EMC® NetWorker™
Release 8.1

Cluster Integration Guide

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Email your clarifications or suggestions for this document to:

BSGdocumentation@emc.com

The following table lists the revision history of this document.

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<th>Date</th>
<th>Description of added or changed sections</th>
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<tr>
<td>02</td>
<td>July 29, 2013</td>
<td>Updated the Registering NetWorker Virtual Server Licenses section in the Configuring Backup and Recovery chapter</td>
</tr>
<tr>
<td>01</td>
<td>July 26, 2013</td>
<td>First release of this document for the EMC NetWorker 8.1 DA Release</td>
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PREFACE

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact your EMC representative if a product does not function properly or does not function as described in this document.

NOTICE

This document was accurate at publication time. New versions of this document might be released on the EMC online support website. Check the EMC online support website to ensure that you are using the latest version of this document.

Purpose

This document describes how to uninstall, update and install the NetWorker software in a cluster environment.

Audience

This document is part of the NetWorker documentation set and is intended for use by system administrators during the installation and setup of NetWorker software in a cluster environment.

Related documentation

The following EMC publications provide additional information:

- **EMC NetWorker Administration Guide**
  Describes how to configure and maintain the NetWorker software.

- **EMC NetWorker Installation Guide**
  Provides information on how to install, uninstall and update the NetWorker software for clients, storage nodes, and servers on all supported operating systems.

- **EMC NetWorker Release Notes**
  Contains information on new features and changes, fixed problems, known limitations, environment and system requirements for the latest NetWorker software release.

- **EMC NetWorker Avamar Devices Integration Guide**
  Provides planning and configuration information on the use of Avamar devices in a NetWorker environment.

- **EMC NetWorker Cloning Integration Guide**
  Contains planning, practices, and configuration information for using the NetWorker, NMM, and NMDA cloning feature.

- **EMC NetWorker Command Reference Guide**
  Provides reference information for NetWorker commands and options.
EMC NetWorker Data Domain Deduplication Devices Integration Guide
Provides planning and configuration information on the use of Data Domain devices for data deduplication backup and storage in a NetWorker environment.

EMC NetWorker Disaster Recovery Guide
Contains information about preparing for a disaster and recovering NetWorker servers, storage nodes, and clients.

EMC NetWorker Error Message Guide
Provides information on common NetWorker error messages.

EMC NetWorker Licensing Guide
Provides information about licensing NetWorker products and features.

EMC NetWorker Performance Optimization Planning Guide
Contains basic performance sizing, planning, and optimizing information for NetWorker environments.

EMC NetWorker Management Console Online Help
Describes the day-to-day administration tasks performed in the NetWorker Management Console and the NetWorker Administration window. To view Help, click Help in the main menu.

EMC NetWorker User Online Help
The NetWorker User program is the Windows client interface. Describes how to use the NetWorker User program which is the Windows client interface connect to a NetWorker server to back up, recover, archive, and retrieve files over a network.

NetWorker Procedure Generator
The NetWorker Procedure Generator (NPG) is a stand-alone Windows application used to generate precise user driven steps for high demand tasks carried out by customers, support, and the field. With the NPG, each procedure is tailored and generated based on user-selectable prompts. This generated procedure gathers the most critical parts of NetWorker product guides and are combined with the advice of experts in a single document with a standardized format. To access the NetWorker Procedure Generator, log on to:
http://support.emc.com
You must have a valid service agreement to use this site.

Technical Notes/White Papers
Technical Notes and White Papers provide an in-depth technical perspective of a product or products as applied to critical business issues or requirements. Technical Notes and White paper types include technology and business considerations, applied technologies, detailed reviews, and best practices planning.

Conventions used in this document

EMC uses the following conventions for special notices:

**NOTICE**

NOTICE is used to present information that is important or essential to software or hardware operation.
Note: A note presents information that is important, but not hazard-related. Used in tables.

Typographical conventions

EMC uses the following type style conventions in this document:

Normal
Used in running (nonprocedural) text for:
- Names of interface elements, such as names of windows, dialog boxes, buttons, fields, and menus
- Names of resources, attributes, pools, Boolean expressions, buttons, DQL statements, keywords, clauses, environment variables, functions, and utilities
- URLs, pathnames, filenames, directory names, computer names, links, groups, service keys, file systems, and notifications

Bold
Used in running (nonprocedural) text for names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system calls, and man pages

Used in procedures for:
- Names of interface elements, such as names of windows, dialog boxes, buttons, fields, and menus
- What the user specifically selects, clicks, presses, or types

Italic
Used in all text (including procedures) for:
- Full titles of publications referenced in text
- Emphasis, for example, a new term
- Variables

Courier
Used for:
- System output, such as an error message or script
- URLs, complete paths, filenames, prompts, and syntax when shown outside of running text

Courier bold
Used for specific user input, such as commands

Courier italic
Used in procedures for:
- Variables on the command line
- User input variables

<> Angle brackets enclose parameter or variable values supplied by the user
[] Square brackets enclose optional values
| Vertical bar indicates alternate selections — the bar means “or”
{} Braces enclose content that the user must specify, such as x or y or z
...
Ellipses indicate nonessential information omitted from the example

Where to get help

EMC support, product, and licensing information can be obtained as follows:

Product information — For documentation, release notes, software updates, or information about EMC products, licensing, and service, go to the EMC online support website (registration required) at:

http://support.emc.com

Technical support — For technical support, go to EMC online support and select Support. On the Support page, you will see several options, including one to create a service request. Note that to open a service request, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.
**Online communities** — Visit EMC Community Network at [https://community.EMC.com](https://community.EMC.com) for peer contacts, conversations, and content on product support and solutions. Interactively engage online with customers, partners, and certified professionals for all EMC products.

**Your comments**

Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Send your opinions of this document to:

BSGdocumentation@emc.com
CHAPTER 5
Introduction

This document describes how to configure and use the NetWorker software in a clustered environment. You can configure the NetWorker software in a cluster in one of the following ways:

◆ “Stand-alone application” on page 12
◆ “Cluster-aware application” on page 12
◆ “Highly-available application” on page 12

This guide also provides cluster specific information that you need to know before you install NetWorker on a clustered host. You must install the NetWorker software on each physical node in a cluster.

This guide does not describe how to install the NetWorker software. The *EMC NetWorker Installation Guide* describes how to install the NetWorker software on supported operating systems.
Stand-alone application

When you install the NetWorker server, storage node, or client software as a stand-alone application, all required daemons run on each node. When the NetWorker daemons stop on a node, the cluster management software does not restart them automatically.

In this configuration:
- NetWorker does not know which node owns the shared disk. To ensure that there is always a backup of the shared disks, you must configure a NetWorker client resource for each physical node to back up the shared and local disks.
- Shared disk backups will fail for each physical node that does not own or control the shared disk.
- NetWorker writes client file index entries for the shared backup to the physical node that owns the shared disk.
- To recover data from a shared disk backup, you must determine which physical node owned the shared disk at the time of backup.

Cluster-aware application

On supported operating systems, when you configure a cluster-aware NetWorker client or server, all required daemons run on each physical node. When the NetWorker daemons stop on a node, the Cluster Management software does not restart them automatically.

A cluster-aware NetWorker application determines path ownership of the virtual applications that run in the cluster. This allows the NetWorker software to back up the shared filesystem and write the client file index entries for the virtual client.

When you configure a cluster-aware NetWorker application, you must:
- Create a NetWorker client resource for the virtual node in the cluster to back up the shared disk.
- Create a NetWorker client resource for each physical node to back up the local disks.
- Select the virtual node to recover data from a shared disk backup.

Highly-available application

On supported operating systems, you can configure the NetWorker server software as a highly-available application. A highly-available NetWorker server is also called a NetWorker virtual server.

When the NetWorker server software is a highly-available application:
- The active node runs the NetWorker server daemons and accesses the global /nsr directory on the shared drive.
- The passive nodes run the NetWorker client daemon, nsrexecd.
- When a failover occurs, the new active node runs the NetWorker server daemons.
- The NetWorker virtual server uses the IP address and hostname of the NetWorker virtual host, regardless of which cluster node owns the NetWorker server application.
NetWorker determines path ownership of the virtual applications that run in the cluster. This allows the NetWorker software to back up the shared filesystem and write the client file index entries for the virtual client.

When you configure a highly-available NetWorker server, you must:

- Create a NetWorker client resource for the virtual node in the cluster to back up the shared disk.
- Create a NetWorker client resource for each physical node to back up the local disks.
- To recover data from a shared disk backup, select the virtual node.

Figure 1 on page 14 provides an example of a highly available NetWorker server in a general cluster configuration consisting of two nodes and one virtual server. In this illustration:

- Node 1, clus_phy1, is a physical node with local disks.
- Node 2, clus_phy2, is a physical node with local disks.
- Virtual Server, clus_vir1:
  - Owns the shared disks. A volume manager manages the shared disk.
  - Can fail over between Node 1 and Node 2. However, the NetWorker server software only runs on one node at a time.
Figure 1  Highly-available NetWorker server
CHAPTER 6
Configuring the cluster

This chapter describes how to prepare for a NetWorker installation on a cluster and how to configure NetWorker on each cluster. Perform these steps after you install NetWorker on each physical node.

The procedures to install NetWorker in a clustered environment are the same as installing and updating the software in a non-clustered environment. The NetWorker Installation Guide describes how to install NetWorker on each supported operating system.

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Preparing to install NetWorker on a cluster

This section provides general information to review before installing NetWorker in a cluster.

- On all supported cluster platforms, ensure the cluster services start before the NetWorker services start. If the cluster services start after the NetWorker services start, then the NetWorker software exhibits undesirable behavior.
- Ensure that the physical and virtual node names are resolvable in Domain Name System (DNS) or by using a hosts file.
- Ensure that the output of the `hostname` command on each physical node corresponds to an IP address that can be pinged.
- You can publish the virtual host name in the DNS or Network Information Services (NIS).
- Install the most recent cluster patch for the operating system.
- Install the NetWorker software in the same location on a private disk, on each cluster node.
- Connect a dedicated shared disk and file system to all the nodes within the cluster. The NetWorker software creates a directory on the shared disk. If the client resource for virtual clients is not properly configured in NetWorker server the backup of shared drives will fail.
- For Windows Server 2012 CSV backups only:

  NetWorker 8.1 Server and Client support backup and recovery of file system data on Windows Server 2012 File Servers configured for Windows Continuous Availability with Cluster Shared Volumes (CSV). Support of CSV backups include levels Full, Incremental and Synthetic-full.

  Support for CSV backups are restricted by NetWorker as follows:
  - Cannot be a critical volume.
  - Not able to shadow copy CSV and local disks in same volume shadow copy set.

**NOTICE**

Microsoft application data stored on a CSV, such as SQL databases or Hyper-V virtual machines, are not protected. Refer to the NMM documentation for specific backup and recovery instructions of Microsoft application data.

AutoStart

This section describes how to:

- Prepare the AutoStart cluster before you install the NetWorker software.
- Configure the NetWorker server software as a highly available application and the NetWorker client as a cluster-aware application after you install the NetWorker software on each physical node of the cluster. The *NetWorker Installation Guide* describes how to install the NetWorker software.
Preparing to install NetWorker on AutoStart

Review this section before you install the NetWorker software or on an AutoStart cluster.

- Always run two primary controllers. Use the AutoStart Console to promote at least one secondary node to the primary. If one node fails, the other becomes online automatically with all data. The AutoStart documentation provides detailed instructions.

- AutoStart for Windows only:
  - On one node, create a folder for the managed, shared disk. For example, s:\nsr. Do not share the folder. If the AutoStart software is already installed and a managed shared disk already exists, then remove the share property. The NetWorker software installation fails when the share property exists.

- AutoStart for UNIX only: on each node, set the `FT_DIR`, `FT_DOMAIN`, and the `FT_CONSOLE_DIR` environment variables for the root account.

Table 1 on page 17 describes how to define the environment variables for each operating system.

Table 1 Environment variables for a highly available NetWorker server

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Commands</th>
<th>User-defined variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIX</td>
<td>FT_DIR=/usr/lpp/LGTOaam51 &lt;br&gt; FT_CONSOLE_DIR=$FT_DIR/console &lt;br&gt; FT_DOMAIN=domain_name &lt;br&gt; export FT_DIR FT_DOMAIN FT_CONSOLE_DIR</td>
<td>domain_name is the AutoStart domain.</td>
</tr>
<tr>
<td>HP-UX</td>
<td>FT_DIR=/opt/EMCas### &lt;br&gt; FT_CONSOLE_DIR=$FT_DIR/console &lt;br&gt; FT_DOMAIN=domain_name &lt;br&gt; export FT_DIR FT_DOMAIN FT_CONSOLE_DIR</td>
<td>### is the AutoStart version. For example, for AutoStart 5.4 Sp3, specify 543. domain_name is the AutoStart domain name.</td>
</tr>
<tr>
<td>Linux</td>
<td>FT_DIR=/opt/EMCas### &lt;br&gt; FT_CONSOLE_DIR=$FT_DIR/console &lt;br&gt; FT_DOMAIN=domain_name &lt;br&gt; export FT_DIR FT_DOMAIN FT_CONSOLE_DIR</td>
<td>### is the AutoStart version. For example, for AutoStart 5.4 Sp3, specify 543. domain_name is the AutoStart domain name.</td>
</tr>
<tr>
<td>Solaris</td>
<td>FT_DIR=/opt/EMCas### &lt;br&gt; FT_CONSOLE_DIR=$FT_DIR/console &lt;br&gt; FT_DOMAIN=domain_name &lt;br&gt; export FT_DIR FT_DOMAIN FT_CONSOLE_DIR</td>
<td>### is the AutoStart version. For example, for AutoStart 5.4 Sp3, specify 543. domain_name is the AutoStart domain name.</td>
</tr>
</tbody>
</table>
Configuring the cluster

Configuring NetWorker on AutoStart for Windows

This section describes how to configure the NetWorker server as a highly available application or the NetWorker client as a cluster-aware application.

- "Configuring a cluster-aware NetWorker client" on page 18
- "Configuring a highly available NetWorker server" on page 18

Configuring a cluster-aware NetWorker client

Perform these steps as the administrator on each physical node.

1. Run the networker_install_path\lc_config script.
2. At the Enter shared nsr dir prompt, specify the path name to the shared nsr directory.
3. At the Enter the EMC Fulltime AutoStart domain name prompt, specify the domain name for the AutoStart server.
4. At the Is this OK [y/n] prompt, type y to confirm that the information is correct.

Configuring a highly available NetWorker server

This section provides the steps to perform on each cluster node when you configure a highly available NetWorker server.

Active node

Perform these steps as an administrator on the active cluster node.

1. Run the networker_install_path\lc_config script.
2. At the Enter shared nsr dir prompt, specify the path name to the shared nsr directory.
3. At the Enter the EMC Fulltime AutoStart domain name prompt, specify the domain name for the AutoStart server. For example: galaxy.
4. At the Is this OK [y/n] prompt, type y to confirm that the information is correct.
5. Stop the NetWorker Backup and Recover Server services.
6. Edit the networker_install_path\nw_nt.aam5.imp file and modify these fields with the appropriate values for the cluster configuration:
   - Virtual hostname
   - Physical cluster node names
   - Shared drive letter

   **Note:** The #NW customise label tag appears before each field that requires modification.

7. To create the NetWorker resource group, run the ftcli command from within the networker_install_path directory:

   "C:\Program Files\EMC\AutoStart\galaxy\bin\ftcli" -d AutoStart_domain_name -c "import nw_nt.lc.imp"
Configuring the cluster

For example:

C:\Program Files\EMC NetWorker\nsr\bin\"C:\Program Files\EMC\AutoStart\galaxy\bin\ftcli" -d galaxy -c "import nw_nt.aam5.imp"

IP Address "guiro" Created
Process Class "nsrd" Created
Process "NSRserver" Created
Configuration "NSRserver" Created
Process Class "nsrexecd" Created
Process "NSRexecd" Created
Configuration "NSRexecd" Created
Data Source "networker_ds" Created
Resource Group "networker" Created
OK

8. Use the AutoStart Console to:
   a. Verify that the import of the NetWorker Server resource completed correctly.
   b. Share the managed shared disk (for example, s:\nsr).
   c. Bring the NetWorker virtual server online.
   d. Select the disk that the NetWorker virtual server will use as storage. Choose a disk
      that each physical node in the cluster manages as shared storage.
   e. Ensure that the AutoStart Management Console program manages the
      networker_ds data source for the NetWorker virtual server.

