Global File System

Red Hat Global File System
This book provides information about installing, configuring, and maintaining Red Hat GFS; (Red Hat Global File System).
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Introduction


HTML and PDF versions of all the official Red Hat Enterprise Linux manuals and release notes are available online at http://www.redhat.com/docs/.

1. Audience

This book is intended primarily for Linux system administrators who are familiar with the following activities:

- Linux system administration procedures, including kernel configuration
- Installation and configuration of shared storage networks, such as Fibre Channel SANs

2. Related Documentation

For more information about using Red Hat Enterprise Linux, refer to the following resources:

- Red Hat Enterprise Linux Installation Guide — Provides information regarding installation of Red Hat Enterprise Linux 5.
- Red Hat Enterprise Linux Deployment Guide — Provides information regarding the deployment, configuration and administration of Red Hat Enterprise Linux 5.

For more information about Red Hat Cluster Suite for Red Hat Enterprise Linux 5, refer to the following resources:

- Configuring and Managing a Red Hat Cluster — Provides information about installing, configuring and managing Red Hat Cluster components.
- LVM Administrator's Guide: Configuration and Administration — Provides a description of the Logical Volume Manager (LVM), including information on running LVM in a clustered environment.
- Using GNBD with Global File System — Provides an overview on using Global Network Block Device (GNBD) with Red Hat GFS.
- Linux Virtual Server Administration — Provides information on configuring high-performance systems and services with the Linux Virtual Server (LVS).
- Red Hat Cluster Suite Release Notes — Provides information about the current release of
3. Document Conventions

Certain words in this manual are represented in different fonts, styles, and weights. This highlighting indicates that the word is part of a specific category. The categories include the following:

**Courier font**

Courier font represents commands, file names and paths, and prompts.

When shown as below, it indicates computer output:

```
Desktop about.html logs paulwesterberg.png
Mail backupfiles mail reports
```

**Bold Courier font**

Bold Courier font represents text that you are to type, such as: `service jonas start`

If you have to run a command as root, the root prompt (`#`) precedes the command:

```
# gconftool-2
```

**Italic Courier font**

Italic Courier font represents a variable, such as an installation directory: `install_dir/bin/`

**Bold font**

Bold font represents application programs and text found on a graphical interface.

When shown like this: **OK**, it indicates a button on a graphical application interface.

Additionally, the manual uses different strategies to draw your attention to pieces of information. In order of how critical the information is to you, these items are marked as follows:

Note

A note is typically information that you need to understand the behavior of the system.

Tip

A tip is typically an alternative way of performing a task.
4. Send in Your Feedback

If you spot a typo in the *Global File System Configuration and Administration* document or if you have thought of a way to make this manual better, we would love to hear from you! Please submit a report in Bugzilla (http://www.redhat.com/bugzilla) against the component rh-gfsg.

Be sure to mention the manual's identifier:

rh-gfsg

If you mention this manual's identifier, we will know exactly which version of the guide you have.

If you have a suggestion for improving the documentation, try to be as specific as possible. If you have found an error, please include the section number and some of the surrounding text so we can find it easily.

5. Recommended References

For additional references about related topics, refer to the following table:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>Reference</td>
<td>Comment</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><em>Building SANs with Brocade Fabric Switches</em> by C. Beauchamp, J. Judd, and B. Keo. Syngress, 2001.</td>
<td>Best practices for building Fibre Channel SANs based on the Brocade family of switches, including core-edge topology for large SAN fabrics.</td>
</tr>
</tbody>
</table>

Table 1. Recommended References Table
Chapter 1. GFS Overview

Red Hat GFS is a cluster file system that is available with Red Hat Cluster Suite. Red Hat GFS nodes are configured and managed with Red Hat Cluster Suite configuration and management tools. Red Hat GFS provides data sharing among GFS nodes in a Red Hat cluster. GFS provides a single, consistent view of the file-system name space across the GFS nodes in a Red Hat cluster. GFS allows applications to install and run without much knowledge of the underlying storage infrastructure. GFS is fully compliant with the IEEE POSIX interface, allowing applications to perform file operations as if they were running on a local file system. Also, GFS provides features that are typically required in enterprise environments, such as quotas, multiple journals, and multipath support.

GFS provides a versatile method of networking your storage according to the performance, scalability, and economic needs of your storage environment. This chapter provides some very basic, abbreviated information as background to help you understand GFS. It contains the following sections:

- Section 1, “New and Changed Features”
- Section 2, “Performance, Scalability, and Economy”
- Section 3, “GFS Functions”
- Section 4, “GFS Software Subsystems”
- Section 5, “Before Setting Up GFS”

1. New and Changed Features

This section lists new and changed features included with the initial release of Red Hat Enterprise Linux 5.

- GULM (Grand Unified Lock Manager) is not supported in Red Hat Enterprise Linux 5. If your GFS file systems use the GULM lock manager, you must convert the file systems to use the DLM lock manager. This is a two-part process.

  - While running Red Hat Enterprise Linux 4, convert your GFS file systems to use the DLM lock manager.
  - Upgrade your operating system to Red Hat Enterprise Linux 5, converting the lock manager to DLM when you do.

  For information on upgrading to Red Hat Enterprise Linux 5 and converting GFS file systems to use the DLM lock manager, see Configuring and Managing a Red Hat Cluster.

- Documentation for Red Hat Cluster Suite for Red Hat Enterprise Linux 5 has been expanded and reorganized. For information on the available documents, see Section 2, “Related Documentation”.


2. Performance, Scalability, and Economy

You can deploy GFS in a variety of configurations to suit your needs for performance, scalability, and economy. For superior performance and scalability, you can deploy GFS in a cluster that is connected directly to a SAN. For more economical needs, you can deploy GFS in a cluster that is connected to a LAN with servers that use GNBD (Global Network Block Device).

The following sections provide examples of how GFS can be deployed to suit your needs for performance, scalability, and economy:

- Section 2.1, “Superior Performance and Scalability”
- Section 2.2, “Performance, Scalability, Moderate Price”
- Section 2.3, “Economy and Performance”

Note

The deployment examples in this chapter reflect basic configurations; your needs might require a combination of configurations shown in the examples.

2.1. Superior Performance and Scalability

You can obtain the highest shared-file performance when applications access storage directly. The GFS SAN configuration in Figure 1.1, “GFS with a SAN” provides superior file performance for shared files and file systems. Linux applications run directly on GFS nodes. Without file protocols or storage servers to slow data access, performance is similar to individual Linux servers with directly connected storage; yet, each GFS application node has equal access to all data files. GFS supports over 300 GFS nodes.
Figure 1.1. GFS with a SAN

2.2. Performance, Scalability, Moderate Price

Multiple Linux client applications on a LAN can share the same SAN-based data as shown in Figure 1.2, “GFS and GNBD with a SAN”. SAN block storage is presented to network clients as block storage devices by GNBD servers. From the perspective of a client application, storage is accessed as if it were directly attached to the server in which the application is running. Stored data is actually on the SAN. Storage devices and data can be equally shared by network client applications. File locking and sharing functions are handled by GFS for each network client.

