory user's UNIX profiles and ndsilib does not immediately reflect the changes in user profiles.

Action:   Enter ndsilib cache refresh command on the console screen to refresh the cache. By default, the NDSILIB cache is refreshed every two hours.

## File Read/Write Issues

### Why am I unable to select Copy Inhibit for any of the files in Gateway volume?

Explanation:   Copy Inhibit (CI) is disabled for all the files in gateway volume, so you cannot select it.

### Why do the messages "Access denied" or "An attached device is not functioning" display when a user tries to open a file in read mode?

Possible Cause:   The user might not be a trustee of the file or the trustee might not have sufficient rights.

Action:   Add the user as a trustee to the file and provide sufficient access to read the file.

Possible Cause:   The user might not have sufficient UNIX permissions.

Action:   Complete the following steps:

**1** Identify the User's UID/GID in his or her UNIX profile in eDirectory.

If the UNIX profile for the user does not exist, create it.

**2** Identify whether the user's UNIX access is coming from user, group, or other permissions.

**3** Grant the read permission to the appropriate entity (user, group, or other).

Possible Cause:   The user's UNIX profile might be set with UID = 0.

Action:   Verify for root access by entering the gymount -d -volparams command at the system console prompt.

If root access is not given, make sure that the world/other group has the read right.

Possible Cause:   The file might be a special file such as block device, character device, or symbolic links file.

Problem:   If the file is a special file, then it is not possible to either open it or read its contents.

**Why does the message "Access denied" display when a user tries to open a file in read-write mode or write to a file?**

| | | |
|---|---|---|
| Possible Cause: | The user might not be a trustee of the file or might not have sufficient rights. |
| Action: | Add the user as a trustee and provide sufficient rights to the file. |
| Possible Cause: | The user might not have sufficient UNIX permissions. |
| Action: | Complete the following steps: |

    **1** Identify the user's UID/GID in his or her UNIX profile in eDirectory.

      If the UNIX profile for the user does not exist, create it.

    **2** Identify whether the user's UNIX access is coming from user, group, or other permissions.

    **3** Grant the read/write permission to the appropriate entity (user, group, or other).

| | |
|---|---|
| Possible Cause: | The volume might have been mounted as read-only. |
| Action: | Dismount and remount the volume with read-write mode using gyumount.nlm and gymount.nlm.. |
| Possible Cause: | The path might have been shared as read-only from the NFS server. |
| Action: | Reshare the path as read-write and dismount and remount the volume using gyumount.nlm and gymount.nlm. |
| Possible Cause: | The user's UNIX profile might be set with UID = 0. |
| Action: | Verify for root access by entering the gymount -d -volparams command at the system console prompt. |
| | If root access is not given, make sure that the world/other group has the read right. |
| Possible Cause: | The file might be a special file such as block device, character device, or symbolic links file. |
| Problem: | If the file is a special file, then it is not possible to either open it or read its contents. |

**Is File I/O error messaging feature enabled for CIFS users?**

| | |
|---|---|
| Explanation: | No, currently only NCP™ users are notified of File I/O errors. |

**Does a File I/O NCP error message imply that my file write failed?**

| | |
|---|---|
| Explanation: | No, up to five users who recently accessed a particular file receive an error message for any file I/O error of any of the five users. To know about your file write status, manually check its contents. |

**What can I do if the file I/O hangs without any error message?**

| | |
|---|---|
| Explanation: | It could be because of a network error. It might take up to one and a half minutes for the error message regarding the network error to display. |

**A symbolic link directory has converted to a file with read-only attribute. What does this imply?**

| | |
|---|---|
| Explanation: | The target directory that the symbolic link is pointing to does not exist |

**Why am I unable to access files/directories on Gateway volumes with lengthy pathnames from NCP/CIFS clients?**

| | |
|---|---|
| Explanation: | Files with a pathname length greater than 243 characters are not accessible from the NCP/CIFS client. |

# Time Stamp and File Content Synchronization Issues

**Even though I save the file contents and close the file, it takes some time for the changes to be visible from other clients attached to the remote server. How can I resolve this?**

Action: If you are accessing NFS Gateway volume over an NCP client, complete the following to resolve this.

**1** In the Advanced Properties of Novell Client, set the File Commit = On.

**2** In Novell Storage Services™ (NSS), set BufferFlushTimer = 1 second.

**IMPORTANT:** This action might have a negative impact on the write performance during large file writes.

**At times, I cannot view the file content modifications that I made on the remote server when I access it from an NFS gateway volume. How can I resolve this?**

Action: For NCP clients, set the FileCache = Off.