      Note: The NetWorker resource group defines the data source for the NetWorker
      virtual server.

9. Run the networker_install_path\nwinst.bat script.

   The nwinst.bat script generates AutoStart warning messages similar to the following:

   Connecting to AutoStart domain autostar...Backbone warning on
   primrose (pid 135) Wed Mar 31 01:52:34 2010 in
   ISIS_MGT_INTERCL_MODULE ..\cl_inter.c/interc1_accept(), line 1927
   ID00005235 Intercl IO Queue NULL/IO_DEAD calling resurrect. Process
   from=1/612 nd dest=1/1352. Backbone warning on primrose (pid 1352)
   Wed Mar 31 01:52:34 2010 in ISIS_MGT_INTERCL_MODULE
   ..\cl_inter.c/interc1_accept(), line 1927 ID00005235 Intercl IO Queue

   These messages do not indicate a problem and you should ignore them.

10. Start the NetWorker Backup and Recover Server service.

Passive nodes

Perform these steps as an administrator on each passive node in the cluster.

1. Run the networker_install_path\lc_config script.

2. At the Enter shared nsr dir prompt, specify the pathname to the shared nsr directory.

3. At the Enter the EMC Fulltime AutoStart domain name prompt, specify the domain
   name for the AutoStart server.

4. At the Is this OK [y/n] prompt, type y to confirm that the information is correct.
Configuring NetWorker on AutoStart for UNIX

This section describes how to configure a highly available NetWorker server or a cluster-aware NetWorker client on AutoStart for UNIX.

◆ “Configuring a cluster-aware NetWorker client” on page 20
◆ “Configuring a highly available NetWorker server” on page 20

Configuring a cluster-aware NetWorker client

Perform these steps as the root user on each physical node:
1. Run the cluster configuration script `/networker_install_path/networker.cluster`.
2. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory that you provided during install. For example: `/nsr`.
3. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes]? prompt, type No.

Configuring a highly available NetWorker server

Perform these steps as the root user on the appropriate physical node.

**Active node**
1. Run the cluster configuration script `/networker_install_path/networker.cluster`.
2. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory that you provided during install. For example: `/nsr`.
3. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes]? prompt, type Yes.
4. At the Do you wish to add now the site-specific values for: NSR_SHARED_DISK_DIR and NSR_SERVICE_ID Yes or No [Yes]? prompt, type Yes to ensure compatibility with other cluster environments.
5. At the Enter the Logical Hostname to be used for NetWorker? prompt, specify the published logical hostname of the highly available NetWorker server. For example: `clus_vir1`.
6. At the In what path will this nsr directory be created/located? prompt, specify the pathname of the globally mounted /nsr directory.

**NOTICE**

To change the configuration at a later time, run the networker.cluster -r option and then run the networker.cluster again.

7. Stop the NetWorker daemons:

```
nsr_shutdown
```
8. Edit the `networker_install_path/nw_ux.lc.aam5.imp` file and modify these fields with the appropriate values for the cluster configuration:
   - Virtual hostname
   - Physical cluster node names
   - Shared drive letter

   **Note:** The `#NW customise label` tag appears before each field that requires modification.

9. To create the NetWorker resource group, run the `ftcli` command from within the `networker_install_path`:
   - AIX: `$FT_DIR/bin/ftcli -c "import/usr/bin/nw_ux.lc.aam5.imp"
   - HPUX: `$FT_DIR/bin/ftcli -c "import /opt/networker/bin/nw_ux.lc.aam5.imp"

   **Note:** If you use LVM software, then the AutoStart application requires two data sources: one to activate the volume group (`/dev/vg03`) and one to mount the shared mount point (`/vg_nsr on /dev/vg03/lvol1`).
   - Linux: `$FT_DIR/bin/ftcli -c "import /usr/sbin/nsr/nw_ux.lc.aam5.imp"
   - Solaris: `$FT_DIR/bin/ftcli -c "import /usr/sbin/nw_ux.lc.aam5.imp"

10. Use the AutoStart Management Console to verify that the import of the NetWorker resource group completed correctly.

11. Run the `networker_install_path/nwinst.sh` script file.

12. For AIX only, on each node that you can attach the logical volume to, ensure that the logical volume mount point value defined in `/etc/filesystems` file and in the FullTime AutoStart Resource group are the same.

   **Note:** To modify the logical volume mount point in the `/etc/filesystems` file, type: `chfs -n new_mountpoint old_mountpoint`

13. Start the NetWorker daemons.

**Passive node**

Perform these steps as the root user on each passive node.

1. Run the cluster configuration script `/networker_install_path/networker.cluster`.

2. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker directory that you provided during install. For example: `/nsr`.

3. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes]? prompt, type **Yes**.

4. At the Do you wish to add now the site-specific values for: `NSR_SHARED_DISK_DIR` and `NSR_SERVICE_ID` Yes or No [Yes]? prompt, type **Yes** to ensure compatibility with other cluster environments:
5. At the Enter the Logical Hostname to be used for NetWorker? prompt, specify the published logical hostname of the highly available NetWorker server. For example: clus_vir1.

6. At the In what path will this nsr directory be created/located? prompt, specify the pathname of the globally mounted /nsr directory.

**AIX HACMP/PowerHA SystemMirror**

This section describes how to:

- Prepare the AIX HACMP/PowerHA SystemMirror cluster before you install the NetWorker software.
- Configure the NetWorker server software as a highly available application or a cluster-aware NetWorker client after you install the NetWorker software on each physical node of the cluster. The NetWorker Installation Guide describes how to install the NetWorker software.

**Preparing to install NetWorker on HACMP**

Before you install NetWorker:

- If you want to back up a physical client, then each node requires persistent IPs or an extra NIC that is configured outside of the control of the HACMP environment.
- Define a service IP label for the NetWorker virtual server.
- If you use IP address takeover (IPAT) and you do not define a resource group, then you must use the boot address to connect to the host. Service addresses are associated with a resource group, not physical nodes.
- Set the hostname to the name equivalent to the address that the dedicated NIC of the physical client uses. Configure this NIC as the primary network adapter, for example, en0. A highly available NetWorker server does not require an extra NIC outside of the control of HACMP/PowerHA SystemMirror.
- Service addresses are associated with a resource group, not physical nodes. The output of the hostname command on a computer must correspond to a pingable IP address. The computer hostname must also be set to the name equivalent of the address used by the physical client's persistent IP or dedicated NIC. Whether you use persistent IP or dedicated NIC, you must use the primary network adapter (for example, en0).
- For a physical client, NetWorker requires an address that uniquely connects to a physical client. The service and boot addresses of HACMP for AIX do not meet this requirement because a cluster configured with IP address takeover (IPAT) replaces the boot address with the service address, when a resource group is attached.
Configuring the cluster

Configuring a cluster-aware NetWorker client

Perform these steps as the root user on each physical node.

1. Run the cluster configuration script `/usr/sbin/networker.cluster`.

2. At the Do you wish to continue? [Yes]? prompt, type Yes.

3. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory you provided when you installed NetWorker. For example: `/space/nsr`.

4. At the Do you want to configure NetWorker virtual server?[y/n] prompt, type No.

Configuring a highly available NetWorker server

Perform these steps as the root user on each physical node.

1. Run the cluster configuration script `/usr/sbin/networker.cluster`.

2. At the Do you wish to continue? [Yes]? prompt, type Yes.

3. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory that you provided when you installed NetWorker. For example: `/nsr`.

4. At the Do you want to configure NetWorker virtual server?[y/n] prompt, type Yes.

5. At the Do you wish to add now the site-specific values for: NSR_SHARED_DISK_DIR and NSR_SERVICE_ID Yes or No [Yes]? prompt, type Yes to ensure compatibility with other cluster environments.

6. In the Enter the published Service IP Label to be used for NetWorker? prompt, type the hostname of the virtual node. For example, clus_vir1.

7. In the In what path will this nsr directory be created/located? specify the shared nsr mount directory. For example/nsr_shared_mnt_pt.

   **NOTICE**

   To change the configuration at a later time, run the `networker.cluster -r` option and then run the `networker.cluster` again.

8. Verify that the following values are set:

   NSR_SERVERHOST = virtual_hostname
   NSR_SHARED_DISK_DIR = shared_nsr mount_directory

   For example:

   NSR_SERVERHOST = clus_vir1
   NSR_SHARED_DISK_DIR = /nsr_shared_mnt_pt
9. Create a NetWorker application server resource:
   a. Type: **smit hacmp**
   b. From the main smit window, select these options:
      
      For HACMP: Cluster Configuration > Cluster Resource > Define Application Server > Add an Application Server
      
      For PowerHA: Cluster Applications and Resources > Resources > Configure User Applications (Scripts and Monitors) > Application Controller Scripts > Add Application Controller Scripts
      
   c. Specify the following values:
      
      Server name: networker
      Start script: /usr/bin/nw_hacmp.lc start
      Stop script: /usr/bin/nw_hacmp.lc stop

10. Configure a NetWorker resource group for the NetWorker server. Include the following resources:

    • Application Server or Application Controllers
    • Disks or Volume Groups
    • Service IP or Service IP Labels/Addresses

    The HACMP/PowerHA for AIX documentation describes how to define and monitor a resource group in an HACMP/PowerHA for AIX environment.

11. Create a NetWorker application monitor:

    • For PowerHA: Select Cluster Applications and Resources > Resources > Configure User Applications (Scripts and Monitors) > Application Monitors > Configure Process Application Monitors > Add a Process Application Monitor.
      

    Configure the Application Monitor attributes as follows:

    • Application Controller(s) to Monitor: networker
    • Monitor Mode: long-running monitoring
    • Processes to Monitor: nsrd nsrindexd nsrmdbd nsrjobd nsrexecd
    • Process Owner: root
    • Instance Count: 1
    • Stabilization Interval: 200
    • Restart Count: 3
    • Restart Interval: 660
    • Action on Application Failure: notify
    • Cleanup Method: /usr/bin/nw_hacmp_clean
    • Restart Method: /usr/bin/nw_hacmp_start

    **Note:** Adjust Stabilization Interval, Restart Count, and Restart Interval according to the requirements of the environment.
12. To enable a scheduled backup of raw volumes that are owned by a resource group (virtual client):

a. Under Volume Groups in the resource group configuration, ensure that the volume group to which the logical volume belongs appears.

b. Use the `chlv` command to set the logical volume type to raw:

```
chlv -t 'raw' logical_volume_name
```

**NOTICE**
The NetWorker software does *not* support the use of raw volumes for concurrent access.

---

**HP MC/ServiceGuard**

This section describes how to:

- Prepare the MC/ServiceGuard cluster before you install the NetWorker software.
- Configure the NetWorker server software as a highly available application or the NetWorker client as a cluster-aware application after you install the NetWorker software on each physical node of the cluster. The *NetWorker Installation Guide* describes how to install the NetWorker software.

**NOTICE**

This section does not apply when NetWorker is a stand-alone application.

---

**Preparing to install NetWorker on MC/ServiceGuard**

Review this section before you install the NetWorker server software.

- NetWorker 8.0 and later does not support an MC/ServiceGuard NetWorker server running on the PA_RISC architecture. The *EMC NetWorker Software Compatibility Guide* provides the most up-to-date information about software requirements.

- To ensure the cluster services automatically start after a reboot, set the `AUTOSTART_CMCLD=1` value in the `/etc/rc.config.d/cmcluster` file.
Configuring the cluster

Configuring NetWorker on MC/ServiceGuard

This section describes how to configure the NetWorker server as a highly available package or the NetWorker client as a cluster-aware package.

After you install the NetWorker software on each physical node, you can use the LC integration framework method or the non-LC integration framework method to configure the NetWorker software.

The benefits of using the LC integration framework method include:

- Support for multiple IPs in one package.
- Support for the lcmap caching mechanism.
- Does not require the creation and configuration of the `NetWorker.clucheck` and `.nsr_cluster` files. The configuration process automatically creates and uses the `nsr_mk_cluinfo` and `lcmap` files in the `/opt/networker/bin` directory.

Non-LC integration framework method only - creating configuration files

This section describes how to create the configuration files that the non-LC integration framework method requires when configuring the NetWorker package in the cluster.

1. On the active node, create the `NetWorker.clucheck` and `.nsr_cluster` file in the `/etc/cmcluster` directory.
   For example:
   ```
touch /etc/cmcluster/NetWorker.clucheck
touch /etc/cmcluster/.nsr_cluster
   ```
   **Note:** Ensure everyone has read ownership and access permissions for the `.nsr_cluster` file.

2. Define the mount points that the MC/ServiceGuard or MC/LockManager package owns in the `.nsr_cluster` file. Include the NetWorker shared mount point.
   For example:
   ```
   pkgname:published_ip_address:owned_path [:...]
   ```
   where:
   - `published_ip_address` is the IP address assigned to the package that owns the shared disk. Enclose IPv6 addresses in square brackets. You can enclose IPv4 addresses in square brackets, but it is not necessary.
   - `Owned_path` is the path to the mount point. Separate additional paths with a colon.
   For example:
   - IPv6 address:
     ```
     networker:[3ffe:80c0:22c:74:230:6eff:fe4c:2128]:/share/nw
     ```
   - IPv4 address:
     ```
     networker:192.168.109.10:/share/nw
     ```
An HP-UX MC/ServiceGuard package that does not contain a disk resource does not require an entry in the .nsr_cluster file. If an online diskless package is the only package on that cluster node, cmgetconf messages may appear in the /var/admin file during a backup.

To avoid these messages, allocate a mounted file system to a mount point, then add this mount point, the package name, and the IP address to the .nsr_cluster file. The NetWorker software does not back up the file system. However, you can mount the file system on each cluster node that the diskless package might fail over to.

3. Copy the NetWorker.clucheck and .nsr_cluster file to the /etc/cmcluster directory to each passive node.

### Configuring a cluster-aware NetWorker client

Perform these steps as the root user on each node.

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file /opt/networker/bin/networker.cluster.

2. At the Do you wish to continue? [Yes]? prompt, type Yes.

3. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory provided during the install procedure.

4. At the Do you wish to use the updated NetWorker integration framework? Yes or No [Yes]? prompt:
   - To use the non-LC integration method, type No.
   - To use the LC integration method, type Yes.

5. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes] prompt, type No. This completes the NetWorker client configuration in the active node.

### Configuring a highly available NetWorker server

Perform these steps as the root user on the appropriate node.

#### Active node

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file /opt/networker/bin/networker.cluster.

2. At the Do you wish to continue? [Yes]? prompt, type Yes.

3. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory provided during the install procedure.

4. At the Do you wish to use the updated NetWorker integration framework? Yes or No [Yes]? prompt:
   - To use the non-LC integration method, type No.
   - To use the LC integration method, type Yes.
Configuring the cluster

5. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes] prompt, type Yes.

6. At the Select the type of package for the NetWorker Server(1-modular or 2-legacy) [2]? prompt, type 1 for the modular mode and 2 for legacy mode.

7. At the Do you wish to generate a new control file for NetWorker package [No]? prompt, type Yes.

8. At the Enter the IP address to use to monitor this package? prompt, type the IP address of the NetWorker server package.

9. At the Enter the IP subnet to monitor for this package? prompt, type the subnet for the IP address of the NetWorker server package.

10. At the Enter the DNS name for NetWorker service? prompt, type the hostname associated with the IP address of the NetWorker server package.