Note

Clients implementing ext2 and ext3 file systems can be configured to access their own dedicated slice of SAN storage.

Figure 1.2. GFS and GNBD with a SAN

2.3. Economy and Performance
Figure 1.3, “GFS and GNBD with Directly Connected Storage” shows how Linux client applications can take advantage of an existing Ethernet topology to gain shared access to all block storage devices. Client data files and file systems can be shared with GFS on each client. Application failover can be fully automated with Red Hat Cluster Suite.

3. GFS Functions

GFS is a native file system that interfaces directly with the VFS layer of the Linux kernel file-system interface. GFS is a cluster file system that employs distributed metadata and multiple journals for optimal operation in a cluster. Cluster management of GFS nodes is managed through Red Hat Cluster Suite. Volume management is managed through CLVM (Cluster Logical Volume Manager). For information about Red Hat Cluster Suite refer to Configuring and Managing a Red Hat Cluster. For information about using CLVM, refer to LVM Administrator's Guide.

Note

CLVM is a cluster-wide implementation of LVM, enabled by the CLVM daemon, clvmd running in a Red Hat Cluster Suite cluster. The daemon makes it possible to use LVM2 to manage logical volumes across a cluster, allowing all nodes in the cluster to share the logical volumes.
GFS provides the following main functions:

- Making a File System
- Mounting a File System
- Unmounting a File System
- GFS Quota Management
- Growing a File System
- Adding Journals to a File System
- Direct I/O
- Data Journaling
- Configuring atime Updates
- Suspending Activity on a File System
- Displaying Extended GFS Information and Statistics
- Repairing a File System
- Context-Dependent Path Names (CDPN)

4. GFS Software Subsystems

Table 1.1, “GFS Software Subsystem Components” summarizes the GFS Software subsystems and their components.

<table>
<thead>
<tr>
<th>Software Subsystem</th>
<th>Components</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFS</td>
<td>gfs.ko</td>
<td>Kernel module that implements the GFS file system and is loaded on GFS cluster nodes.</td>
</tr>
<tr>
<td></td>
<td>gfs_fsck</td>
<td>Command that repairs an unmounted GFS file system.</td>
</tr>
<tr>
<td></td>
<td>gfs_grow</td>
<td>Command that grows a mounted GFS file system.</td>
</tr>
<tr>
<td></td>
<td>gfs_jadd</td>
<td>Command that adds journals to a mounted GFS file system.</td>
</tr>
<tr>
<td></td>
<td>gfs_mkfs</td>
<td>Command that creates a GFS file system on a storage device.</td>
</tr>
<tr>
<td></td>
<td>gfs_quota</td>
<td>Command that manages quotas on a mounted GFS file system.</td>
</tr>
<tr>
<td></td>
<td>gfs_tool</td>
<td>Command that configures or tunes a GFS</td>
</tr>
</tbody>
</table>
5. Before Setting Up GFS

Before you install and set up GFS, note the following key characteristics of your GFS file systems:

Number of file systems
Determine how many GFS file systems to create initially. (More file systems can be added later.)

File-system name
Determine a unique name for each file system. Each file-system name is required in the form of a parameter variable. For example, this book uses file-system names gfs1 and gfs2 in some example procedures.

Journals
Determine the number of journals for your GFS file systems. One journal is required for each node that mounts a GFS file system. Make sure to account for additional journals needed for future expansion.

GFS nodes
Determine which nodes in the Red Hat Cluster Suite will mount the GFS file systems.

GNBD server nodes
If you are using GNBD, determine how many GNBD server nodes are needed. Note the

<table>
<thead>
<tr>
<th>Software Subsystem</th>
<th>Components</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>file system. This command can also gather a variety of information about the file system.</td>
</tr>
<tr>
<td>lock_harness.ko</td>
<td></td>
<td>Implements a pluggable lock module interface for GFS that allows for a variety of locking mechanisms to be used (for example, the DLM lock module, lock_dlm.ko).</td>
</tr>
<tr>
<td>lock_dlm.ko</td>
<td></td>
<td>A lock module that implements DLM locking for GFS. It plugs into the lock harness, lock_harness.ko and communicates with the DLM lock manager in Red Hat Cluster Suite.</td>
</tr>
<tr>
<td>lock_nolock.ko</td>
<td></td>
<td>A lock module for use when GFS is used as a local file system only. It plugs into the lock harness, lock_harness.ko and provides local locking.</td>
</tr>
</tbody>
</table>

Table 1.1. GFS Software Subsystem Components
5. Before Setting Up GFS

hostname and IP address of each GNBD server node for setting up GNBD clients later. For information on using GNBD with GFS, see the Using GNBD with Global File System document.

Storage devices and partitions
Determine the storage devices and partitions to be used for creating logical volumes (via CLVM) in the file systems.
Chapter 2. System Requirements

This chapter describes the system requirements for Red Hat GFS with Red Hat Enterprise Linux 5 and consists of the following sections:

- Section 1, “Platform Requirements”
- Section 2, “Red Hat Cluster Suite”
- Section 3, “Fencing”
- Section 4, “Fibre Channel Storage Network”
- Section 5, “Fibre Channel Storage Devices”
- Section 6, “Network Power Switches”
- Section 7, “Console Access”

1. Platform Requirements

Table 2.1, “Platform Requirements” shows the platform requirements for GFS.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Hardware Architecture</th>
<th>RAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat Enterprise Linux AS, ES, or WS, Version 4 or later</td>
<td>ia64, x86-64, x86 SMP supported</td>
<td>256 MB, minimum</td>
</tr>
</tbody>
</table>

Table 2.1. Platform Requirements

2. Red Hat Cluster Suite

Red Hat GFS runs with Red Hat Cluster Suite 4.0 or later. The Red Hat Cluster Suite software must be installed on the cluster nodes before you can install and run Red Hat GFS.

Note

Red Hat Cluster Suite 4.0 and later provides the infrastructure for application fail-over in the cluster and network communication among GFS nodes (and other Red Hat Cluster Suite nodes).

3. Fencing

You must configure each GFS node in your Red Hat cluster for at least one form of fencing.
Fencing is configured and managed in Red Hat Cluster Suite. For more information about fencing options, refer to *Configuring and Managing a Red Hat Cluster*.