Action: Make sure that the system time of the NetWare server and the corresponding UNIX machine are synchronized.

**How can I view the latest time stamps of files or subdirectories every time that I list a directory?**

Action: During volume mounting using gymount, decrease the value of the *dirCompFreq* parameter of gymount. The minimum value for *dirCompFreq* parameter = 1 second.

**IMPORTANT:** This will have a negative impact on the directory listing performance.

# Performance and Scalability Issues

**Even though the NFS Gateway volume is mounted over NFS version 3, the clients attached to it time out while listing a directory containing more than 50,000 entries. What should I do?**

Action: Increase the value of the pageCachesize parameter:

**1** Unload the NFS Gateway by executing gystop.

**2** Reload nfsgy with a larger pageCacheSize. To do this, modify gystart.ncf (or anywhere nfsgy is being loaded, including directly at the console prompt). After modifying the NCF file, execute it to reload nfsgy.nlm.

For more details, refer to the pageCachesize parameter description in "Setting NFS Gateway Parameters" on page 16.

Action: If increasing the pageCachesize does not have any impact, try increasing the value of the CacheSize parameter in sys:\system\bti.cfg. Refer to the guidelines mentioned in "Configuring NFS Gateway for the First Time" on page 14.

**Why does the client time out when I look up certain entries in a large directory?**

Possible Cause: The entries must be the last few entries in a large directory, and it must be the first lookup in the directory for which shadow entries do not exist.

Action: We recommend a complete building of shadow entries for the volume.

**1** After importing the volume, load toolbox.nlm on the server.

**2** Using toolbox.nlm, change the current working directory to the root directory of the volume imported.

**3** Create the shadow entries for all directories in the volume by executing **`dir /s`**, the recursive directory browsing command of toolbox.nlm.

### What do I need to do when multiple directories of an NFS Gateway volume are scanned from multiple clients simultaneously, and clients time out with a "Network path not available" message. How can I resolve this?

Action:     Increase the value of the shadowCachesize parameter:

**1** Unload the NFS Gateway by executing **`gystop`**.

**2** Set the value of the shadowCachesize parameter based on the performance requirement.

For more details, refer to the shadowCachesize parameter in "Setting NFS Gateway Parameters" on page 16.

**3** Reload nfsgy.nlm.

Action:     If increasing the shadowCachesize does not have any impact, increase the CacheSize in sys:\system\bti.cfg. Refer to the guidelines mentioned in "Configuring NFS Gateway for the First Time" on page 14.

### What should I do when the message "CacheAllocator out of available memory" displays?

Action:     Decrease the value of the NSS ClosedFileCacheSize parameter based on the memory available on your server.

### What is the impact of setting the SGID bit on a directory?

Explanation:     File operations such as copy and create on this directory will take a longer time.

### When working with certain NFS Servers, directory creation fails although directory creation seemed to be working. Why does this happen?

Explanation:     Certain NFS Servers have a upper limit on holding subdirectories in a directory. For example, Red Hat Linux 8.0 can hold 32000 subdirectories in a directory and Solaris 8.0 can hold 32767 subdirectories in a directory.

# 10 Error Messages

## NFS Gateway Error Messages

### 9906: Could not initialize NFS Gateway

Possible Cause:    The sys:\etc\hosts file on the server where NFS Gateway is running does not contain an entry for its own primary IP address.

Action:    Ensure that the primary (first bound) IP address of the NetWare® server is present in the sys:\etc\hosts file.

### Error mounting *volume_name*, status = 4099

Possible Cause:    At this time, 255 volumes including the NFS Gateway, NSS, and traditional volumes have been mounted.

Action:    Dismount the volumes that are not utilized to mount the required *volume_name*.

### NFSGY ERROR: Failed writing part of the file *volume_name*:\\*path*\\*file*. Error Code: 300. Remote Server has timed out. Save your data to a another location and then contact system administrator to fix the problem.

Possible Cause:    Remote Server might have timed out becaus of network problems or the NFS Server is unable to handle many parallel requests.

Action:    Resolve the network problems and/or change the value for the maxOutstandingPackets parameter based on the description for "maxOutstandingPackets" on page 23.

If you are using NFS version 2, see "Tuning for NFS Version 2" on page 41.