11. At the Select which Volume Management will be used for the disk resource (1-LVM or 2-VxVM) [1]? prompt, choose the volume manager to define the logical volumes or volume groups the NetWorker software will use.
   - To use Logical Volume Manager (LVM), type 1 then:
     - At the Enter the volume group resource for this package? prompt, specify the name of the volume group resource. For example: vgshare1.
     - At the Enter the mounted logical volume name for this package? prompt, specify the mounted logical volume name. For example: /dev/vgshare1/lvol1.
     - At the Enter the mount path for this package prompt, specify the mount path. For example: /vgshare1.
     - At the Enter the type of the file system for this package [hfs]? prompt, specify the file system. For example: hfs.
   - To use Veritas Volume Manager (VxVM), type 2 and then:
     - At the Enter the VxVM disk resource for this package? prompt, specify the name of the disk resource. For example: nsrdg.
     - At the Enter the mounted logical volume name for this package? prompt, specify the logical volume name. For example: dev/vx/dsk/nsrdg/nsrdg/nsrvol.
     - At the Enter the mount path for this package? prompt, specify the mount path. For example: /nsrdata.
     - At the Enter the type of the file system for this package [vxfs]? prompt, press Enter.

12. Perform these steps for Legacy mode only:
   a. At the Do you wish to generate a new pkg.conf file for NetWorker package [No]? prompt, type Yes.
   b. At the Enter the IP subnet to monitor for this package? prompt, type the subnet for the IP address of the NetWorker server package.
   c. At the Enter node number 1 for this package [no more]? prompt, specify the name of the active node.
Configuring the cluster

c. At the **Enter node number 2 for this package [no more]??** prompt, specify the name of the passive node.

d. At the **Enter node number 3 for this package [no more]??** prompt, specify the name of another passive node or press **Enter**.

13. Perform these steps for Modular mode only:

a. At the **Do you wish to generate a new monitor script for NetWorker package [No]?** prompt, type **Yes**.

b. At the **Do you wish to generate a new external script for NetWorker package [No]?** prompt, type **Yes**.

c. At the **Do you wish to generate a new external_pre script for NetWorker package [No]?** prompt, type **Yes**.

14. To confirm that the NetWorker software correctly creates the configuration file in the **/etc/cmcluster/networker** directory, use the **cmcheckconf** command.

For example:

- **Legacy mode**: `cmcheckconf -P pkg.conf`
- **Modular mode**: `cmcheckconf -P networker.conf`

    cmcheckconf: Verification completed with no errors found
    Use the cmapplyconf command to apply the configuration.

15. To create the package, use the **cmapplyconf** command.

For example:

- For Legacy mode, type: `cmapplyconf -P pkg.conf`
- For Modular mode, type: `cmapplyconf -P networker.conf`

    The following output appears:

    Modify the package configuration ([y]/n)? y
    Completed the cluster update

16. Copy the following files located in **/etc/cmcluster/networker** directory to the same directory on each passive node:

- **Legacy mode**:
  - lepato.control
  - pkg.conf

- **Modular mode**:
  - networker.conf
  - networker.monitor
  - networker.script
  - networker.pre_script

**Note**: Ensure the files have execute permission.
Passive nodes

1. Run the cluster configuration script file `/opt/networker/bin/networker.cluster`.
2. In the Do you wish to continue? [Yes]? prompt, type Yes.
3. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker directory provided during the install.
4. At the Do you wish to use the updated NetWorker integration framework? Yes or No [Yes]? prompt:
   - To use the non-LC integration method, type No.
   - To use the LC integration method, type Yes.
5. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes] prompt, type Yes.
6. At the Select the type of package for the NetWorker Server(1-modular or 2-legacy) [2]? prompt, type 1 for the modular mode and 2 for legacy mode.
7. For Legacy mode only, at the Do you wish to generate a new control file for NetWorker package [No]? prompt, type no.
8. Perform these steps for modular mode only:
   - At the Do you wish to generate a new package configuration file for NetWorker package [No]? prompt, type No:
   - At the Do you wish to generate a new package configuration file for NetWorker package [No]? prompt, type No.
   - At the Do you wish to generate a new monitor script for NetWorker package [No]? prompt, type No.
   - At the Do you wish to generate a new external script for NetWorker package [No]? prompt, type No.
   - At the Do you wish to generate a new external_pre script for NetWorker package [No]? prompt, type No.
9. Confirm the `nsrexecd` daemon starts on each node:
   ```
   ps -ef | grep nsrexecd
   ```
   To change the configuration at a later time, run the `networker.cluster -r` option and then run `networker.cluster` again.
10. Enable and run the package:
    ```
    cmmodpkg -e networker
cmrunpkg networker
    ```
SLES High Availability Extension

This section describes how to configure the NetWorker software as a highly available application and how to configure a cluster-aware NetWorker client application after you install the NetWorker software on each physical node of the cluster. The NetWorker Installation Guide describes how to install the NetWorker software.

SLES HAE provides three cluster management tools: Pacemaker GUI, HA Web Konsole, and the crm shell. This section only describes how to use the crm shell to configure the NetWorker server software.

This section does not apply when you install NetWorker as a stand-alone application.

Configuring a cluster-aware NetWorker client

Perform these steps as the root user on each physical node.

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file, /usr/sbin/networker.cluster.

2. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory provided during the install procedure. For example: /nsr.

3. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes]? prompt, type No.

Configuring a highly available NetWorker server in the cluster

Perform these steps as the root user on each physical node.

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file, /usr/sbin/networker.cluster.

2. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory provided during the install procedure. For example: /nsr.

3. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes]? prompt, type Yes.

4. At the In what path will the shared nsr directory be created/located? prompt, specify the pathname of the globally mounted /nsr directory that contains the configuration information for the highly available NetWorker server. For example: /share1.

5. At the Enter the Logical Hostname to be used for NetWorker? prompt, specify the published logical hostname for the highly available NetWorker server. For example: clus_vir1.

To change the configuration at a later time, run the networker.cluster -r option and then run the networker.cluster again.
6. On one node, create the required resource groups for the NetWorker resources:
   a. Start the `crm` tool:

   ```
   crm configure
   ```

   b. Create a filesystem resource for the `nsr` directory. For example, type:

   ```
   primitive fs ocf:heartbeat:Filesystem \
   operations $id="fs-operations" \n   op monitor interval="20s" timeout="40s" \n   params device="/dev/sdb1" directory="/share1" fstype="ext3"
   ```

   c. Create an IP address resource for the NetWorker server name. For example, type:

   ```
   primitive ip ocf:heartbeat:IPaddr \
   operations $id="ip-operations" \n   op monitor interval="5s" timeout="20s" \n   params ip="10.5.172.250" cidr_netmask="255.255.254.0" nic="eth1"
   ```

   d. Create the NetWorker server resource. For example, type:

   ```
   primitive nws ocf:EMC_NetWorker:Server \
   operations $id="nws-operations" \n   op monitor interval="100" timeout="100" \n   op start interval="0" timeout="120" \n   op stop interval="0" timeout="60" \n   op migrate_to interval="0" timeout="60" \n   op migrate_from interval="0" timeout="120" \n   op meta-data interval="0" timeout="10" \n   op validate-all interval="0" timeout="10" \n   meta is-managed="true"
   ```

   **Note:** Adjust the timeout values, as required for your environment.

   e. Define the NetWorker server resource group that contains the filesystem, NetWorker server, and IP address resources. For example, type:

   ```
   group NW_group fs ip nws
   ```

   f. To commit the changes, type:

   ```
   commit
   ```

---

### Sun Cluster and Oracle Solaris Cluster

This section describes how to:

- Prepare the Sun Cluster or Oracle Solaris Cluster before you install the NetWorker software.
- Configure the NetWorker server as a highly available application.
- Configure a cluster-aware NetWorker client application after you install the NetWorker software on each physical node of the cluster. The *NetWorker Installation Guide* describes how to install the NetWorker software.

**NOTICE**

This section does not apply when NetWorker is a stand-alone application.
Preparing to install NetWorker on Sun and Oracle Solaris Clusters

Review this section before you install the NetWorker software.

◆ Install Volume Manager software in the cluster. For example: Solaris Volume Manager.
◆ Configure a shared disk as a mount point for the global filesystem to contain the shared /nsr directory.
◆ Ensure that the PATH environment variable includes the /usr/sbin and /usr/cluster/bin directories.
◆ A resource group must own each globally mounted file system (except the /global/.devices/... file system). To enable a resource group to own a globally mounted file system (except the /global/.devices/... file systems), specify the file system in only one NetWorker Client type resource. If you misconfigure the ownership of global file systems in a NetWorker client type resource, then multiple backup copies occur for each cluster node.

Configuring a cluster-aware NetWorker client

Perform these steps as the root user on each physical node:

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file /usr/sbin/networker.cluster.
2. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory provided during the install procedure. For example: /nsr.
3. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes]? prompt, type No.
4. On one node in the cluster, create a resource group for the backup and a resource instance for the LGTO.clnt resource:
   a. Create a resource group:

   ```bash
clresourcegroup create resource_group_name
   ```
   
   For example, to create the resource group backups, type:

   ```bash
clresourcegroup create backups
   ```

   NOTICE

   A resource group must own all globally mounted file systems (except the /global/.devices/... file systems). All globally mounted filesystems (except the /global/.devices/... file systems) must have a NetWorker Client resource type. A misconfigured file system results in multiple backup copies for each cluster node.

   b. Add the logical hostname resource type to the new resource group:

   ```bash
clreslogicalhostname create -g resource_group_name logical_name
   ```
   
   For example, when the logical hostname is clus_vir1, type:

   ```bash
clreslogicalhostname create -g backups clus_vir1
   ```
c. Optionally, to create an instance of the SUNW.HAStoragePlus resource type:
   - Determine if the HAStragePlus resource type is registered within the cluster:
     
     ```
     clresource list
     ```
   - If required, register the HAStragePlus resource type within the cluster:
     
     ```
     clresource register SUNW.HAStoragePlus
     ```
   - Create the SUNW.HAStoragePlus resource:
     
     ```
     clresource create -g resource_group_name -t SUNW.HAStoragePlus
     -x FilesystemMountPoints=pathname_1,pathname_2[,...]
     -x AffinityOn=True hastorageplus
     ```
     
     For example, to create the resource with mount points /global/nw and /global/space, type:
     
     ```
     clresource create -g backups -t SUNW.HAStoragePlus -x FilesystemMountPoints=/global/nw,/
     /global/space
     ```
     
     **Note:** The Sun Cluster documentation provides more information about the SUNW.HAStoragePlus resource and locally mounted global systems.

d. Create an instance of the LGTO.clnt resource:
   
   ```
   clresource create -g resource_group_name -t LGTO.clnt -x
   clientname=virtual_hostname -x
   owned_paths=pathname_1,pathname_2[,...] client
   ```
   
   where:
   
   - `virtual_hostname` is the name of the resource used by the Sun Cluster logical hostname (SUNW.LogicalHostname) or shared address (SUNW.SharedAddress) that you want to configure as a virtual hostname.
   
   - `owned_paths` is a list of filesystems or raw devices on a shared storage device to back up, separated by commas.

   For example:
   
   ```
   clresource create -g backups -t LGTO.clnt -x clientname=clus_vir1
   -x owned_paths=/global/nw, /global/space client
   ```

   When the logical host resource name differs from the hostname it specifies, define the clientname variable as the virtual hostname, then set the `network_resource` property to the logical host resource name.

   For example:
   
   ```
   clresource create -g resource_group_name -t LGTO.clnt -x
   clientname=virtual_hostname -x network_resource=virtual_hostname
   -x owned_paths=pathname_1,pathname_2[,...] client
   ```
Configuring a highly available NetWorker server

Perform these steps as the root user on each physical node:

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file /usr/sbin/networker.cluster.

2. At the Enter directory where local NetWorker database is installed [/nsr]? prompt, specify the location of the local NetWorker database directory provided during the install procedure. For example: /nsr.

3. At the Do you wish to configure for both NetWorker server and client? Yes or No [Yes]? prompt, type Yes.

4. At the Do you wish to add now the site-specific values for: NSR_SHARED_DISK_DIR and NSR_SERVICE_ID Yes or No [Yes]? prompt, type Yes to ensure compatibility with other cluster environments.

5. At the Enter the Logical Hostname to be used for NetWorker? prompt, specify the published logical hostname of the highly available NetWorker server. For example: clus_vir1.

6. At the In what path will this nsr directory be created/located? prompt, specify the pathname of the globally mounted /nsr directory that contains the configuration information for the highly available NetWorker server. For example: /global/nw.

   NOTICE

To change the configuration at a later time, run the networker.cluster -r option and then run the networker.cluster again.

7. On one node in the cluster, create a resource group for the backup and resource instances for the NetWorker resources:

   a. Create a resource group:

      clresourcegroup create resource_group_name

      For example, to create the resource group networker, type:

      clresourcegroup create networker

   b. Add the logical hostname resource type to the new resource group:

      clreslogicalhostname create -g resource_group_name logical_name

      For example, when the logical hostname is clus_vir1, type:

      clreslogicalhostname create -g networker clus_vir1

   c. Optionally, to create an instance of the SUNW.HAStoragePlus resource type:

      – Determine if the HASStoragePlus resource type is registered within the cluster:

      clresourcetype list

      – If required, register the HASStoragePlus resource type within the cluster:

      clresourcetype register SUNW.HAStoragePlus
Configuring the cluster

- Create the SUNW.HAStoragePlus resource:

  ```
  clresource create -g resource_group_name -t SUNW.HAStoragePlus  
  -x FilesystemMountPoints=pathname_1,pathname_2[,...]  
  -x AffinityOn=True hastorageplus
  
  For example, to create the resource with mount points /global/nw and  
  /global/space, type:
  
  clresource create -g networker -t SUNW.HAStoragePlus -x 
  FilesystemMountPoints=/global/nw,\  
  /global/space  
  -x AffinityOn=True hastorageplus
  
  Note: The Sun Cluster documentation provides more information about the  
  SUNW.HAStoragePlus resource and locally mounted global systems.
  ```

d. Create an instance of the LGTO.clnt resource:

  ```
  clresource create -g resource_group_name -t LGTO.clnt -x  
  clientname=virtual_hostname  
  -x owned_paths=pathname_1,pathname_2[,...]  
  
  where:
  
  - `virtual_hostname` is the name of the resource used by the Sun Cluster logical  
    hostname (SUNW.LogicalHostname) or shared address (SUNW.SharedAddress)  
    that you want to configure as a virtual hostname.
  
  - `owned_paths` is a list of filesystems or raw devices on a shared storage device  
    to back up, separated by commas.
  
  For example:
  
  clresource create -g networker -t LGTO.clnt -x  
  clientname=clus_vir1 -x owned_paths=/global/nw,/global/space  
  client
  
  When the logical host resource name differs from the hostname it specifies, define  
  the `clientname` variable as the virtual hostname, then set the `network_resource`  
  property to the logical host resource name.
  
  For example:
  
  clresource create -g resource_group_name -t LGTO.clnt -x  
  clientname=virtual_hostname -x network_resource=virtual_hostname  
  -x owned_paths=pathname_1,pathname_2[,...]  
  
e. For a highly available NetWorker server, create an instance of the LGTO.serv  
  resource:

  ```
  clresource create -g resource_group_name -t LGTO.serv -y  
  Resource_dependencies=virtual_hostname -x  
  config_dir=configuration_directory
  
  For example, when the configuration directory on the globally mounted filesystem  
  is /global, type:
  
  clresource create -g backups -t LGTO.serv -y  
  Resource_dependencies=clus_vir1 -x config_dir=/global
When the logical host resource name is different than the hostname it specifies, set the optional `servername` property to the virtual hostname:

```
clresource create -g resource_group_name -t LGTO.serv -y
Resource_dependencies=virtual_hostname -x servername=virtual_hostname -x config_dir=configuration_directory
```

g. Optionally, if you created an SUNW.HAStoragePlus resource, then:
   - Define a dependency for the NetWorker server resource:
     ```
     clresource set -y Resource_Dependencies=virtual_hostname, hastorageplus server
     ```
   - Verify that the resource dependencies are correctly set. For example:
     ```
     clresource show -v server | grep Resource_dependencies
     ```

Example Sun Cluster configurations

The section provides two examples of a Sun Cluster configuration:

- Example 1, “A highly available Informix database server”
- Example 2, “A scalable Apache web server”

Example 1  A highly available Informix database server

In this example, the Informix database server uses the DNS registered hostname `informix_lhrs`.