### 4. Fibre Channel Storage Network

Table 2.2, “Fibre Channel Network Requirements” shows requirements for GFS nodes that are to be connected to a Fibre Channel SAN.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBA (Host Bus Adapter)</td>
<td>One HBA minimum per GFS node</td>
</tr>
<tr>
<td>Connection method</td>
<td>Fibre Channel switch</td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> If an FC switch is used for fencing, you may want to consider using Brocade, McData, or Vixel FC switches, for which Red Hat Cluster Suite fencing agents exist. Refer to <em>Configuring and Managing a Red Hat Cluster</em> for more information about supported fencing agents. <em>Note:</em> When a small number of nodes is used, it may be possible to connect the nodes directly to ports on the storage device. <em>Note:</em> FC drivers may not work reliably with FC hubs.</td>
</tr>
</tbody>
</table>

Table 2.2. Fibre Channel Network Requirements

### 5. Fibre Channel Storage Devices

Table 2.3, “Fibre Channel Storage Device Requirements” shows requirements for Fibre Channel devices that are to be connected to a GFS cluster.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Type</td>
<td>FC RAID array or JBOD</td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> Make sure that the devices can operate reliably when heavily accessed simultaneously from multiple initiators. <em>Note:</em> Make sure that your GFS configuration does not exceed the number of nodes an array or JBOD supports.</td>
</tr>
<tr>
<td>Size</td>
<td>8 TB maximum supported per GFS file system</td>
</tr>
</tbody>
</table>

Table 2.3. Fibre Channel Storage Device Requirements

### 6. Network Power Switches
You can fence GFS nodes with power switches and fencing agents available with Red Hat Cluster Suite. For more information about fencing with network power switches, refer to Configuring and Managing a Red Hat Cluster.

7. Console Access

Make sure that you have console access to each GFS node. Console access to each node ensures that you can monitor nodes and troubleshoot problems.

8. Installing GFS

Installing GFS consists of installing Red Hat GFS RPMs on nodes in a Red Hat cluster. Before installing the RPMs, make sure of the following:

• The cluster nodes meet the system requirements described in this chapter.

• You have noted the key characteristics of your GFS configuration (refer to Section 5, “Before Setting Up GFS”).

• The correct Red Hat Cluster Suite software is installed in the cluster.

For information on installing RPMs for Red Hat Cluster Suite and Red Hat GFS, see Configuring and Managing a Red Hat Cluster. If you have already installed the appropriate Red Hat Cluster Suite RPMs, follow the procedures that pertain to installing the Red Hat GFS RPMs.
Chapter 3. Getting Started

This chapter describes procedures for initial setup of GFS and contains the following sections:

- Section 1, “Prerequisite Tasks”
- Section 2, “Initial Setup Tasks”

1. Prerequisite Tasks

Before setting up Red Hat GFS, make sure that you have noted the key characteristics of the GFS nodes (refer to Section 5, “Before Setting Up GFS”) and have loaded the GFS modules into each GFS node. Also, make sure that the clocks on the GFS nodes are synchronized. It is recommended that you use the Network Time Protocol (NTP) software provided with your Red Hat Enterprise Linux distribution. In addition, if you are using GNBD multipath, make sure that you understand GNBD multipath considerations. For information on GNBD multipath, see the document Using GNBD with Global Filesystem.

Note

The system clocks in GFS nodes must be within a few minutes of each other to prevent unnecessary inode time-stamp updating. Unnecessary inode time-stamp updating severely impacts cluster performance.

2. Initial Setup Tasks

Initial GFS setup consists of the following tasks:

1. Setting up logical volumes.
2. Making a GFS files system.
3. Mounting file systems.

Follow these steps to set up GFS initially.

1. Using CLVM (Cluster Logical Volume Manager), create a logical volume for each Red Hat GFS file system.

Note

You can use `init.d` scripts included with Red Hat Cluster Suite to automate activating and deactivating logical volumes. For more information about `init.d`
2. Create GFS file systems on logical volumes created in Step 1. Choose a unique name for each file system. For more information about creating a GFS file system, refer to Section 1, “Making a File System”.

Command usage:

```
gfs_mkfs -p lock_dlm -t ClusterName:FSName -j NumberJournals BlockDevice
```

3. At each node, mount the GFS file systems. For more information about mounting a GFS file system, refer to Section 2, “Mounting a File System”.

Command usage:

```
mount -t gfs BlockDevice MountPoint
mount -t gfs -o acl BlockDevice MountPoint
```

The -o acl mount option allows manipulating file ACLs. If a file system is mounted without the -o acl mount option, users are allowed to view ACLs (with `getfacl`), but are not allowed to set them (with `setfacl`).

**Note**

You can use init.d scripts included with Red Hat Cluster Suite to automate mounting and unmounting GFS file systems. For more information about init.d scripts, refer to Configuring and Managing a Red Hat Cluster.
Chapter 4. Managing GFS

This chapter describes the tasks and commands for managing GFS and consists of the following sections:

• Section 1, “Making a File System”
• Section 2, “Mounting a File System”
• Section 3, “Unmounting a File System”
• Section 4, “GFS Quota Management”
• Section 5, “Growing a File System”
• Section 6, “Adding Journals to a File System”
• Section 7, “Direct I/O”
• Section 8, “Data Journaling”
• Section 9, “Configuring atime Updates”
• Section 10, “Suspending Activity on a File System”
• Section 11, “Displaying Extended GFS Information and Statistics”
• Section 12, “Repairing a File System”
• Section 13, “Context-Dependent Path Names”

1. Making a File System

Once a cluster is set up and running, you can create a GFS file system with the `gfs_mkfs` command. A file system is created on an activated CLVM volume. The following information is required to run the `gfs_mkfs` command:

• Lock protocol/module name (for example, `lock_dlm`)
• Cluster name
• Number of journals (one journal required for each node that may be mounting the file system)

Usage

```
gfs_mkfs -p LockProtoName -t LockTableName -j Number BlockDevice
```
Warning

Make sure that you are very familiar with using the LockProtoName and LockTableName parameters. Improper use of the LockProtoName and LockTableName parameters may cause file system or lock space corruption.

LockProtoName

Specifies the name of the locking protocol (for example, lock_dlm) to use.

LockTableName

This parameter has two parts separated by a colon (no spaces) as follows: ClusterName:FSName

- ClusterName, the name of the Red Hat cluster for which the GFS file system is being created.
- FSName, the file-system name, can be 1 to 16 characters long, and the name must be unique among all file systems in the cluster.

Number

Specifies the number of journals to be created by the gfs_mkfs command. One journal is required for each node that mounts the file system. (More journals than are needed can be specified at creation time to allow for future expansion.)

BlockDevice

Specifies a volume.

Examples

In this example, lock_dlm is the locking protocol that the file system uses. The cluster name is alpha, and the file-system name is gfs1. The file system contains eight journals and is created on /dev/vg01/lvol0.

`gfs_mkfs -p lock_dlm -t alpha:gfs1 -j 8 /dev/vg01/lvol0`

In this example, a second lock_dlm file system is made, which can be used in cluster alpha. The file-system name is gfs2. The file system contains eight journals and is created on /dev/vg01/lvol1.

`gfs_mkfs -p lock_dlm -t alpha:gfs2 -j 8 /dev/vg01/lvol1`

Complete Options

Table 4.1, “Command Options: gfs_mkfs” describes the gfs_mkfs command options (flags and parameters).
<table>
<thead>
<tr>
<th>Flag</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-b</td>
<td>BlockSize</td>
<td>Sets the file-system block size to BlockSize. Default block size is 4096 bytes.</td>
</tr>
<tr>
<td>-D</td>
<td></td>
<td>Enables debugging output.</td>
</tr>
<tr>
<td>-h</td>
<td></td>
<td>Help. Displays available options.</td>
</tr>
<tr>
<td>-J</td>
<td>MegaBytes</td>
<td>Specifies the size of the journal in megabytes. Default journal size is 128 megabytes. The minimum size is 32 megabytes.</td>
</tr>
<tr>
<td>-j</td>
<td>Number</td>
<td>Specifies the number of journals to be created by the gfs_mkfs command. One journal is required for each node that mounts the file system. <strong>Note:</strong> More journals than are needed can be specified at creation time to allow for future expansion.</td>
</tr>
<tr>
<td>-p</td>
<td>LockProtoName</td>
<td>Specifies the name of the locking protocol to use. Recognized cluster-locking protocols include:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lock_dlm — The standard locking module.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lock_nolock — May be used when GFS is acting as a local file system (one node only).</td>
</tr>
<tr>
<td>-O</td>
<td></td>
<td>Prevents the gfs_mkfs command from asking for confirmation before writing the file system.</td>
</tr>
<tr>
<td>-q</td>
<td></td>
<td>Quiet. Do not display anything.</td>
</tr>
<tr>
<td>-r</td>
<td>MegaBytes</td>
<td>Specifies the size of the resource groups in megabytes. Default resource group size is 256 megabytes.</td>
</tr>
<tr>
<td>-s</td>
<td>Blocks</td>
<td>Specifies the journal-segment size in file-system blocks.</td>
</tr>
<tr>
<td>-t</td>
<td>LockTableName</td>
<td>This parameter has two parts separated by a colon (no spaces) as follows: ClusterName:FSName.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ClusterName</strong> is the name of the Red Hat cluster for which the GFS file system is being created. The cluster name is set in the /etc/cluster/cluster.conf file via the Cluster Configuration Tool and displayed at the Cluster Status Tool in the Red Hat Cluster Suite cluster management GUI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>FSName</strong>, the file-system name, can be 1 to 16 characters in length, and the name must be unique among all file systems in the cluster.</td>
</tr>
<tr>
<td>-V</td>
<td></td>
<td>Displays command version information.</td>
</tr>
</tbody>
</table>
2. Mounting a File System

Before you can mount a GFS file system, the file system must exist (refer to Section 1, "Making a File System"), the volume where the file system exists must be activated, and the supporting clustering and locking systems must be started (refer to Chapter 3, Getting Started and Configuring and Managing a Red Hat Cluster). After those requirements have been met, you can mount the GFS file system as you would any Linux file system.

To manipulate file ACLs, you must mount the file system with the `-o acl` mount option. If a file system is mounted without the `-o acl` mount option, users are allowed to view ACLs (with `getfacl`), but are not allowed to set them (with `setfacl`).

**Usage**

### Mounting Without ACL Manipulation

`mount -t gfs BlockDevice MountPoint`

### Mounting With ACL Manipulation

`mount -t gfs -o acl BlockDevice MountPoint`

- `-o acl`  
  GFS-specific option to allow manipulating file ACLs.

- `BlockDevice`  
  Specifies the block device where the GFS file system resides.

- `MountPoint`  
  Specifies the directory where the GFS file system should be mounted.

**Example**

In this example, the GFS file system on `/dev/vg01/lvol0` is mounted on the `/gfs1` directory.

`mount -t gfs /dev/vg01/lvol0 /gfs1`

**Complete Usage**

`mount -t gfs BlockDevice MountPoint -o option`

The `-o option` argument consists of GFS-specific options (refer to Table 4.2, “GFS-Specific Mount Options”) or acceptable standard Linux `mount -o` options, or a combination of both. Multiple `option` parameters are separated by a comma and no spaces.
The `mount` command is a Linux system command. In addition to using GFS-specific options described in this section, you can use other, standard, `mount` command options (for example, `-r`). For information about other Linux `mount` command options, see the Linux `mount` man page.

Table 4.2, “GFS-Specific Mount Options” describes the available GFS-specific `-o` option values that can be passed to GFS at mount time.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>acl</td>
<td>Allows manipulating file ACLs. If a file system is mounted without the <code>acl</code> mount option, users are allowed to view ACLs (with <code>getfacl</code>), but are not allowed to set them (with <code>setfacl</code>).</td>
</tr>
<tr>
<td>ignore_local_fs</td>
<td><strong>Caution:</strong> This option should <em>not</em> be used when GFS file systems are shared.</td>
</tr>
<tr>
<td>localcaching</td>
<td><strong>Caution:</strong> This option should <em>not</em> be used when GFS file systems are shared.</td>
</tr>
<tr>
<td>localflocks</td>
<td><strong>Caution:</strong> This option should not be used when GFS file systems are shared.</td>
</tr>
<tr>
<td>lockproto=LockModuleName</td>
<td>Allows the user to specify which locking protocol to use with the file system. If <code>LockModuleName</code> is not specified, the locking protocol name is read from the file-system superblock.</td>
</tr>
<tr>
<td>locktable=LockTableName</td>
<td>Allows the user to specify which locking table to use with the file system.</td>
</tr>
<tr>
<td>oopses_ok</td>
<td>This option allows a GFS node to <em>not</em> panic when an oops occurs. (By default, a GFS node panics when an oops occurs, causing the file system used by that node to stall for other GFS nodes.) A GFS node <em>not</em> panicking when an oops occurs minimizes the failure on other GFS nodes using the file system that the failed node is using. There may be circumstances where you do not want to use this option — for example, when you need more de-</td>
</tr>
</tbody>
</table>
3. Unmounting a File System

The GFS file system can be unmounted the same way as any Linux file system — by using the `umount` command.

Usage

```bash
umount MountPoint
```

*MountPoint*

Specifies the directory where the GFS file system should be mounted.

4. GFS Quota Management

File-system quotas are used to limit the amount of file-system space a user or group can use. A user or group does not have a quota limit until one is set. GFS keeps track of the space used by each user and group even when there are no limits in place. GFS updates quota information in a transactional way so system crashes do not require quota usages to be reconstructed.

To prevent a performance slowdown, a GFS node synchronizes updates to the quota file only periodically. The "fuzzy" quota accounting can allow users or groups to slightly exceed the set limit. To minimize this, GFS dynamically reduces the synchronization period as a "hard" quota limit is approached.

GFS uses its `gfs_quota` command to manage quotas. Other Linux quota facilities cannot be used with GFS.
4.1. Setting Quotas

Two quota settings are available for each user ID (UID) or group ID (GID): a *hard limit* and a *warn limit*.