An existing failover resource group `informix_rg` contains:

- SUNW.informix resource named `informix_res`
- SUNW.LogicalHostname resource named `informix_lhrs`

This SUNW.informix database server accesses data on a global file system under `/global/informix/config` and `/global/informix/db`.

To add a NetWorker virtual client to the existing resource group `informix_rg`, type:

```
clresource create -g informix_rg -t LGTO.clnt \ 
-x clientname=informix_lhrs \ 
-x owned_paths=/global/informix/config,/global/informix/db \ 
informix_clntrs
```

To help understand this example, study the following output that was created by running the `scstat -g` command after the running the `scrgadm` command. The `scstat-g` command output displays the `informix_rg` group and its resources, assuming that the `informix_rg` group is the only resource group configured in the cluster.
Configuring the cluster

-- Resource Groups and Resources --

<table>
<thead>
<tr>
<th>Resources</th>
<th>informix_rg</th>
<th>informix_res</th>
<th>informix_lhrs</th>
<th>informix_clntrs</th>
</tr>
</thead>
</table>

-- Resource Groups --

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Node Name</th>
<th>state</th>
<th>Suspended</th>
</tr>
</thead>
<tbody>
<tr>
<td>informix_rg</td>
<td>phynode-1</td>
<td>Offline</td>
<td>No</td>
</tr>
<tr>
<td>informix_rg</td>
<td>phynode-2</td>
<td>Offline</td>
<td>No</td>
</tr>
</tbody>
</table>

--Resources--

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Node Name</th>
<th>state</th>
<th>Suspended</th>
</tr>
</thead>
<tbody>
<tr>
<td>informix_res</td>
<td>phynode-1</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>informix_res</td>
<td>phynode-2</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>informix_lhrs</td>
<td>phynode-1</td>
<td>Offline</td>
<td>Offline - LogicalHostname offline.</td>
</tr>
<tr>
<td>informix_lhrs</td>
<td>phynode-2</td>
<td>Offline</td>
<td>Offline - LogicalHostname offline.</td>
</tr>
<tr>
<td>informix_clntrs</td>
<td>phynode-1</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>informix_clntrs</td>
<td>phynode-2</td>
<td>Offline</td>
<td>Offline</td>
</tr>
</tbody>
</table>
Example 2 A scalable Apache web server

In this example, an Apache web server uses the DNS registered hostname `apache_sars`. An existing scalable resource group `apache_rg` contains:

- SUNW.apache resource named `apache_res`
- SUNW.SharedAddress resource named `apache_sars`

The Apache web server accesses data on a global file system under `/global/web/config` and `/global/web/data`.

To add a NetWorker virtual client to the existing resource group `apache_rg`, type:

```
clresource create -g apache_rg -t LGTO.clnt \   
-x clientname=apache_sars \   
-x owned_paths=/global/web/config,/global/web/data \   
apache_clntrs
```

To help understand this example, study the `scstat -g` output. The `scstat -g` command displays the `apache_rg` group and its resources, assuming that the `apache_rg` group is the only resource group configured in the cluster.

**Note:** The `scstat -g` command runs after the `scrgadm` command completes.

```
-- Resource Groups and Resources --

--- Resource Groups --

Group Name         Resources
-
Group: apache_rg     apache_res
               apache_sars
               apache_clntrs

-- Resource Groups --

Group Name         Node Name  state  Suspended
-
Group: apache_rg     phynode-1  Offline  No
Group: apache_rg     phynode-2  Offline  No

-- Resources --

Resource Name         Node Name  State  Status Message
-
Resource: apache_res   phynode-1  Offline  Offline
Resource: apache_res   phynode-2  Offline  Offline
Resource: apache_res   phynode-1  Offline  Offline - SharedAddress offline.
Resource: apache_res   phynode-2  Offline  Offline - SharedAddress offline.
Resource: apache_res   phynode-1  Offline  Offline
Resource: apache_res   phynode-2  Offline  Offline
```
Microsoft Cluster Server 2003

In NetWorker 8.0 and later, only the NetWorker client software supports Microsoft Cluster server (MSCS). The NetWorker Installation Guide describes how to install the NetWorker software.

Microsoft Failover Cluster Server 2008 and 2012

This section describes how to:
- Prepare the Microsoft Failover Cluster Server (MSFCS) cluster before you install the NetWorker software.
- Configure the NetWorker server software as a highly available on each physical node of the cluster after you install the NetWorker software on each physical node of the cluster. The NetWorker Installation Guide describes how to install the NetWorker software.
- Change the default timeout for NetWorker server daemons.

**NOTICE**

This section does not apply when NetWorker is a stand-alone application.

Preparing to install NetWorker on MSFCS clusters

Review this section before you install the MSFCS.
- Reboot the cluster node after you install the NetWorker software. If you do not reboot, you cannot start the cluster administrator program. If this error occurs, close the cluster administrator interface and reload the software by running the following command, from the command line:
  ```
  regsvr32 /u nsrdresx.dll
  ```
- To back up a host that is a member of multiple domains, an Active Directory (AD) domain, and a DNS domain, you must define the AD domain name in:
  - The host file on the NetWorker server.
  - The Alias attribute for the Client resource on the NetWorker server.
- NetWorker backs up the MSFCS database as part of the WINDOWS ROLES AND FEATURES save set. If you back up the WINDOWS ROLES AND FEATURES save set, NetWorker backs up the cluster configuration automatically. The MSFCS database is maintained synchronously on two nodes. Consequently, backing up the database on one node might not reflect changes made on the other node.

Configuring a highly available NetWorker server

Perform these steps on the appropriate cluster node as administrator.
1. On one cluster node, create the NetWorker server resource type:
  ```
  regcnsrd -c
  ```
2. On the remaining cluster nodes, register the NetWorker server resource type:

`regcnsrd -r`

If prompted with a message similar to the following, then type `y`:

Is this machine a member of the cluster on which you want to register Resource Extension for NetWorker Server resource?

3. Verify that a NetWorker Server resource type exists:

a. In the Failover Cluster Management program, right-click the name of the cluster and select Properties.

b. From the Resource Types tab, verify the User Defined Resource Types list contains the NetWorker Server resource.

4. Start the High Availability Wizard:

- Windows 2008: From the Action menu, select Configure a Service or Application.
- Windows 2012: From the Action menu, select Configure Role...

5. On the Before You Begin page, click Next.

6. On the Select Service or Application page (Windows 2008) or the Select Role page (Windows 2012), select Other Server, and then click Next.

**NOTICE**

Do not create a Generic Application resource for the NetWorker virtual server.

7. On the Client Access Point page, specify a hostname that does not exist in the ID and an available IP address, and then click Next.

**Note:** The Client Access Point resource type defines the virtual identity of the NetWorker server, and the wizard registers the hostname and IP address in DNS.

8. On the Select Storage page, select the shared storage volume for the shared nsr directory, and then click Next.

9. In the Select Resource Type list, select the NetWorker Server resource type, and then click Next.

10. On the Confirmation page, review the resource configurations and then click Next. The High Availability Wizard creates the resources components and the group.

When the Summary page appears, a message similar to the following appears which you can ignore:

Windows 2008:

The group will not be brought online since the resources may need additional configuration. Please finish configuration and bring the group online.

Windows 2012:

The clustered role will not be started because the resources may need additional configuration. Finish configuration, and then start the clustered role.
11. Click **Finish**.

12. Set a dependency between NetWorker server resource and the shared disk:

   - Windows 2008: Expand **Services and Applications** and select the new NetWorker server resource.
   - Windows 2012: In the **Roles** window, select the new NetWorker role and click on the **Resources** tab.

   a. In the **Server Name** section, expand the NetWorker server resource then right-click the new IP Address resource and then select **Properties**.
   b. On the **Dependencies** tab, select the shared disk associated with the NetWorker server resource from the **Dependencies** list and then click **Ok**.
   c. In the **Other Resources** section, right-click **New NetWorker server** and select **Properties**.
   d. On the **Dependencies** tab, in the **Resource** list, select the name of the NetWorker resource.
   e. On the **Parameters** tab, in the **NsrDir** field, specify the path to locate the nsr directory on the shared disk. Do not specify the quorum disk. For example: `e:\nsr`.

      **Note:** Leave the **ServerName** and **AdditionalArguments** fields blank.

   f. Click **OK**.

---

**NOTICE**

Do not create multiple NetWorker server resources. Creating more than one instance of a NetWorker Server resource interferes with how the existing NetWorker Server resources function.

---

13. Configure client resource for both the physical hosts and the virtual host.

   a. Update the saveset to **ALL** for the physical client.

      This backs up the local disk that belongs to the physical node, `WINDOWS ROLES AND FEATURES` save set, and `DISASTER_RECOVERY: \` save set.

   b. Update the saveset to **ALL** for the virtual client.

      This backs up the disk owned by the virtual client, for example, Shared Disks.

14. Configure the Remote Access attribute for the client resources on the physical hosts.

   for example,

   ```
   SYSTEM@physical-client1
   SYSTEM@physical-client2
   SYSTEM@Virtual-client
   ```

15. After the client resources are configured on the NetWorker server, add the clients to a group.
Correct name resolution for both the physical and virtual clients is required. The resolution can be set in the HOSTS file.

16. Start the NetWorker server resource:
   - Windows 2008: Right-click on the NetWorker cluster service and select Bring this service or application online.
   - Windows 2012: Right-click the NetWorker cluster resource and select Start Role.

17. Confirm that the state of the NetWorker Server resource changes to Online.

Changing the default timeout of NetWorker daemons

A NetWorker server failover occurs when the time to start up any NetWorker server daemons exceeds 10 minutes.

To modify the timeout parameter:

1. In the Cluster Administrator program, select the resource group where the NetWorker Server resource exists.
2. In the Parameters tab of the NetWorker Server cluster resource, edit the value for the AdditionalArguments field and add the ServerStartupTimeout keyword. For example:
   
   ```
   ServerStartupTimeout=time
   ```
   
   where time is a numeric value in seconds.

   NOTICE

   The ServerStartupTimeout keyword is case sensitive.

VERITAS Cluster Server

This section describes how to:

- Prepare the VERITAS cluster before you install the NetWorker software.
- Configure the NetWorker server software as a highly available or the NetWorker client as a cluster-aware application after you install the NetWorker software on each physical node of the cluster. The NetWorker Installation Guide describes how to install the NetWorker software.

NOTICE

This section does not apply when NetWorker is a stand-alone application.

Preparing to install NetWorker on VERITAS cluster

Review this section before you install the NetWorker software on a Linux or Solaris VERITAS cluster.
When the VERITAS Cluster Server installation and configuration directories are not the default directories, set the following environment variables:

- **VCS_HOME**
  The default directory is /opt/VRTSvcs.

- **VCS_CONF**
  The default directory is /etc/VRTSvcs.

Ensure that the PATH environment variable includes the /usr/sbin and $VCS_HOME/bin directories. The default $VCS_HOME directory is /opt/VRTSvcs/bin.

### Configuring NetWorker on a VERITAS cluster

This section describes how to configure a highly available NetWorker server or cluster-aware client on a VERITAS Cluster Server (VCS).

- “Creating NetWorker Client resource instances” on page 44
- “Configuring a cluster-aware NetWorker client” on page 45
- “Configuring a highly available NetWorker server” on page 46

### Creating NetWorker Client resource instances

This section applies to Windows and UNIX.

A NetWorker virtual server requires an instance of the NWClient resource type in any VERITAS Cluster service group that:

- Contains raw devices or raw logical volumes to back up.
- Contains more than one IP type resource.
- Contains storage resources that are not automatically detected, for example:
  - Storage resources defined in dependent groups.
  - Storage resources that are not of the type Mount or CFSmount.

Creating an instance of the NWClient resource type for a NetWorker virtual server is optional when:

- The failover VERITAS Cluster service group has only one IP type resource.
- The owned filesystems on the shared devices are instances of the mount type resource contained in the same service group.

### About the NWClient resource

Before creating a NWclient resource, review this section to become familiar with the structure of the NWClient resource.
Table 2 on page 45 describes the required NWClient resource attributes.

### Table 2 NWClient resource type attributes

<table>
<thead>
<tr>
<th>Required attributes</th>
<th>Type and dimension</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPAddress</td>
<td>string, scalar</td>
<td>IP address of the virtual NetWorker client. An IP type resource with a matching Address attribute must exist in the service group.</td>
</tr>
<tr>
<td>Owned_paths</td>
<td>string, vector</td>
<td>A list of filesystems or raw devices on a shared storage device. The virtual NetWorker client specified by the IP Address attribute owns these filesystems or raw devices.</td>
</tr>
</tbody>
</table>

**Example 3 NWClient resource sample configuration**

The following is a sample of a configured NWClient resource:

```bash
NWClient nw_helene { 
  IPAddress="137.69.104.251"
  Owned_paths={ "/shared1", "/shared2", "/dev/rdsk/c1t4d0s4" }
```

**Configuring a cluster-aware NetWorker client**

**On Solaris and Linux**

Perform these steps as the root user on each physical node.

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file `/usr/sbin/networker.cluster`.
2. At the **Would you like to configure NetWorker for it [Yes]***? prompt, type Yes.
3. At the **Do you wish to continue? [Yes]***? prompt, type Yes.
4. At the **Enter directory where local NetWorker database is installed [/nsr]***? prompt, specify the location of the local NetWorker database directory that you provided when you installed NetWorker. For example: `/space/nsr`.
5. At the **Do you want to configure NetWorker virtual server?[y/n]** prompt, type No.

**On Windows**

Perform these steps as an administrator on each physical node.

1. To define the resource types that the NetWorker software requires, run the cluster configuration binary `NetWorker_installation_path\lc_config.exe`.
2. At the **Do you want to configure NetWorker virtual server?[y/n]** prompt, type No.

**Registering the resource type and creating resource instances**

Register the NWClient resource and create NWClient resource instances on Windows and UNIX.

1. To save the existing VERITAS Cluster Server configuration and prevent further changes while `main.cf` is modified, type:
   ```bash
   haconf -dump -maker
   ```
2. To stop the VERITAS Cluster Server software on all nodes and leave the resources available, type:

   hastop -all -force

3. To make a backup copy of the main.cf file, type.

   • For UNIX systems, type:
     
     cd /etc/VRTSvcs/conf/config
     cp main.cf main.cf.orig

   • For Windows systems, type:
     
     cd C:\Program Files\Veritas\cluster server\conf\config
     cp main.cf main.cf.orig

4. To copy the NWClient resource definition file located in the VERITAS Cluster Server configuration directory, type:

   • For UNIX systems, type:
     
     cp /etc/VRTSvcs/conf/NWClient.cf /etc/VRTSvcs/conf/config/NWClient.cf

   • For Windows systems, type:
     
     cp C:\Program Files\Veritas\cluster server\conf\NWClient.cf
     C:\Program Files\Veritas\cluster server\conf\config\NWClient.cf

5. To add the NWClient resource type and the NWClient resource type instances to the main.cf file, type:

   include "NWClient.cf"

6. Save and close the file.

7. To verify the syntax of the main.cf file, type:

   hacf -verify config

8. To start the VERITAS Cluster Server engine, type:

   hastart

9. Log in on the remaining nodes in the cluster and start the VERITAS Cluster Server engine. To start the engine, type:

   hastart

10. To verify the status of all service groups, type:

    hagrp -display

11. Add a NWClient resource instance for the service groups that require it.

Configuring a highly available NetWorker server

To configure a highly available NetWorker server, run the NetWorker cluster configuration script file, and then create a NetWorker resource group.