A hard limit is the amount of space that can be used. The file system will not let the user or group use more than that amount of disk space. A hard limit value of zero means that no limit is enforced.

A warn limit is usually a value less than the hard limit. The file system will notify the user or group when the warn limit is reached to warn them of the amount of space they are using. A warn limit value of zero means that no limit is enforced.

Limits are set using the `gfs_quota` command. The command only needs to be run on a single node where GFS is mounted.

**Usage**

**Setting Quotas, Hard Limit**

```
gfs_quota limit -u User -l Size -f MountPoint
```

```
gfs_quota limit -g Group -l Size -f MountPoint
```

**Setting Quotas, Warn Limit**

```
gfs_quota warn -u User -l Size -f MountPoint
```

```
gfs_quota warn -g Group -l Size -f MountPoint
```

**User**

A user ID to limit or warn. It can be either a user name from the password file or the UID number.

**Group**

A group ID to limit or warn. It can be either a group name from the group file or the GID number.

**Size**

Specifies the new value to limit or warn. By default, the value is in units of megabytes. The additional `-k`, `-s` and `-b` flags change the units to kilobytes, sectors, and file-system blocks, respectively.

**MountPoint**

Specifies the GFS file system to which the actions apply.

**Examples**

This example sets the hard limit for user *Bert* to 1024 megabytes (1 gigabyte) on file system `/`
4.2. Displaying Quota Limits and Usage

Quota limits and current usage can be displayed for a specific user or group using the `gfs_quota` get command. The entire contents of the quota file can also be displayed using the `gfs_quota` list command, in which case all IDs with a non-zero hard limit, warn limit, or value are listed.

**Usage**

**Displaying Quota Limits for a User**

`gfs_quota get -u User -f MountPoint`

**Displaying Quota Limits for a Group**

`gfs_quota get -g Group -f MountPoint`

**Displaying Entire Quota File**

`gfs_quota list -f MountPoint`

**User**

A user ID to display information about a specific user. It can be either a user name from the password file or the UID number.

**Group**

A group ID to display information about a specific group. It can be either a group name from the group file or the GID number.

**MountPoint**

 Specifies the GFS file system to which the actions apply.

**Command Output**

GFS quota information from the `gfs_quota` command is displayed as follows:

```
user User:   limit:LimitSize  warn:WarnSize  value:Value
```

```
group Group:  limit:LimitSize  warn:WarnSize  value:Value
```

The `LimitSize`, `WarnSize`, and `Value` numbers (values) are in units of megabytes by default. Adding the `-k`, `-s`, or `-b` flags to the command line change the units to kilobytes, sectors, or file-
4.3. Synchronizing Quotas

GFS stores all quota information in its own internal file on disk. A GFS node does not update this quota file for every file-system write; rather, it updates the quota file once every 60 seconds. This is necessary to avoid contention among nodes writing to the quota file, which would cause a slowdown in performance.

As a user or group approaches their quota limit, GFS dynamically reduces the time between its quota-file updates to prevent the limit from being exceeded. The normal time period between quota synchronizations is a tunable parameter, `quota_quantum`, and can be changed using the `gfs_tool` command. By default, the time period is 60 seconds. Also, the `quota_quantum` parameter must be set on each node and each time the file system is mounted. (Changes to the `quota_quantum` parameter are not persistent across unmounts.)

You can use the `gfs_quota sync` command to synchronize the quota information from a node to the on-disk quota file between the automatic updates performed by GFS.

system blocks, respectively.

**User**
A user name or ID to which the data is associated.

**Group**
A group name or ID to which the data is associated.

**LimitSize**
The hard limit set for the user or group. This value is zero if no limit has been set.

**Value**
The actual amount of disk space used by the user or group.

**Comments**

When displaying quota information, the `gfs_quota` command does not resolve UIDs and GIDs into names if the `-n` option is added to the command line.

Space allocated to GFS's hidden files can be left out of displayed values for the root UID and GID by adding the `-d` option to the command line. This is useful when trying to match the numbers from `gfs_quota` with the results of a `du` command.

**Examples**

This example displays quota information for all users and groups that have a limit set or are using any disk space on file system `/gfs`.

```
gfs_quota list -f /gfs
```

This example displays quota information in sectors for group `users` on file system `/gfs`.

```
gfs_quota get -g users -f /gfs -s
```

4.3. Synchronizing Quotas

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You can use the `gfs_quota sync` command to synchronize the quota information from a node to the on-disk quota file between the automatic updates performed by GFS.
4.4. Disabling/Enabling Quota Enforcement

Enforcement of quotas can be disabled for a file system without clearing the limits set for all users and groups. Enforcement can also be enabled. Disabling and enabling of quota enforcement is done by changing a tunable parameter, \texttt{quota\_enforce}, with the \texttt{gfs\_tool} command. The \texttt{quota\_enforce} parameter must be disabled or enabled on each node where quota enforcement should be disabled/enabled. Each time the file system is mounted, enforcement is enabled by default. (Disabling is not persistent across unmounts.)

**Usage**

\begin{verbatim}
gfs\_tool settune MountPoint quota\_enforce \{0|1\}
\end{verbatim}

MountPoint

Specifies the GFS file system to which the actions apply.

---

**Usage**

**Synchronizing Quota Information**

\begin{verbatim}
gfs\_quota sync -f MountPoint
\end{verbatim}

MountPoint

Specifies the GFS file system to which the actions apply.

**Tuning the Time Between Synchronizations**

\begin{verbatim}
gfs\_tool settune MountPoint quota\_quantum Seconds
\end{verbatim}

MountPoint

Specifies the GFS file system to which the actions apply.

Seconds

Specifies the new time period between regular quota-file synchronizations by GFS. Smaller values may increase contention and slow down performance.

**Examples**

This example synchronizes the quota information from the node it is run on to file system /gfs.

\begin{verbatim}
gfs\_quota sync -f /gfs
\end{verbatim}

This example changes the default time period between regular quota-file updates to one hour (3600 seconds) for file system /gfs on a single node.

\begin{verbatim}
gfs\_tool settune /gfs quota\_quantum 3600
\end{verbatim}
4.5. Disabling/Enabling Quota Accounting

**quota_enforce** (0|1)

0 = disabled

1 = enabled

**Comments**

A value of 0 disables enforcement. Enforcement can be enabled by running the command with a value of 1 (instead of 0) as the final command line parameter. Even when GFS is not enforcing quotas, it still keeps track of the file-system usage for all users and groups so that quota-usage information does not require rebuilding after re-enabling quotas.

**Examples**

This example *disables* quota enforcement on file system `/gfs`.

```
gfs_tool settune /gfs quota_enforce 0
```

This example *enables* quota enforcement on file system `/gfs`.

```
gfs_tool settune /gfs quota_enforce 1
```

4.5. Disabling/Enabling Quota Accounting

By default, quota accounting is enabled; therefore, GFS keeps track of disk usage for every user and group even when no quota limits have been set. Quota accounting incurs unnecessary overhead if quotas are not used. You can disable quota accounting completely by setting the `quota_account` tunable parameter to 0. This must be done on each node and after each mount. (The 0 setting is not persistent across unmounts.) Quota accounting can be enabled by setting the `quota_account` tunable parameter to 1.

**Usage**

```
fs_tool settune MountPoint quota_account (0|1)
```

*MountPoint*

Specifies the GFS file system to which the actions apply.

**quota_account** (0|1)

0 = disabled

1 = enabled

**Comments**

To enable quota accounting on a file system, the `quota_account` parameter must be set back to 1. Afterward, the GFS quota file must be initialized to account for all current disk usage for users and groups on the file system. The quota file is initialized by running: `gfs_quota init -f MountPoint`. 

--

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Examples

This example disables quota accounting on file system `/gfs` on a single node.

`gfs_tool settune /gfs quota_account 0`

This example enables quota accounting on file system `/gfs` on a single node and initializes the quota file.

```
# gfs_tool settune /gfs quota_account 1
# gfs_quota init -f /gfs
```

5. Growing a File System

The `gfs_grow` command is used to expand a GFS file system after the device where the file system resides has been expanded. Running a `gfs_grow` command on an existing GFS file system fills all spare space between the current end of the file system and the end of the device with a newly initialized GFS file-system extension. When the fill operation is completed, the resource index for the file system is updated. All nodes in the cluster can then use the extra storage space that has been added.

The `gfs_grow` command must be run on a mounted file system, but only needs to be run on one node in a cluster. All the other nodes sense that the expansion has occurred and automatically start using the new space.

To verify that the changes were successful, use the `gfs_grow` command with the `-t` (test) and `-v` (verbose) flags. Running the command with those flags displays the current state of the mounted GFS file system.

Usage

`gfs_grow MountPoint`

*MountPoint*

Specifies the GFS file system to which the actions apply.

Comments

Before running the `gfs_grow` command:
• Back up important data on the file system.

• Display the volume that is used by the file system to be expanded by running a `gfs_tool df` command.

• Expand the underlying cluster volume with LVM. For information on administering LVM volumes, see the *LVM Administrator’s Guide*

After running the `gfs_grow` command, run a `df` command to check that the new space is now available in the file system.

**Examples**

In this example, the file system on the `/gfs1` directory is expanded.

```
gfs_grow /gfs1
```

In this example, the state of the mounted file system is checked.

```
gfs_grow -Tv /gfs1
```

**Complete Usage**

```
gfs_grow [Options] {MountPoint | Device} [MountPoint | Device]
```

*MountPoint*

Specifies the directory where the GFS file system is mounted.

*Device*

Specifies the device node of the file system.

Table 4.3, “GFS-specific Options Available While Expanding A File System” describes the GFS-specific options that can be used while expanding a GFS file system.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-h</code></td>
<td>Help. Displays a short usage message.</td>
</tr>
<tr>
<td><code>-q</code></td>
<td>Quiet. Turns down the verbosity level.</td>
</tr>
<tr>
<td><code>-T</code></td>
<td>Test. Do all calculations, but do not write any data to the disk and do not expand the file system.</td>
</tr>
<tr>
<td><code>-V</code></td>
<td>Displays command version information.</td>
</tr>
<tr>
<td><code>-v</code></td>
<td>Turns up the verbosity of messages.</td>
</tr>
</tbody>
</table>

**Table 4.3. GFS-specific Options Available While Expanding A File System**
6. Adding Journals to a File System

The `gfs_jadd` command is used to add journals to a GFS file system after the device where the file system resides has been expanded. Running a `gfs_jadd` command on a GFS file system uses space between the current end of the file system and the end of the device where the file system resides. When the fill operation is completed, the journal index is updated.

The `gfs_jadd` command must be run on mounted file system, but it only needs to be run on one node in the cluster. All the other nodes sense that the expansion has occurred.

To verify that the changes were successful, use the `gfs_jadd` command with the `-T` (test) and `-v` (verbose) flags. Running the command with those flags displays the current state of the mounted GFS file system.

Usage

```
gfs_jadd -j Number MountPoint
```

- **Number**: Specifies the number of new journals to be added.
- **MountPoint**: Specifies the directory where the GFS file system is mounted.

Comments

Before running the `gfs_jadd` command:

- Back up important data on the file system.
- Run a `gfs_tool df MountPoint` command to display the volume used by the file system where journals will be added.
- Expand the underlying cluster volume with LVM. For information on administering LVM volumes, see the `LVM Administrator's Guide`

After running the `gfs_jadd` command, run a `gfs_jadd` command with the `-T` and `-v` flags enabled to check that the new journals have been added to the file system.

Examples

In this example, one journal is added to the file system on the `/gfs1` directory.

```
gfs_jadd -j1 /gfs1
```

In this example, two journals are added to the file system on the `/gfs1` directory.

```
gfs_jadd -j2 /gfs1
```
In this example, the current state of the file system on the /gfs1 directory is checked for the new journals.

```
gfs_jadd -Tv /gfs1
```

**Complete Usage**

```
gfs_jadd [Options] [MountPoint | Device] [MountPoint | Device]
```

**MountPoint**

Specifies the directory where the GFS file system is mounted.

**Device**

Specifies the device node of the file system.

Table 4.4, “GFS-specific Options Available When Adding Journals” describes the GFS-specific options that can be used when adding journals to a GFS file system.

<table>
<thead>
<tr>
<th>Flag</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-h</td>
<td></td>
<td>Help. Displays short usage message.</td>
</tr>
<tr>
<td>-J</td>
<td>MegaBytes</td>
<td>Specifies the size of the new journals in megabytes. Default journal size is 128 megabytes. The minimum size is 32 megabytes. To add journals of different sizes to the file system, the gfs_jadd command must be run for each size journal. The size specified is rounded down so that it is a multiple of the journal-segment size that was specified when the file system was created.</td>
</tr>
<tr>
<td>-j</td>
<td>Number</td>
<td>Specifies the number of new journals to be added by the gfs_jadd command. The default value is 1.</td>
</tr>
<tr>
<td>-T</td>
<td></td>
<td>Test. Do all calculations, but do not write any data to the disk and do not add journals to the file system. Enabling this flag helps discover what the gfs_jadd command would have done if it were run without this flag. Using the -v flag with the -T flag turns up the verbosity level to display more information.</td>
</tr>
<tr>
<td>-q</td>
<td></td>
<td>Quiet. Turns down the verbosity level.</td>
</tr>
<tr>
<td>-V</td>
<td></td>
<td>Displays command version information.</td>
</tr>
<tr>
<td>-v</td>
<td></td>
<td>Turns up the verbosity of messages.</td>
</tr>
</tbody>
</table>

**Table 4.4. GFS-specific Options Available When Adding Journals**
7. Direct I/O

Direct I/O is a feature of the file system whereby file reads and writes go directly from the applications to the storage device, bypassing the operating system read and write caches. Direct I/O is used only by applications (such as databases) that manage their own caches.