◆ “Creating the service group” on page 47
◆ “Configuring NetWorker on Solaris and Linux” on page 48
Creating the service group

This section provides a high-level overview of how to create and configure the NetWorker server service group.

- Add the IP type resource. Use the IP address for the virtual NetWorker server specified in the NetWorker service group.
- For Windows and VxVM: Add the VMDg and MountV type resources for the shared disk to the NetWorker service group.
- For Solaris and Linux: Add the Mount type resource for the shared disk to the NetWorker service group.
- Set the **CleanProgramTimeout** attribute of the NetWorker server process to a minimum value of 180. Set the **StopProgramTimeout** attribute to a minimum of value of 120.

The following example shows an instance of the NetWorker resource group defined in the /etc/VRTSvcs/conf/config/main.cf VCS cluster configuration file.

**Example 4 An instance of a NetWorker resource group definition on Linux**

group networker {
    SystemList = { arrow = 0, canuck = 1 }
}

Application nw_server {
    StartProgram = "/usr/sbin/nw_vcs start"
    StopProgram = "/usr/sbin/nw_vcs stop"
    CleanProgram = "/usr/sbin/nw_vcs stop_force"
    MonitorProgram = "/usr/sbin/nw_vcs monitor"
    MonitorProcesses = {"/usr/sbin/nsrd -k avro"}
}

IP NW_IP {
    Device = eth0
    Address = "137.69.104.104"
}

Mount NW_Mount {
    MountPoint = "/mnt/share"
    BlockDevice = "/dev/sdc3"
    FSType = ext2
    FsckOpt = "-n"
}

NW_IP requires NW_Mount
nw_server requires NW_IP
// resource dependency tree
//
// group networker
// ( { // Application nw_server // { // IP NW_IP // { // Mount NW_Mount // } // } // )
The following example, shows an instance of the NetWorker resource group defined in the C:\Program Files\Veritas\cluster server\conf\config\main.cf VCS cluster configuration file.

**Example 5** An instance of a NetWorker resource group definition on Windows

group networker {
    SystemList = { BU-ZEUS32 = 0, BU-HERA32 = 1 }
}

IP NWip1 {
    Address = "10.5.163.41"
    SubNetMask = "255.255.255.0"
    MACAddress @BU-ZEUS32 = "00-13-72-5A-FC-06"
    MACAddress @BU-HERA32 = "00-13-72-5A-FC-1E"
}

MountV NWmount1 {
    MountPath = "S:\"
    VolumeName = SharedVolume1
    VMDGResName = NWdg_1
}

Process NW_1 {
    Enabled = 0
    StartProgram = "D:\Program Files\EMC NetWorker\nsr\bin\nw_vcs.exe start"
    StopProgram = "D:\Program Files\EMC NetWorker\nsr\bin\nw_vcs.exe stop"
    CleanProgram = "D:\Program Files\EMC NetWorker\nsr\bin\nw_vcs.exe stop_force"
    MonitorProgram = "D:\program files\EMC NetWorker\nsr\bin\nw_vcs.exe monitor"
    UserName = "bureng\administrator"
    Password = BHFlGHdNDpGNkNNnF
}

VMDg NWdg_1 {
    DiskGroupName = "32dg1"
}

NWip1 requires NWmount1
NWmount1 requires NWdg_1
NW_1 requires NWip1
// resource dependency tree
//
// group networker
// {
//     Process NW_1
//     {
//         IP NWip1
//         {
//             MountV NWmount1
//             {
//                 VMDg NWdg_1
//             }
//         }
//     }
// }

**Configuring NetWorker on Solaris and Linux**

Perform these steps as the root user on each physical node.

1. To define the resource types that the NetWorker software requires, run the cluster configuration script file /usr/sbin/networker.cluster.

2. At the Veritas Cluster Server is detected. Would you like to configure NetWorker for it [Yes]?
   prompt, type Yes.
Configuring the cluster

3. At the **Do you wish to continue? [Yes]**? prompt, type **Yes**.

4. At the **Enter directory where local NetWorker database is installed [/nsr]**? prompt, specify the location of the local NetWorker database directory that you provided when you installed NetWorker. For example: **/space/nsr**.

5. At the **Do you want to configure NetWorker virtual server? [y/n]** prompt, type **Yes**.

6. At the **Do you wish to add now the site-specific values for: NSR_SHARED_DISK_DIR and NSR_SERVICE_ID Yes or No [Yes]**? prompt, type **Yes** to ensure compatibility with other cluster environments.

7. At the **In what path will the shared nsr directory be created/located?** prompt, specify the pathname of the globally mounted /nsr directory that contains the configuration information for the highly available NetWorker server. For example: **/global/nw**.

8. At the **Enter the Logical Hostname to be used for NetWorker?** prompt, specify the published logical hostname that the highly available NetWorker server uses. For example: **clus_vir1**.

**NOTICE**

To change the configuration at a later time, run the **lc_config.exe -r** option and then run **lc_config.exe** again.

Configuring the NetWorker software on Windows

Perform these steps as an administrator on each physical node.

1. Bring the NetWorker server service group online.

2. To define the resource types that the NetWorker software requires, run the cluster configuration binary, **NetWorker_installation_path\lc_config.exe**.

3. At the **Do you want to configure NetWorker virtual server? [y/n]** prompt, type **Yes**.

4. At the **Enter shared nsr dir:** prompt, specify the pathname of the shared nsr directory that will contain the configuration information for the highly available NetWorker server. For example: **S:\nsr**.

5. At the **Enter the directory in which your Veritas Cluster Server software is installed (typically something like C:\Program Files\Veritas\cluster server):** prompt, specify the location where you installed the Veritas Cluster Server.

6. At the **Is this OK [y/n]** prompt, type **Y** to update the configuration.

**NOTICE**

To change the configuration at a later time, run the **lc_config.exe -r** option and then run **lc_config.exe** again.

Add the NetWorker server resource to the NetWorker service group

The NetWorker server is an Application resource type on UNIX and a Process resource type on Windows. Add these resource types to the NetWorker service group.

The following dependencies on other resources in the service group exist:

For UNIX systems:
Configuring the cluster

- Process resource depends on the IP resource
- IP resource depends on the MountV resource

For Windows systems:
- Application resource depends on the IP resource
- IP resource depends on the Mount resource

The following example, shows an instance of the Application resource type defined on a UNIX VCS cluster.

**Example 6  NWserver resource on VCS for UNIX**

```
"Resource type:  "Application"
"Attributes:
User = root
StartProgram = "/usr/sbin/nw_vcs start"
StopProgram = "/usr/sbin/nw_vcs stop"
CleanProgram = "/usr/sbin/nw_vcs stop_force"
MonitorProgram = "/usr/sbin/nw_vcs monitor"
MonitorProcesses = "/sbin/nsrd -k Virtual_server_hostname"
```

The following example, shows an instance of the Process resource type defined on a UNIX VCS cluster.

**Example 7  NWserver resource on VCS for Windows**

```
"Resource type:  "Process"
"Attributes:
StartProgram = "C:\program files\EMC NetWorker\nsr\bin\nw_vcs.exe start"
StopProgram = "C:\program files\EMC NetWorker\nsr\bin\nw_vcs.exe stop"
CleanProgram = "C:\program files\EMC NetWorker\nsr\bin\nw_vcs.exe stop_force"
MonitorProgram = "C:\program files\EMC NetWorker\nsr\bin\nw_vcs.exe monitor"
UserName = "<administrator user name> "
Password = "<administrator password>"
Domain = "<Active Directory domain name>"
```

### Troubleshooting configuration

This section describes how to troubleshoot NetWorker configuration issues in a cluster.

- “Slow backups or slow nsrd startup times” on page 50
- “NetWorker virtual server fails to start nsrmmd” on page 52

### Slow backups or slow nsrd startup times

The `lcmap` program, queries cluster nodes to creates a map that includes information such as path ownership of resource groups. In large cluster configurations, `lcmap` may take a long time to complete and thus slow down certain operations. This is most often noticed in slow NetWorker server (nsrd) start times or in very long backup times. In these situations, consider adjusting cluster cache timeout. This attribute specifies a time, in seconds, in which to cache the cluster map information on a NetWorker client.
Edit the cluster cache timeout attribute with caution. Values for the attribute can vary from several minutes to several days, depending on how often the cluster configuration changes, the possibility of resource group failover, and the frequency of NetWorker operations.

Too large a value can result in an out-of-date cluster map, which can cause incorrect path resolution. For example, if the cluster cache timeout value is set to 86400 (one day), any changes to the cluster map will not be captured for up to one day. If cluster map information changes before the next refresh period, some paths may not resolve correctly.

Too small a value can negatively affect performance because of too frequent cache updates.

Experiment with one physical cluster node to find a satisfactory timeout value. If you cannot obtain a significant improvement in performance by adjusting this attribute, reset the attribute value to 0 (zero) so NetWorker does not use the attribute.

Editing the cluster cache timeout attribute

The cluster cache timeout attribute resides in the NSRLA database of the NetWorker client and is visible only when NetWorker is configured for a cluster. For example on UNIX, a NetWorker client is configured for a cluster when the networker.cluster script is executed and nsrexceld is restarted.

NOTICE

If the timeout value will be modified, it is recommended that you edit the initial cluster cache timeout value before bringing the highly available NetWorker server online.

To edit the cluster cache timeout value, take the highly available NetWorker server offline and perform these steps on each physical node as the root user on UNIX or an administrator on Windows:

1. Connect to the NSRLA database.
   • For the passive node, type:
     \texttt{nsradmin -p nsrexceld}
   • For the active node, type:
     \texttt{nsradmin -d directory}
     where \texttt{directory} is the location of the local NSRLA database:
     - UNIX: \texttt{/nsr.NetWorker.local/res/nsrladb}.
     - Windows: \texttt{NetWorker_install_path\nsr\res\nsrladb}.

2. Display the current settings for attributes in the NSRLA resource. For example, type:
   \texttt{print type:NSRLA}

3. Change the value of the cluster cache timeout attribute. For example, type:
   \texttt{update \_cluster cache timeout: value}
   where \texttt{value} is the timeout value in seconds. A value of 0 (zero) specifies that the cache is not used.

4. When prompted to confirm the change, type \texttt{Yes}. 
5. Confirm the attribute updated successfully. Type:

```bash
print type: NSRLA
```

6. Bring the highly available NetWorker server online. NetWorker updates the shared NSRLA database with the new cache value.

   The updated value takes effect after the next cache update, based on the previous timeout value.

   To make the timeout value take effect immediately, delete the cache file on the physical node that owns the NetWorker virtual server:

   - UNIX: `/tmp/lcmap.out`
   - Windows: `NetWorker_install_path\nsr\bin\lcmap.out`

---

### NetWorker virtual server fails to start nsrmmd

When the NetWorker virtual server cannot start `nsrmmd` on a NetWorker storage node, the following error messages appears in the NetWorker server `daemon.raw` file:

```
06/08/00 10:00:11 nsrmon #217: connect to nsrexec prog 390113 vers 1 on `uranus' failed: RPC error: Remote system error
06/08/00 10:00:11 nsrd: media notice: check storage node: uranus (RPC error: Remote system error)
06/08/00 10:00:11 nsrd: media info: restarting nsrmmd #1 on uranus in 2 minute(s)
06/08/00 10:02:12 nsrd: media info: restarting nsrmmd #1 on uranus now
06/08/00 10:02:42 nsrmon #183: connect to nsrexec prog 390113 vers 1 on `uranus' failed: RPC error: Remote system error
```

The error also appears when the nsrexecd daemon on UNIX or the NetWorker Remote Exec service on Windows is not running on the storage node.

To resolve this issue, start the nsrexecd process on UNIX or the NetWorker Remote Exec service on Windows.
CHAPTER 7
Configuring devices for a highly available NetWorker server

NetWorker supports the use of tape, AFTD, and Data Domain devices to back up cluster host data. This chapter describes three common configuration scenarios when using autochangers and tape devices to back up a highly available NetWorker server. The information describing how to configure AFTD and Data Domain devices in the *NetWorker Administration Guide* and *Data Domain Integration Guide* applies to clustered and non-clustered hosts.

- Configuring an autochanger with shared tape devices ............................................. 54
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Configuring devices for a highly available NetWorker server

Configuring an autochanger with shared tape devices

In this configuration, the NetWorker virtual server manages the robotic arm. NetWorker uses Dynamic Drive Sharing (DDS) to allow the virtual node and each physical node to share tape devices. Each physical and virtual node sends backup data directly to a tape device and not over the network. Use this configuration when most of the backup data originates from the inactive physical node.

Before you configure a shared autochanger and DDS devices:

- Ensure that the “device-sharing infrastructure” supports complete isolation and protection of the path session between the autochanger and the node that owns the NetWorker server resource. Protect the path from stray bus signals and unauthorized session access from the other nodes.

**NOTICE**

If processes on nodes other than the one that owns on the NetWorker server can access the tape devices, data corruption might occur. The NetWorker software might not detect the data corruption.

- Zone the robotic arm and all drives to each physical node in the cluster.

- Configure the same path (bus, target and LUNs) to the robotics and tape drives on each node.

- If you configured the bridge with node device-reassignment reservation commands, then add these commands to the nsrrc startup script on the NetWorker virtual server. The *NetWorker Administration Guide* describes how to modify the nsrrc script.

- Install the cluster vendor-supplied special device file for the robotic arm on each physical node. The special device file creates a link to the tape or autochanger device driver. Ensure that the name assigned to the link is the same on each node for the same device. If you do not have matching special device files across cluster nodes, you may need to install fibre HBAs in the same PCI slots on all the physical nodes within the cluster.

*Figure 2 on page 55* provides a graphical view of this configuration option.
In this example:

- To configure the autochanger and devices by using the NMC device configuration wizard, specify the hostname of the virtual server, clus_vir1, when prompted for the storage node name and the prefix name. The NetWorker Administration Guide describes how to use NMC to configure autochangers and devices.

- To configure the autochanger and devices by using the jbconfig command, run `jbconfig -s clus_vir1` on the physical node that owns the NetWorker server resource.
  - When prompted for the hostname to use as a prefix, specify the virtual server name, clus_vir1.
  - When prompted to configure shared devices, select Yes.

The NetWorker Administration Guide describes how to use NMC to configure autochangers and devices.

- The storage node attribute value for each host is as follows:
  - clus_phys1: clus_phys1
  - clus_phys2: clus_phys2
  - clus_vir1: nsrserverhost

"Configuring backup and recovery" on page 59 describes how to configure the Client resource for each cluster node.


When a failover occurs, NetWorker relocates and restarts savegroup operations that were in progress on the failover node. Standard autochanger operations however, (for example: performing an inventory, labeling, mounting or unmounting a volume) will not automatically restart on the new failover node.

Configuring an autochanger with non-shared tape devices

In this configuration, the robotic arm and tape devices are configured for the virtual node only.

The NetWorker virtual server and the physical node that owns the NetWorker server resource sends backup data directly to the tape devices. The inactive physical node sends backup data to the tape devices over the network. Use this configuration when most of the backup data originates from the active physical node, the shared disk resource, and hosts external to the cluster.

Figure 2 on page 55 provides a graphical view of this configuration option.

![Autochanger with non-shared devices](image)

**Figure 3** Autochanger with non-shared devices
In this example:

- To configure the autochanger and devices by using the NMC device configuration wizard, specify the hostname of the virtual server, clus_vir1, when prompted for the storage node name and the prefix name. The *NetWorker Administration Guide* describes how to use NMC to configure autochangers and devices.

- To configure the autochanger and devices by using the `jbconfig` command, run `jbconfig -s clus_vir1` on the physical node that owns the NetWorker server resource.
  
  - When prompted for the hostname to use as a prefix, specify the virtual server name, clus_vir1.
  
  - When prompted to configure shared devices, select Yes.