An application invokes direct I/O by opening a file with the O_DIRECT flag. Alternatively, GFS can attach a direct I/O attribute to a file, in which case direct I/O is used regardless of how the file is opened.

When a file is opened with O_DIRECT, or when a GFS direct I/O attribute is attached to a file, all I/O operations must be done in block-size multiples of 512 bytes. The memory being read from or written to must also be 512-byte aligned.

One of the following methods can be used to enable direct I/O on a file:

- O_DIRECT
- GFS file attribute
- GFS directory attribute

7.1. O_DIRECT

If an application uses the O_DIRECT flag on an open() system call, direct I/O is used for the opened file.

To cause the O_DIRECT flag to be defined with recent glibc libraries, define _GNU_SOURCE at the beginning of a source file before any includes, or define it on the cc line when compiling.

7.2. GFS File Attribute

The gfs_tool command can be used to assign (set) a direct I/O attribute flag, directio, to a GFS file. The directio flag can also be cleared.

Usage

Setting the directio Flag

```
gfs_tool setflag directio File
```

Clearing the directio Flag

```
gfs_tool clearflag directio File
```

File

Specifies the file where the directio flag is assigned.

Example
In this example, the command sets the `directio` flag on the file named `datafile` in directory `/gfs1`.

```
gfs_tool setflag directio /gfs1/datafile
```

### 7.3. GFS Directory Attribute

The `gfs_tool` command can be used to assign (set) a direct I/O attribute flag, `inherit_directio`, to a GFS directory. Enabling the `inherit_directio` flag on a directory causes all newly created regular files in that directory to automatically inherit the `directio` flag. Also, the `inherit_directio` flag is inherited by any new subdirectories created in the directory. The `inherit_directio` flag can also be cleared.

**Usage**

**Setting the `inherit_directio` flag**

```
gfs_tool setflag inherit_directio Directory
```

**Clearing the `inherit_directio` flag**

```
gfs_tool clearflag inherit_directio Directory
```

**Directory**

Specifies the directory where the `inherit_directio` flag is set.

**Example**

In this example, the command sets the `inherit_directio` flag on the directory named `/gfs1/data/`.

```
gfs_tool setflag inherit_directio /gfs1/data/
```

### 8. Data Journaling

Ordinarily, GFS writes only metadata to its journal. File contents are subsequently written to disk by the kernel's periodic sync that flushes file-system buffers. An `fsync()` call on a file causes the file's data to be written to disk immediately. The call returns when the disk reports that all data is safely written.

Data journaling can result in a reduced `fsync()` time, especially for small files, because the file data is written to the journal in addition to the metadata. An `fsync()` returns as soon as the data is written to the journal, which can be substantially faster than the time it takes to write the file data to the main file system.

Applications that rely on `fsync()` to sync file data may see improved performance by using data journaling. Data journaling can be enabled automatically for any GFS files created in a flagged
directory (and all its subdirectories). Existing files with zero length can also have data journaling turned on or off.

Using the gfs_tool command, data journaling is enabled on a directory (and all its subdirectories) or on a zero-length file by setting the inherit_jdata or jdata attribute flags to the directory or file, respectively. The directory and file attribute flags can also be cleared.

**Usage**

**Setting and Clearing the inherit_jdata Flag**

```bash
gfs_tool setflag inherit_jdata Directory
gfs_tool clearflag inherit_jdata Directory
```

**Setting and Clearing the jdata Flag**

```bash
gfs_tool setflag jdata File
gfs_tool clearflag jdata File
```

- **Directory**
  - Specifies the directory where the flag is set or cleared.

- **File**
  - Specifies the zero-length file where the flag is set or cleared.

**Examples**

This example shows setting the inherit_jdata flag on a directory. All files created in the directory or any of its subdirectories will have the jdata flag assigned automatically. Any data written to the files will be journaled.

```bash
gfs_tool setflag inherit_jdata /gfs1/data/
```

This example shows setting the jdata flag on a file. The file must be zero size. Any data written to the file will be journaled.

```bash
gfs_tool setflag jdata /gfs1/datafile
```

9. **Configuring atime Updates**

Each file inode and directory inode has three time stamps associated with it:

- **ctime** — The last time the inode status was changed
- **mtime** — The last time the file (or directory) data was modified
- **atime** — The last time the file (or directory) data was accessed

If atime updates are enabled as they are by default on GFS and other Linux file systems then
every time a file is read, its inode needs to be updated. Because few applications use the information provided by atime, those updates can require a significant amount of unnecessary write traffic and file-locking traffic. That traffic can degrade performance; therefore, it may be preferable to turn off atime updates.

Two methods of reducing the effects of atime updating are available:

- **Mount with noatime**
- **Tune GFS atime quantum**

### 9.1. Mount with noatime

A standard Linux mount option, noatime, can be specified when the file system is mounted, which disables atime updates on that file system.

**Usage**

```bash
mount -t gfs BlockDevice MountPoint -o noatime
```

*BlockDevice*

- Specifies the block device where the GFS file system resides.

*MountPoint*

- Specifies the directory where the GFS file system should be mounted.

**Example**

In this example, the GFS file system resides on the `/dev/vg01/lvol0` and is mounted on directory `/gfs1` with atime updates turned off.

```bash
mount -t gfs /dev/vg01/lvol0 /gfs1 -o noatime
```

### 9.2. Tune GFS atime Quantum

When atime updates are enabled, GFS (by default) only updates them once an hour. The time quantum is a tunable parameter that can be adjusted using the gfs_tool command.

Each GFS node updates the access time based on the difference between its system time and the time recorded in the inode. It is required that system clocks of all GFS nodes in a cluster be synchronized. If a node's system time is out of synchronization by a significant fraction of the tunable parameter, atime_quantum, then atime updates are written more frequently. Increasing the frequency of atime updates may cause performance degradation in clusters with heavy work loads.

By using the `gettune` flag of the gfs_tool command, all current tunable parameters including atime_quantum (default is 3600 seconds) are displayed.

The gfs_tool settune command is used to change the atime_quantum parameter value. It must
be set on each node and each time the file system is mounted. (The setting is not persistent across unmounts.)

**Usage**

**Displaying Tunable Parameters**

\[ \text{gfs\_tool gettune MountPoint} \]

- **MountPoint**
  - Specifies the directory where the GFS file system is mounted.

**Changing the atime\_quantum Parameter Value**

\[ \text{gfs\_tool settune MountPoint atime\_quantum Seconds} \]

- **MountPoint**
  - Specifies the directory where the GFS file system is mounted.
- **Seconds**
  - Specifies the update period in seconds.

**Examples**

In this example, all GFS tunable parameters for the file system on the mount point /gfs1 are displayed.

\[ \text{gfs\_tool gettune /gfs1} \]

In this example, the atime update period is set to once a day (86,400 seconds) for the GFS file system on mount point /gfs1.

\[ \text{gfs\_tool settune /gfs1 atime\_quantum 86400} \]

---

10. **Suspending Activity on a File System**

You can suspend write activity to a file system by using the \text{gfs\_tool freeze} command. Suspending write activity allows hardware-based device snapshots to be used to capture the file system in a consistent state. The \text{gfs\_tool unfreeze} command ends the suspension.

**Usage**

**Start Suspension**

\[ \text{gfs\_tool freeze MountPoint} \]

**End Suspension**

---
gfs_tool unfreeze MountPoint

MounrPoint

Specifies the file system.

Examples

This example suspends writes to file system /gfs.

gfs_tool freeze /gfs

This example ends suspension of writes to file system /gfs.

gfs_tool unfreeze /gfs

11. Displaying Extended GFS Information and Statistics

You can use the gfs_tool command to gather a variety of details about GFS. This section describes typical use of the gfs_tool command for displaying statistics, space usage, and extended status.

Usage

Displaying Statistics

gfs_tool counters MountPoint

The counters flag displays statistics about a file system. If -c is used, the gfs_tool command continues to run, displaying statistics once per second.

Displaying Space Usage

gfs_tool df MountPoint

The df flag displays a space-usage summary of a given file system. The information is more detailed than a standard df.

Displaying Extended Status

gfs_tool stat File

The stat flag displays extended status information about a file.

MountPoint

Specifies the file system to which the action applies.
File

Specifies the file from which to get information.

The `gfs_tool` command provides additional action flags (options) not listed in this section. For more information about other `gfs_tool` flags, refer to the `gfs_tool` man page.

Examples

This example reports extended file system usage about file system `/gfs`.

```
gfs_tool df /gfs
```

This example reports extended file status about file `/gfs/datafile`.

```
gfs_tool stat /gfs/datafile
```

12. Repairing a File System

When nodes fail with the file system mounted, file-system journaling allows fast recovery. However, if a storage device loses power or is physically disconnected, file-system corruption may occur. (Journaling cannot be used to recover from storage subsystem failures.) When that type of corruption occurs, you can recover the GFS file system by using the `gfs_fsck` command.

The `gfs_fsck` command must only be run on a file system that is unmounted from all nodes.

Note

The `gfs_fsck` command has changed from previous releases of Red Hat GFS in the following ways:

- You can no longer set the interactive mode with `Ctrl-C`. Pressing `Ctrl-C` now cancels the `gfs_fsck` command. Do not press `Ctrl-C` unless you want to cancel the command.

- You can increase the level of verbosity by using the `--v` flag. Adding a second `--v` flag increases the level again.

- You can decrease the level of verbosity by using the `--q` flag. Adding a second `--q` flag decreases the level again.

- The `--n` option opens a file system as read-only and answers no to any queries automatically. The option provides a way of trying the command to reveal errors without actually allowing the `gfs_fsck` command to take effect.

Refer to the `gfs_fsck` man page, `gfs_fsck(8)`, for additional information about other command options.
Usage

gfs_fsck -y BlockDevice

-y
   The -y flag causes all questions to be answered with yes. With the -y flag specified, the
gfs_fsck command does not prompt you for an answer before making changes.

BlockDevice
   Specifies the block device where the GFS file system resides.

Example

In this example, the GFS file system residing on block device /dev/vg01/lvol0 is repaired. All
queries to repair are automatically answered with yes.

gfs_fsck -y /dev/vg01/lvol0

13. Context-Dependent Path Names

Context-Dependent Path Names (CDPNs) allow symbolic links to be created that point to vari-
able destination files or directories. The variables are resolved to real files or directories each
time an application follows the link. The resolved value of the link depends on the node or user
following the link.

CDPN variables can be used in any path name, not just with symbolic links. However, the
CDPN variable name cannot be combined with other characters to form an actual directory or
file name. The CDPN variable must be used alone as one segment of a complete path.

Usage

For a Normal Symbolic Link

ln -s TargetLinkName

Target
   Specifies an existing file or directory on a file system.

LinkName
   Specifies a name to represent the real file or directory on the other end of the link.

For a Variable Symbolic Link

ln -s VariableLinkName

Variable
   Specifies a special reserved name from a list of values (refer to Table 4.5, “CDPN Variable
Values”) to represent one of multiple existing files or directories. This string is not the name of an actual file or directory itself. (The real files or directories must be created in a separate step using names that correlate with the type of variable used.)

**LinkName**

Specifies a name that will be seen and used by applications and will be followed to get to one of the multiple real files or directories. When **LinkName** is followed, the destination depends on the type of variable and the node or user doing the following.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>@hostname</td>
<td>This variable resolves to a real file or directory named with the hostname string produced by the output of the following command: <code>echo </code>uname -n`</td>
</tr>
<tr>
<td>@mach</td>
<td>This variable resolves to a real file or directory name with the machine-type string produced by the output of the following command: <code>echo </code>uname -m`</td>
</tr>
<tr>
<td>@os</td>
<td>This variable resolves to a real file or directory named with the operating-system name string produced by the output of the following command: <code>echo </code>uname -s`</td>
</tr>
<tr>
<td>@sys</td>
<td>This variable resolves to a real file or directory named with the combined machine type and OS release strings produced by the output of the following command: <code>echo </code>uname -m<code>_</code>uname -s`</td>
</tr>
<tr>
<td>@uid</td>
<td>This variable resolves to a real file or directory named with the user ID string produced by the output of the following command: <code>echo </code>id -u`</td>
</tr>
<tr>
<td>@gid</td>
<td>This variable resolves to a real file or directory named with the group ID string produced by the output of the following command: <code>echo </code>id -g`</td>
</tr>
</tbody>
</table>

**Table 4.5. CDPN Variable Values**

**Example**

In this example, there are three nodes with hostnames **n01**, **n02**, and **n03**. Applications on each node uses directory `/gfs/log/`, but the administrator wants these directories to be separate for each node. To do this, no actual log directory is created; instead, an @hostname CDPN link is created with the name **log**. Individual directories `/gfs/n01/`, `/gfs/n02/`, and `/gfs/n03/` are created that will be the actual directories used when each node references `/gfs/log/`.

```
n01# cd /gfs
n01# mkdir n01 n02 n03
n01# ln -s @hostname log

n01# ls -l /gfs
lrwxrwxrwx 1 root root 9 Apr 25 14:04 log -> @hostname/
drwxr-xr-x 2 root root 3864 Apr 25 14:05 n01/
drwxr-xr-x 2 root root 3864 Apr 25 14:06 n02/
```

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Example

drwxr-xr-x 2 root root 3864 Apr 25 14:06 n03/
n01# touch /gfs/log/fileA
n02# touch /gfs/log/fileB
n03# touch /gfs/log/fileC

n01# ls /gfs/log/
fileA
n02# ls /gfs/log/
fileB
n03# ls /gfs/log/
fileC
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