The *NetWorker Administration Guide* describes how to use `jbconfig` to configure autochangers and devices.

- The storage node attribute value for each host is as follows:
  
  - clus_phys1: nsrserverhost
  - clus_phys2: nsrserverhost
  - clus_vir1: nsrserverhost

“Configuring backup and recovery” on page 59 describes how to configure the Client resource for each cluster node.

### Configuring the robotics on a stand-alone host

You can set up a stand-alone physical host as a storage node outside the cluster to control the robotic arm when you cannot match bus target LUNs across the cluster nodes or when you do not have a NetWorker server within the cluster. The stand-alone physical host can control the robotic arm through a Fibre Channel or SCSI connection. Each node in the cluster sends backup data over the network to the tape devices. The NetWorker virtual server requires a local device to back up the indexes and bootstrap.
Configuring devices for a highly available NetWorker server

Figure 4 on page 58 provides a graphical view of this configuration option.

In this example:

- The NetWorker virtual server uses local device AFTD1 to back up the bootstrap and indexes.
- To configure the autochanger and devices by using the NMC device configuration wizard, specify the hostname of the stand-alone host, ext_SN, when prompted for the storage node name and the prefix name.
- To configure the autochanger and devices by using the `jbconfig` command, run `jbconfig -s clu_vir1` on the ext_SN. The NetWorker Administrators Guide describes how to use `jbconfig` to configure autochangers and devices.
  - When prompted for the hostname to use as a prefix, specify the external storage node, ext_SN.
  - When prompted to configure shared devices, select Yes.
- The Storage nodes attribute value in the Client resource for each host is as follows:
  - clus_phys1: clus_phys1
  - clus_phys2: clus_phys2
  - clus_vir1: nsrserverhost

“Configuring backup and recovery” on page 59 describes how to configure the Client resource for each cluster node.
CHAPTER 8
Configuring backup and recovery

This chapter describes how to configure a NetWorker virtual server, backup virtual and physical nodes in a cluster, and how to configure non-clustered clients to backup to a NetWorker virtual server.

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- Setting NetWorker environment variables in a cluster ............................................... 62
- Limiting NetWorker server access to a client ............................................................. 62
- Configuring the NetWorker virtual server ............................................................... 64
- Creating client resources for physical node backups ............................................... 65
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Registering NetWorker virtual server licenses

NetWorker uses the hostid of the NetWorker server to generate authorization codes for licenses. For a NetWorker virtual server, you must determine the hostid of each physical node and create a composite hostid. A composite hostid is a combination of hostids for each node of a highly-available NetWorker server. NetWorker stores the composite hostid value in a hostids file on the shared nsr directory.

Use the composite hostid to register and license a highly-available NetWorker server. When a failover occurs, the licenses for the NetWorker virtual server do not require authorization.

**NOTICE**

The *NetWorker Licensing Guide* describes how to obtain NetWorker licenses and how to add them to a NetWorker server.

To create a composite hostid:

1. Determine the hostid of a physical node:
   - On each UNIX physical node, type `hostid` from a system prompt and record the value.
     
     For example:
     ```
     # hostid
     84f8c879
     ```
   - On each Windows physical node:
     a. Connect to the NetWorker virtual server from NMC.
     b. In the **Configuration** window, select **Licensing**.
     c. Right-click one of the listed licenses and select **Properties**.
     d. Record the value in the **hostid** attribute.
     e. Move the NetWorker resource group to each cluster node then repeat step a through to step d.

2. Log in to the system that runs the NetWorker virtual server and create the hostids file in the shared `/nsr/res` directory on UNIX or the share `NetWorker_install_path
sr\res` directory on Windows.

3. Specify the hostid of each cluster node in this file, separated by a colon (`:`).
   
   For example:
   ```
   12345678:87654321
   ```

4. Restart the NetWorker virtual server:
   - Take the NetWorker application offline in the cluster.
     - For AutoStart, use the **AutoStart Console** to take the NetWorker virtual server offline.
     - For HACMP/PowerHA, type: `/usr/bin/nw_hacmp.lc stop`
– For MSFCS Windows 2008, in the Failover Cluster Management program, right-click on the NetWorker cluster service and select Take this service or application Offline.

– For MSFCS Windows 2012, in the Failover Cluster Management program, right-click the NetWorker cluster resource and select Stop Role.

– For MC/ServiceGuard, type: cmhaltpkg networker

– For SLES HAE, type: crm resource stop NetWorker_server_resource_group

– For SunCluster, type: clresourcegroup offline
  NetWorker_server_resource_group

– For VCS, type: hagrp -offline NetWorker_service_group -sys system
  where system is the node name.

b. Stop the NetWorker daemons.

c. Start the NetWorker daemons.

d. Bring the NetWorker application online in the cluster.

– For AutoStart, use the AutoStart Console to bring the NetWorker virtual server online.

– For HACMP/PowerHA, type: /usr/bin/nw_hacmp -lc start

– For M/C ServiceGuard, type: cmrunpkg networker

– For SLES HAE, type: crm resource start NetWorker_server_resource_group

– For SunCluster, type: clresourcegroup online
  NetWorker_server_resource_group

– For MSFCS Windows 2008, in the Failover Cluster Management program, right-click on the NetWorker cluster service and select Bring this service or application online.

– For MSFCS Windows 2012, in the Failover Cluster Management program, right-click the NetWorker cluster resource and select Start Role.

– For VCS, type: hagrp -online NetWorker_service_group -sys system
  where system is the node name.

5. Connect to the NetWorker virtual server from NMC.

6. In the Configuration window, select Licensing.

7. Right-click one of the listed licenses and select Properties.

8. Record the new composite hostid value in the hostid attribute to provide to Licensing.

**NOTICE**

Do not change the logical hostname for the highly-available NetWorker server. If you change it after you update the software, you must permanently license and authorize the highly-available NetWorker server.
Setting NetWorker environment variables in a cluster

In a UNIX cluster, specify environment variables for a highly-available NetWorker server in the global /nsr/nsrrc file. The NetWorker Administration Guide describes how to use the /nsr/nsrrc file.

To define environment variables for the cluster-aware or stand-alone UNIX NetWorker host, modify or create the /nsr/nsrrc file in the local /nsr directory.

Limiting NetWorker server access to a client

By default, any NetWorker server can back up a NetWorker host and perform a directed recover to any NetWorker host. Use the servers files on a NetWorker host to limit NetWorker server access.

A highly available NetWorker or server or cluster-aware client uses multiple servers files. To limit NetWorker server access to a cluster node, you must create and edit these servers files:

- Global servers file, located on the shared drive.
- Local servers file on for each physical cluster node.

A stand-alone NetWorker application on a cluster node uses one servers file, located in the /nsr/res/servers on UNIX or the NetWorker_installation_path\nsr\res on Windows.

To limit NetWorker server access to a cluster node:

1. For a highly available NetWorker server or cluster-aware NetWorker client, take the NetWorker virtual server offline on the active cluster node:
   - For AutoStart, use the AutoStart Console to take the NetWorker virtual server offline.
   - For HACMP/PowerHA, type: /usr/bin/nw_hacmp.lc stop
   - For MSFCS on Windows 2008, in the Failover Cluster Management program, right-click on the NetWorker cluster service and select Take this service or application Offline.
   - For MSFCS on Windows 2012, in the Failover Cluster Management program, right-click the NetWorker cluster resource and select Stop Role.
   - For MC/ServiceGuard, type: cmhaltpkg networker
   - For SLES HAE, type: crm resource stop NetWorker_server_resource_group
   - For SunCluster, type: clresourcegroup offline NetWorker_server_resource_group
   - For VCS, type: hagrp -offline NetWorker_service_group -sys system
     where system is the node name.

2. On each node, stop the NetWorker processes:
   - From a command prompt on UNIX, type:
     nsr_shutdown
On Windows, stop the NetWorker Remote Exec service. This also stops the NetWorker Backup and Recover service on a NetWorker server.

3. On each physical node, edit or create the servers file:
   - UNIX: /nsr/res/servers
   - Windows: NetWorker_installation_path\nsr\res\servers

4. Specify the shortname and FDQN for each NetWorker server, one per line, that requires access to the NetWorker host.
   
   When the NetWorker server is highly available:
   a. Add an entry for the NetWorker logical or virtual hostname first.
   b. Add entries for each physical host that can run the NetWorker resource group. The first entry becomes the default NetWorker server.
      
      For example:
      
      clus_vir1
      clus_vir1.emc.com
      clus_phys1
      clus_phys1.emc.com
      clus_phys2
      clus_phys2.emc.com
      
      When the servers file does not contain any hosts, any NetWorker server can back up or perform a directed recovery to the host.

5. On the node with access to the shared disk, edit the global servers file.

   Note: Note: “Ensure the hostnames defined in the global servers file are the same as the local servers file on each physical node.

6. For UNIX only, edit the NetWorker boot-time startup file, /etc/init.d/networker and delete any nsrexecd -s arguments that exist.

   For example, when the /etc/init.d/networker contains the following entry:

   nsrexecd -s venus -s mars

   Modify the file so the entry appears as:

   nsrexecd

7. Start the NetWorker daemons on each node.

8. For a highly available NetWorker host only, bring the NetWorker application online:
   - For AutoStart, use the AutoStart Console to bring the NetWorker virtual server online.
   - For HACMP/PowerHA, type: /usr/bin/nw_hacmp -lc start
   - For M/C ServiceGuard, type: cmrunpkg networker
   - For SLES HAE, type: crm resource start NetWorker_server_resource_group
   - For SunCluster, type: clresourcegroup online NetWorker_server_resource_group
Configuring backup and recovery

- For MSFCS on Windows 2008, in the Failover Cluster Management program, right-click on the NetWorker cluster service and select Bring this service or application online.
- For MSFCS on Windows 2012 in the Failover Cluster Management program, right-click the NetWorker cluster resource and select Start Role.

Confirm that the state of the NetWorker server resource changes to Online.

- For VCS, type: hagrp -online NetWorker_service_group -sys system
  where system is the node name.

Configuring the NetWorker virtual server

This section only applies to a highly-available NetWorker server and describes how to configure the NetWorker virtual server and how to backup the shared disk.

NetWorker supports the use of multiple IP address for a resource group (resource service for MC/ServiceGuard). However, use only one of these IP addresses to configure the virtual client resource. The name of the NetWorker Client resource can be the short name, the FQDN corresponding to the IP address, or the IP address.

For example: resgrp1 is a resource group defined in a cluster and there are two IP resources defined in the group, IP1 and IP2. If the IP address for IP1 is defined as a NetWorker Client resource, then all shared paths in resgrp1 are saved under the IP address for IP1 index.

To configure the NetWorker virtual server:

1. Use NMC to connect to the NetWorker virtual server.
2. In the Configuration window, right-click the NetWorker server and select Properties.
3. In the Administrator attribute, specify the root user account for each UNIX physical node. For each Windows physical node, specify the administrator and the system account for each Windows physical node.

For example:

UNIX physical nodes:

root@clus_phys1
root@clus_phys2

Windows physical nodes:

administrator@clus_phys1
system@clus_phys1
administrator@clus_phys2
system@clus_phys2

4. Click Ok.
Creating client resources for physical node backups

This section describes how to create a client resource on a NetWorker server to back up the local disks of a physical cluster node.

1. Connect to the NetWorker server in NMC. For a highly-available NetWorker server connect by using the virtual node name.

2. Click Configuration and select Groups. Configure a Group resource or select an existing group to back up the physical nodes.

3. Create a NetWorker client for each physical node within the cluster:
   a. Right-click Clients and select Create.
   b. In the Name attribute, type the name of the physical client.
   c. In the Save set field, specify the local disks or ALL.

   **NOTICE**

   The ALL save set does not include shared disks. For Windows, do not specify the quorum disk.

   d. In the Group attribute, select the Group configured in step 2.
   e. Define the remaining attributes in the Client properties window, as required, and click Ok.

Creating a client resource for virtual client backups

This section describes how to create a client resource on a NetWorker server to back up a shared disk or Cluster Shared Volume (CSV). These steps apply to cluster-aware clients and the NetWorker virtual server.

1. Connect to the NetWorker server in NMC. For a highly available NetWorker server, connect by using the virtual node name.

2. Create a Group resource to back up the cluster node or select an existing group. To ensure that backups for the virtual node restart when a NetWorker server failover occurs, enable the Autorestart attribute and disable the Manual Restart option.

3. Create a client resource for the virtual node, or edit the Client resource that NetWorker automatically creates for a NetWorker virtual server.

4. In the Save set field, to back up:

   - All of the shared drives and CSVs that a virtual client owns, specify All.
   - A single drive volume of shared disk that a virtual client owns, specify the drive volume letter.

   For example, to backup a single drive volume, specify G:\.

   To backup a single CSV, specify C:\clusterstorage\volumeX, where X is the volume number, and C: is the system drive.

5. For HACMP only, add the boot adapter name in the Aliases attribute.
6. On the **Globals (1 of 2)** tab, in the **Remote Access** field, specify the root user account for each UNIX physical node or the system account for each Windows physical node within the cluster.

   **For UNIX physical nodes:**
   
   `root@clus_phys1`
   `root@clus_phys2`
   
   **For Windows physical nodes:**
   
   `system@clus_phys1`
   `system@clus_phys2`

7. On the **Apps and Modules** tab, in the **Application Information** field, specify environment variables, as required.

   - For **Snapsh**ot Management backups only, use the `NSR_PS_SHARED_DIR` variable to specify the share directory. For example:
     
     `NSR_PS_SHARED_DIR=P:\share`
     
     The *NetWorker Snapshot Management Integration Guide* describes how to configure Snapshot backups.

   - For **Windows Server 2012 CSV backups only**: You can optionally specify the preferred cluster node to perform the backup. To specify the preferred server, use the NetWorker client Preferred Server Order List (PSOL) variable `NSR_CSV_PSOL`.
     
     If no PSOL is specified, the default behavior is to perform the backup using the Current Host Server node (virtual node).
     
     If a PSOL is specified, then NetWorker **save.exe** uses the first available server in the list to initiate the CSV backup. The first node that is available and responds becomes the preferred backup host. If none of the specified nodes in the PSOL are available, then the backup is attempted on the Current Host Server node.
     
     To specify the PSOL, the customer includes a key/value pair in the client resource **Application information** field. The key/value pair is of the form:
     
     `NSR_CSV_PSOL=MachineName1,MachineName2,MachineName3,etc.`
     
     When a PSOL is specified, the cluster nodes identified must also be listed in the **remote access list** of the NetWorker client.

**Note:** When you specify the node names, use the NetBIOS name. You cannot specify the IP address or FQDN of the node.

For example, physical node `clus_phys2` owns the cluster resources for virtual node `clus_vir1`. By default, `clus_vir1` runs the backup request. To offload operations, define `clus_phy1` as the preferred node to start the save operation. If `clus_phy1` is unavailable, then NetWorker should attempt to use `clus_phy2` to start the save operation.

The `NSR_CSV_PSOL` variable in the `clus_vir1` client resource is set to:

`NSR_CSV_PSOL=clus_phy1,clus_phy2`
Configuring a backup device for the NetWorker virtual server

The NetWorker virtual server requires a local backup device to save the bootstrap and the server indexes. To ensure that the device is always available, configure a device that belongs to the NetWorker virtual server and is shared between the physical nodes.

1. Edit the NetWorker virtual server client resource in NMC.
2. Select **Globals (2 of 2)**.
3. In the **Storage nodes** attribute, specify the hostnames of each physical cluster node followed by `nsrserverhost`.

MSFCS does not support shared tapes. You cannot configure the NetWorker virtual server with tape devices connected to a shared bus.

MSFCS does support disk devices connected to a shared bus. EMC recommends that you do *not* use file type devices connected to a shared bus.

Configuring a virtual client to back up to a local storage node

By default, NetWorker sends the data from a virtual client to the first storage node listed in the Storage Nodes attribute in the virtual client resource.

Use the keyword `curphyhost` to direct virtual client backups to a storage node device on the physical host that currently owns the virtual client.

The `curphyhost` keyword is only applicable to virtual clients. Do not specify this keyword in the clone storage nodes attribute in the Storage node resource or to the client resource of a NetWorker virtual server. This can cause unexpected behavior. For example, NetWorker might write the bootstrap and index backups to the local storage node for the virtual clients, instead of a local device on the NetWorker virtual server.

For example, consider a two-node cluster where:

- Nodes A and B are the two physical nodes in the cluster.
- The virtual client is Saturn, which can reside on Node A or fail over to Node B.

During a backup without `curphyhost` listed in the Storage Nodes attribute for the virtual client, NetWorker directs the backup data to the remote device (`rd=`) on Node A. When Saturn fails over to Node B and a backup for Saturn starts, NetWorker still directs the backup data to the remote device (`rd=`) on Node A.
When you specify curphyhost first in the Storage Nodes attribute for saturn, if saturn fails over to Node B and a backup of saturn starts, NetWorker directs the backup data to the remote device (rd=) on Node B. This action takes place because, after the failover, saturn resides on Node B—the current physical host.

To use curphyhost:

1. Edit the properties of the virtual client resource in NMC.
2. SelectGlobals (2 of 2).
3. In the Storage nodes attribute, add the curphyhost keyword.

Performing manual backups of a cluster node

You can perform manual backups of the physical or virtual nodes in a cluster from the command prompt on UNIX and Windows or from the NetWorker User GUI, on Windows only.

This section describes how to configure NetWorker to allow manual backup by a non-root or non-administrator account and how to perform a manual backup:

- “Configuring manual backups for non-root or non-administrator users” on page 68
- “Performing manual backups from the command prompt” on page 70
- “Performing manual backups from NetWorker User” on page 70

Configuring manual backups for non-root or non-administrator users

Backups use the lmmap script to query the cluster to determine path ownership. When you perform a manual backup with a non-root account on UNIX or a non-administrator account on Windows, NetWorker cannot determine path ownership information. As a result, NetWorker writes the backup information to the client file index of the physical node that owns the filesystem.

These sections describe how to configure the system to enable lmmap to determine path ownership for non-root or non-administrator users:

- “Using non-root accounts on AutoStart for UNIX” on page 68
- “Using non-root accounts on HP MC/ServiceGuard” on page 69
- “Using non-administrator accounts on MSFCS” on page 69
- “Using non-root accounts on VCS for UNIX” on page 69

Using non-root accounts on AutoStart for UNIX

Before you perform a manual backup of data from a virtual cluster client with non-root privileges on AutoStart for UNIX, use the ftconsole program to add non-root users to the security access list for the FT domain.
Using non-root accounts on HP MC/ServiceGuard

Before you perform a manual backup of data from a virtual cluster client with non-root privileges on HP MC/ServiceGuard, do one of the following:

- On each node in the cluster, ensure that the `.rhosts` file in the home directory of the non-root account includes the hostname of each cluster node. For example:

  nodeA
  nodeB

- As the root user on each node in the cluster, edit or create the `/etc/cmcluster/cmclnodelist` file and add this information to the file:

  nodeA  `user_name`
  nodeB  `user_name`

**NOTICE**

If the `cmclnodelist` file exists, the cluster software ignores any `.rhosts` file.

Using non-administrator accounts on MSFCS

Before you perform a manual backup of data from a virtual cluster client with non-administrator privileges on MSFCS, modify the security descriptor properties on the cluster so that the user can access the cluster resources. For example:

```
Cluster ClusterName /prop "security descriptor"=DOMAIN\USER,grant,f:security
```

Using non-root accounts on VCS for UNIX

When you perform a manual backup of a physical or virtual cluster client in VCS as a non-root user, the operating system might prompt you for a password.

To avoid the password prompt:

- In VCS 4.0, set the `AllowNativeCliUsers` attribute to 1.
- In VCS version 4.1 or later, use the VCS `halogin` command to store authentication information.

For information on how to set up VCS authentication, see the VCS documentation.

Using non-root accounts on VCS for Windows

For VCS 6.0 on Windows 2008 and Windows 2008 R2, you must start the NetWorker User program or command prompt window, as an administrator.

For example:

- To start a backup operation from the NetWorker User application: Right-click on the NetWorker User application and select Run as Administrator.
- To start a backup operation from the command prompt, right-click on the command prompt application and select Run as Administrator.
Performing manual backups from the command prompt

To perform a manual backup of a virtual or physical node, use the `save` command.

For example:

```
save -c client save_set
```

where:

- `client` is the virtual hostname to back up shared disk data or the physical node hostname to back up data that is local to the node on which you run the `save` command.
- `save_set` specifies the path to the backup data.

Performing manual backups from NetWorker User

You can use the NetWorker User program on a Windows physical node to back up shared or local data. To back up shared data, open NetWorker User on the active physical node. While NetWorker User on a Windows 2003 passive node displays the shared drives and VSS SYSTEM save sets, when you attempt to back up the shared drives, error messages similar to the following appear:

77259:winworkr: VSS reports adding volume [shared_drive] to snapshot set failed for both hardware/software provider.
7281:winworkr: VSS snapshot failed with error 0x80042308 -- The specified object does not exist..
7284:winworkr: Networker will save the files without the snapshot.
84687:winworkr: Unable to get volume information of file system 'shared_drive': The device is not ready. (Win32 error 0x15).

Troubleshooting backups

This section provides resolutions for the following common backup and configuration errors:

- “RAP error: Unable to extract resource info for client” on page 70
- “Filesystems omitted during a scheduled save” on page 70
- “Filesystem backup information written to the wrong client file index” on page 71
- “No matching devices found when backing up to HACMP devices” on page 72

RAP error: Unable to extract resource info for client

This message appears when the NetWorker server fails to back up a virtual cluster client because a NetWorker client resources does not exist for each physical node.

To resolve this issue, create a client resource for each physical node that is allowed to own the virtual cluster client and then rerun the backup.

Filesystems omitted during a scheduled save

In a cluster environment, the NetWorker software must distinguish between:

- File systems associated with a physical client.
- File systems managed by a resource group (a virtual client).
The criteria used are called the path-ownership rules. These rules determine which client file index a save set is written to.

By default, the NetWorker software does not back up scheduled save sets when conflicts with path-ownership occur. This prevents a virtual NetWorker client from writing to multiple client file indexes. The NetWorker software views the client (which owns the file system) as not having matched the client of the current scheduled save set. Writing to multiple indexes might cause recovery issues.

These conditions omit a filesystem backup during a scheduled save:

- The Save set attribute for a physical client resource contains a filesystem owned by a virtual client.
- The Save set attribute for a virtual Client resource contains a filesystem owned by a physical client.

Resolve this issue in one of the following ways:

- "Correct the save set attribute for the client" on page 71
- "Override default path-ownership rules" on page 71

Correct the save set attribute for the client

Configure the NetWorker client to only back up the filesystems that the client owns.

1. Use the `savegrp` command to check the NetWorker path-ownership rules and display the list of filesystems owned by the client:
   ```
   savegrp -p -c client_name
   ```

2. Modify the Save set attribute for the client to contain only the filesystems that the client owns.

Override default path-ownership rules

To force NetWorker to back up filesystems that a client does not own, you can create the `pathownerignore` file in the NetWorker bin directory on the client. This file causes NetWorker to ignore default path-ownership rules. The filesystem backup information is saved under the client file index of its correct owner.

**NOTICE**

Use the `mminfo` command to confirm that the backup information saves to the correct client file index. By design, the Console server Group Details window and the `savegrp` completion report state that the backup corresponds to the physical client where you configured the save set.

**Filesystem backup information written to the wrong client file index**

When the pathownerignore file exists on a client at the time of a backup, NetWorker backs up save sets that the client does not own but writes information about the backup to the client file index of the host that owns the filesystem.

To determine which client file index will contain save set information, run a test probe with the `verbose` option set.
For example: `savegrp -pv -c client_name group_name`

where:

- `client_name` is the name of the cluster client.
- `group_name` is the name of a group that contains the client backup.

Resolve this issue in one of the following ways:

- For a manual save, use the `-c` option to specify the name of the client with the save set information.
- For a scheduled save:
  1. Update the **Save set** attribute for the client and specify only save sets that the client owns.
  2. Force the save set information to write to the index of the client that backs up the save set:
     - Edit the properties of the client in NMC.
     - Select the **Apps & Module** tab.
     - In the **Backup command** attribute, specify the `save` command with the name of the client to receive the save set information:

```
save -c client_name
```

**NOTICE**

Use the `mminfo` command to confirm that the backup information saves to the correct client file index. By design, the Console server Group Details window and the `savegrp` completion report state that the backup corresponds to the physical client where you configured the save set.

---

**No matching devices found when backing up to HACMP devices**

This error message appears when backups to devices attached to an AIX HACMP cluster fail because the physical node name is not configured with an IP address attached to the primary NIC.

To resolve this issue, configure the physical node IP address on primary NIC. “Preparing to install NetWorker on HACMP” on page 22 provides more information.

**Recovering**

Recovering data backed up from a *private disk* that belongs to a physical client in a cluster is the same as recovering data on a host that is not part of a cluster. The *NetWorker Administrators Guide* provides more information.

This section describes how to recover data from shared disks that belong to a virtual client.

To recover Windows clusters, the chapter Windows Bare Metal Recovery (BMR) in the *NetWorker Administrators Guide* provides more information.
To recover data backed up from a *shared disk* that belongs to a virtual client:

1. Ensure that you have correctly configured remote access to the virtual client:
   a. Edit the properties of the virtual client resource in NMC.
   b. On the **Globals (2 of 2)** tab, ensure that the **Remote Access** attribute contains an entry for the root or Administrator user for each physical cluster node.

2. To recover a CSV backup for a client that uses the **NSR_CSV_PSOL** variable, ensure that the system account for each host in the preferred server order list is a member of the NetWorker Operators User Group.

   For example, if you configure the virtual node client resource that specifies the CSV volumes with the following variable: **NSR_CSV_PSOL=clu_virt1, clu_virt2**, specify the following users in the NetWorker Operators User Group:

   ```
   system@clu_virt1
   system@clu_virt2
   ```

3. Mount the filesystems of the virtual client.

4. Recover the data.

   • When you use the **NetWorker User** program on Windows, the source client is the virtual client.

   • When you perform a command line recovery, use the **recover** command with the **-c** option to specify the name of the client you are attempting to recover. For example:

     ```
     recover -s server_name -c virtual_client
     ```

     **Note:** The **-c virtual_client** is optional when you run the **recover** command from the global file system that the virtual client owns.

     The **recover** man page or the *EMC NetWorker Command Reference Guide* provide information.

     **NOTICE**

     To recover data from a VCS 6.0 on Windows 2008 and Windows 2008 R2 you must also start the **NetWorker User** program or command prompt window, as administrator. For example:
     
     To start a recover operation from the **NetWorker User** application, right-click on the **NetWorker User** application and select **Run as Administrator**.
     
     To start a recover operation from the command prompt, right-click on the command prompt application and select **Run as Administrator**.

**Configuring a virtual client to recover from a local storage node**

During a recover operation of virtual client data, NetWorker attempts to mount the required volume in a device on the first storage node listed in the Recovery Storage Nodes attribute in the virtual client resource.

Use the keyword “currenchost” to instruct a virtual client recovery to mount the required volume in a storage node device on the physical host that owns the virtual client.
The “curphyhost” keyword only applies to virtual clients. Do not specify this keyword in the clone storage nodes attribute in the Storage node resource or to the client resource of the NetWorker virtual server. This can cause unexpected behavior, for example, the NetWorker software writes the bootstrap and index backups to the local storage node for the virtual clients, instead of a local device on the NetWorker virtual server.

The following restrictions apply when you configure the recovery of virtual client data from a local storage node:

- Ensure that there are no hosts or machines named `curphyhost` on the network.
- Do not specify `curphyhost` in the Clone storage nodes attribute of a virtual client storage node resource.
- Do not apply the `curphyhost` keyword to the Storage nodes attribute or the Recover Storage Nodes attribute of the virtual server’s Client resource.

To configure the virtual client to recover data from a local storage node:

1. Edit the properties of the virtual client resource in NMC.
2. In the Globals (2 of 2) tab, for the Storage nodes attribute or the Recover storage nodes attribute, add the `curphyhost` keyword. Position the keyword in the list based on the required priority. The top of the list is the highest priority. Ensure that this keyword is not the only keyword in the list.

Troubleshooting recovery

This section provides resolutions to issues recovering data from a cluster node backup.

**NSR server ‘nw_server_name’: client ‘virtual_hostname’ is not properly configured on the NetWorker Server**

This message appears when you attempt to recover data from the physical node of a highly available NetWorker server that was backed up by a NetWorker server that is external to the cluster. To resolve this issue, create a client resource for the highly available virtual NetWorker server on the external NetWorker server and retry the recover operation.
CHAPTER 9
Uninstalling the NetWorker software in a cluster

Before removing the NetWorker server software, you must remove the NetWorker configuration from the cluster. This section describes how to take a highly available NetWorker server offline and remove the NetWorker configuration from the cluster.

This section does not apply when the NetWorker server software is a stand-alone application (not cluster managed) or when only the client software is installed.

The process of uninstalling the NetWorker software from a cluster is the same as uninstalling the software on a stand-alone machine. The *NetWorker Installation Guide* describes how to uninstall the NetWorker software.

- Uninstalling NetWorker from AutoStart .................................................................... 76
- Uninstalling NetWorker from HACMP ....................................................................... 77
- Uninstalling NetWorker from HP MC/ServiceGuard .................................................. 78
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- Uninstalling NetWorker from SUN Cluster and Oracle Solaris Cluster....................... 80
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Uninstalling the NetWorker software in a cluster

Uninstalling NetWorker from AutoStart

This section describes how to remove NetWorker from AutoStart for Windows and AutoStart for UNIX clusters.

- “Uninstalling NetWorker on AutoStart for Windows” on page 76
- “Uninstalling NetWorker on AutoStart for UNIX” on page 76

Uninstalling NetWorker on AutoStart for Windows

Before you uninstall the NetWorker software from each node in the cluster, first delete the NetWorker services and resources, then remove the NetWorker configuration from the cluster.

Perform these steps as an administrator:

1. Start the AutoStart Console on one node, then:
   a. Take the NetWorker Resource Group offline.
   b. Select and delete the NetWorker Resource Group from the Current Resource Group list.
   c. Select and delete the NSRserver and the NSRexecd services.
   d. Select and delete the networker_ds resource.
   e. Select and delete the NetWorker virtual server IP Address.

2. Log in to each cluster node, then:
   a. Shut down the NetWorker services.
   b. Remove the NetWorker configuration:
      ```
      lc_config.exe -r
      ```
   c. Uninstall the NetWorker software. The NetWorker Installation Guide provides more information.

3. If the NetWorker software will be reinstalled to the same location, ensure you delete these files from the \bin subdirectory:
   - NetWorker.clustersvr
   - lcmap.bat
   - nwinst.bat

Uninstalling NetWorker on AutoStart for UNIX

Before you uninstall the NetWorker software from each node in the cluster, first remove the NetWorker configuration from the cluster, then remove the NetWorker software.

Perform these steps as the root user.

1. On one node in the cluster, use the AutoStart Console to:
   a. Take the NetWorker Resource Group offline.
   b. Select and delete the NetWorker Resource Group from the Current Resource Group list.
c. Select and delete the **NSRserver** and the **NSRexecd** services.

d. Select and delete the **networker_ds** resource.

e. Select and delete the NetWorker virtual server IP Address.

2. Log in to each node in the cluster, then:

   a. Shut down the client services on the node where the NetWorker software is being removed:

```
slr_shutdown
```

   b. Ensure that the `$FT_DIR` and `$FT_DOMAIN` environment variables are set. “Preparing to install NetWorker on AutoStart” on page 17 provides more information.

   c. Remove the NetWorker configuration:

```
- AIX: /usr/bin/networker.cluster -r
- HP-UX: /opt/networker/bin/networker.cluster -r
- Linux and Solaris: /usr/sbin/networker.cluster -r
```

   d. Uninstall the NetWorker software. The *NetWorker Installation Guide* provides more information.

### Uninstalling NetWorker from HACMP

Before you uninstall the NetWorker software from each node in the cluster, first remove the NetWorker configuration from the cluster, then remove the NetWorker software.

Perform these steps as the root user.

1. Log in to one node in the cluster, then:

   a. Stop the NetWorker server services:

```
/usr/bin/nw_hacmp.lc stop
```

   b. Remove the following NetWorker resources:

```
- NetWorker Application server resource for HACMP, or NetWorker Application controller scripts for PowerHA.
- NetWorker resource group.
- For PowerHA only, the NetWorker Application monitor, if configured.
```

2. Log in to each cluster node, then:

   a. Shut down the NetWorker daemons:

```
slr_shutdown
```

   b. Remove the NetWorker configuration:

```
networker.cluster -r
```

   c. Uninstall the NetWorker software. The *NetWorker Installation Guide* provides more information.
Uninstalling NetWorker from HP MC/ServiceGuard

Before you uninstall the NetWorker software from each node in the cluster, first remove the NetWorker configuration from the cluster, then remove the NetWorker software.

Perform these steps on each node, as the root user:

1. Halt the NetWorker package. For example:
   ```
   cmhaltpkg networker
   ```

2. Remove the NetWorker package. For example:
   ```
   cmdeleteconf -p networker
   ```

3. Stop the NetWorker services. For example:
   ```
   nsr_shutdown
   ```

4. Remove the NetWorker configuration from the cluster. For example:
   ```
   /opt/networker/bin/networker.cluster -r
   ```

5. Uninstall the NetWorker software. The *NetWorker Installation Guide* provides more information.

6. If you used the non-LC integration method to configure the NetWorker software, remove the `/etc/cmcluster/NetWorker.clucheck` file.

Uninstalling NetWorker from MSFCS

Before you uninstall the NetWorker software from each node in the cluster, first delete the NetWorker resource, then remove the NetWorker configuration from the cluster.

Perform these steps as an administrator:

1. Log in to one node in the cluster.
   a. Take the NetWorker server application offline:
      - On Windows 2008, in the *Failover Cluster Management* program, right-click the NetWorker cluster service and select *Take this service or application Offline*.
      - On Windows 2012, in the *Failover Cluster Management* program, right-click the NetWorker cluster resource and select *Stop Role*.
   b. Select **Action > Delete** to delete the **NetWorker Server** resource from Microsoft Failover Cluster.
   c. Close the *Failover Cluster Management* program on all the nodes where you plan to uninstall NetWorker software.

2. From a command prompt, on all but one node in the cluster, type `regcnsrd -u`.

   **NOTICE**

   If you are prompted with the following message, then type `y`:
   ```
   Is this machine a member of the cluster on which you want to un-register Resource Extension for NetWorker Server resource?
   ```
3. From a command prompt on the last node of the cluster, type `regcnsrd -d`.

4. Uninstall the NetWorker software on each node. The *NetWorker Installation Guide* provides more information.

**Uninstalling NetWorker from SLES HAE**

Before you uninstall the NetWorker software from each node in the cluster, first delete the NetWorker resources, then remove the NetWorker configuration from the cluster.

Perform these steps as the root user:

1. Log in to one node in the cluster and perform the following steps:
   a. Take the NetWorker server resource group offline. For example, type:
      
      ```
      crm resource stop NetWorker_server_resource_group
      ```

   b. Start the `crm` tool. For example, type:
      
      ```
      crm configure
      ```

   c. Delete the NetWorker resource group. For example, type:
      
      ```
      delete networker_resource_group
      ```

   d. Delete the NetWorker server resource. For example:
      
      ```
      delete networker_server_resource
      ```

   e. Commit the changes:
      
      ```
      commit
      ```

   f. Exit the `crm` tool:
      
      ```
      exit
      ```

2. Log in to each node in the cluster and perform the following steps:
   a. Stop the NetWorker daemons. For example, type:
      
      ```
      nsr_shutdown
      ```

   b. Remove the NetWorker configuration. For example, type:
      
      ```
      networker.cluster -r
      ```

   c. Uninstall the NetWorker software. The *NetWorker Installation Guide* provides more information.
Uninstalling NetWorker from SUN Cluster and Oracle Solaris Cluster

Before you uninstall the NetWorker software from each node in the cluster, first delete the NetWorker resources, then remove the NetWorker configuration from the cluster.

Perform these steps as the root user:

1. Log in to one node in the cluster, then:
   a. Take the NetWorker resource group offline. For example, type:
      ```
      clresourcegroup offline networker_resource_group
      ```
   b. Remove the NetWorker resources and configuration from the cluster:
      ```
      clresource disable networker_client_resource
      clresource disable networker_server_resource
      clresource delete networker_client_resource
      clresource delete networker_server_resource
      ```
   c. Remove the hastorageplus resource, if it exists. For example, type:
      ```
      clresource disable hastorageplus
      clresource delete hastorageplus
      ```

2. On each node of the cluster, log in as the root user, then:
   a. Stop the NetWorker daemons. For example, type:
      ```
      nsr_shutdown
      ```
   b. Remove the NetWorker configuration from the cluster. For example, type:
      ```
      networker.cluster -r
      ```

3. On the last node in the cluster, remove the NetWorker resource group from the cluster. For example, type:
   ```
   clresourcegroup delete networker_resource_group
   ```

4. Uninstall the NetWorker software from each node. The NetWorker Installation Guide provides more information.

Uninstalling NetWorker from VCS

This section describes how to remove the NetWorker configuration from the cluster and remove the NetWorker software on Solaris, Linux and Windows.

Uninstalling NetWorker on VCS for Solaris and Linux

To remove NetWorker, perform these steps as the root user.

1. Log in to one node in the cluster, then:
   a. Take the NetWorker resource group offline. For example, type:
      ```
      hagrp -offline NetWorker_service_group -sys system
      ```
      where `system` is the node name.
Uninstalling the NetWorker software in a cluster

b. Remove all the instances of the NWClient resource type and remove the NWClient type definition from the configuration.

For information, refer to the `hares(1m)` and `hatype(1m)` man pages.

2. Log in to each cluster node, then:

   a. Shut down the NetWorker daemons. For example, type:
      
      ```
      nsr_shutdown
      ```

   b. Remove the NetWorker configuration. For example, type:
      
      ```
      networker.cluster -r
      ```

   c. Uninstall the NetWorker software. The *NetWorker Installation Guide* provides more information.

**Uninstalling NetWorker on VCS for Windows**

To remove NetWorker, perform these steps with the administrator account.

1. Log in to one node in the cluster, then:

   a. Take the NetWorker resource group offline.

   b. Remove all the instances of the NWClient resource type and remove the NWClient type definition from the configuration.

2. Log in to each node of the cluster, then:

   a. Stop the NetWorker services.

   b. From a command prompt, remove the NetWorker configuration from the cluster. For example, type:
      
      ```
      lc_config.exe -r
      ```

   c. Uninstall the NetWorker software. The *NetWorker Installation Guide* provides more information.
Uninstalling the NetWorker software in a cluster
CHAPTER 10
Updating a highly available NetWorker application

This chapter provides an overview of how to update the NetWorker software in a highly available cluster.

Perform these steps on each node in the cluster.

1. Uninstall the NetWorker software from each node in the Cluster. “Uninstalling the NetWorker software in a cluster” on page 75 describes how to remove the NetWorker software in each supported cluster.

2. Install the NetWorker software on each node in the cluster. The NetWorker Installation Guide describes how to install the NetWorker software.

3. Configure the NetWorker software in the cluster. “Configuring the cluster” on page 15 describes how to configure the NetWorker software in each supported cluster.
Updating a highly available NetWorker application
GLOSSARY

This glossary contains definitions for terms used in this guide.

A

administrator
Person who normally installs, configures, and maintains software on network computers, and who adds users and defines user privileges.

advanced file type device (AFTD)
Disk storage device that uses a volume manager to enable multiple concurrent backup and recovery operations and dynamically extend available disk space.

attribute
Feature of a NetWorker resource. It is a setting or information that the resource provides.

authorization code
Unique code that in combination with an associated enabler code unlocks the software for permanent use on a specific host computer. See also “license key.”

B

BMR
Windows Bare Metal Recovery, formerly known as Disaster Recovery. For more information on BMR, refer to the Windows Bare Metal Recovery chapter in the EMC Networker Administration Guide.

backup
1. Duplicate of database or application data, or entire computer system, stored separately from the original, which can be used to recover the original if it is destroyed or damaged.

2. Operation that saves data to a volume for use as a backup.

backup group
See “group.”

boot address
The address used by a node name when it boots up, but before HACMP/PowerHA for AIX starts.

bootstrap
Save set that is essential for NetWorker disaster recovery procedures with the NetWorker server. The bootstrap consists of three components that reside on the NetWorker server: the media database, the resource database, and a server index.

C

client
Computer, workstation, or application server whose data can be backed up and restored with the NetWorker software.

client file index
Database maintained by the NetWorker server that tracks every database object, file, or filesystem backed up. The NetWorker server maintains a single index file for each client computer. The tracking information is purged from the index after the browse time of each backup expires.

Client resource
NetWorker server resource that identifies the save sets to be backed up on a client. The Client resource also specifies information about the backup, such as the schedule, browse policy, and retention policy for the save sets.

cluster client
A NetWorker client within a cluster; this can be either a virtual client, or a NetWorker Client resource that backs up the private data that belongs to one of the physical nodes.
| **cluster virtual server** | Cluster network name, sometimes referred to as cluster server name or cluster alias. A cluster virtual server has its own IP address and is responsible for starting cluster applications that can fail over from one cluster node to another. |
| **Console server** | See “NetWorker Management Console (NMC).” |
| **current host server** | Cluster physical node that is hosting the Cluster Core Resources or owns the Cluster Group. The cluster virtual server resolves to the current host server for a scheduled NetWorker backup. |
| **database** | 1. A collection of data arranged for ease and speed of update, search, and retrieval by computer software.  
2. An instance of a database management system (DBMS), which in a simple case might be a single file containing many records, each of which contains the same set of fields. |
| **datazone** | Group of clients, storage devices, and storage nodes that are administered by a NetWorker server. |
| **device** | 1. Storage folder or storage unit that can contain a backup volume. A device can be a tape device, optical drive, autochanger, or disk connected to the server or storage node.  
2. General term that refers to storage hardware.  
3. Access path to the physical drive, when dynamic drive sharing (DDS) is enabled. |
| **device-sharing infrastructure** | The hardware, firmware, and software that permit several nodes in a cluster to share access to a device. |
| **disaster recovery** | Restore and recovery of business operations and data in the event of hardware failure or software corruption. |
| **enabler code** | Unique code that activates the software:  
- Evaluation enablers or temporary enablers, such as a Powerlink entitlement for NetWorker, expire after a fixed period of time.  
- Base enablers unlock the basic features for software.  
- Add-on enablers unlock additional features or products, for example, library support.  
See also “license key.” |
| **failover** | A means of ensuring application availability by relocating resources in the event of a hardware or software failure. Two-node failover capability allows operations to switch from one cluster node to the other. Failover capability can also be used as a resource management tool. |
failover cluster  Windows high-availability clusters, also known as HA clusters or failover clusters, are
groups of computers that support server applications that can be reliably utilized with a
minimum of down-time. They operate by harnessing redundant computers in groups or
clusters that provide continued service when system components fail.

G

Group  Client computer or group of clients that are configured to back up files during a NetWorker
scheduled backup, according to a single designated schedule or set of conditions.

H

Highly available application  An application that is installed in a cluster environment and configured for failover
capability. On an MC/ServiceGuard cluster this is called a highly-available package.

Highly available package  An application that is installed in a HP MC/ServiceGuard cluster environment and
configured for failover capability.

Host  Computer on a network.

host ID  Eight-character alphanumeric number that uniquely identifies a computer.

hostname  Name or address of a physical or virtual host computer that is connected to a network.

L

License key  Combination of an enabler code and authorization code for a specific product release to
permanently enable its use. Also called an activation key.

M

Managed application  Program that can be monitored or administered, or both from the Console server.

Media index  Database that contains indexed entries of storage volume location and the lifecycle status
of all data and volumes managed by the NetWorker server. Also known as media
database.

N

NetWorker Management Console (NMC)  Software program that is used to manage NetWorker servers and clients. The NMC server
also provides reporting and monitoring capabilities for all NetWorker processes.

NetWorker server  Computer on a network that runs the NetWorker server software, contains the online
indexes, and provides backup and restore services to the clients and storage nodes on the
same network.

toolkit_install_path  The path or directory where the installation process places the NetWorker software.
  
  - AIX: /usr/sbin
  - Linux: /usr/bin
  - Solaris: /usr/sbin
  - HP-UX: /opt/networker/bin
Glossary

- **node**: A physical computer that is a member of a cluster. See also “physical client.”
- **node name**: The HACMP/PowerHA for AIX defined name for a physical node. See also “physical client.”

**P**

- **pathname**: Set of instructions to the operating system for accessing a file. An absolute pathname indicates how to find a file starting from the root directory and working down the directory tree. A relative pathname indicates how to find a file starting from the current location.
- **physical client**: The client associated with a physical node. For example the / and /usr file systems belong to the physical client.

**Physical host address (physical hostname)**: The address used by the physical client. For HACMP for AIX 4.5, this is equivalent to a persistent IP address.

- **private disk**: A local disk on a cluster node. A private disk is not available to other nodes within the cluster.

**R**

- **recover**: To restore data files from a backup volume to a client disk and apply transactional (redo) logs to the data to make it consistent with a given point in time.

- **remote device**: 1. Storage device that is attached to a storage node that is separate from the NetWorker server.

  2. Storage device located at an offsite location that stores a copy of data from a primary storage device for disaster recovery.

- **resource**: Software component that describes details of the NetWorker server or its clients. Clients, devices, schedules, groups, and policies are all NetWorker resources. Each resource has configurable attributes that define its properties.

- **resource database**: NetWorker database of information about each configured resource.

- **resource group (application service)**: The AutoStart defined name for a virtual server. See also “virtual server.”

**S**

- **save**: NetWorker command that backs up client files to backup media volumes and makes data entries in the online index.

- **save set**: Group of files or a filesystem that has been backed up on storage media by using the NetWorker software.

- **service address**: The address used by highly-available services in an HACMP/PowerHA for AIX environment.

- **shared disk**: A disk that is shared by the cluster nodes.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>scheduled backup</td>
<td>Type of backup that is configured to start automatically at a specified time for a group of one or more NetWorker clients. A scheduled backup generates a bootstrap save set.</td>
</tr>
<tr>
<td>stand-alone server</td>
<td>A NetWorker server that is running within a cluster, but <em>not</em> configured as a highly-available application. A stand-alone server does not have failover capability.</td>
</tr>
<tr>
<td>storage device</td>
<td>See “device.”</td>
</tr>
<tr>
<td>storage node</td>
<td>Storage device physically attached to a computer other than the NetWorker server, whose backup operations are administered from the controlling NetWorker server.</td>
</tr>
<tr>
<td>virtual client</td>
<td>A NetWorker Client resource that backs up data that belongs to a highly-available service or application within a cluster. Virtual clients can fail over from one cluster node to another. For HACMP/PowerHA for unix the virtual client is the client associated with a highly-available resource group. The file system defined in a resource group belongs to a virtual client. The virtual client uses the service address. The HACMP/PowerHA for AIX resource group must contain an IP service label to be considered a NetWorker virtual client.</td>
</tr>
<tr>
<td>virtual server</td>
<td>A NetWorker server configured to run as a highly-available application. A virtual server can fail over from one cluster node to another.</td>
</tr>
</tbody>
</table>