Cascaded replication environment ........................................................ 33
Shared datazones environment .......................................................... 34
Dedicated storage node environment ................................................... 36

Chapter 3  DD Boost Conversion and Upgrade
Upgrading from legacy DD Boost configurations ...................................... 40
Converting DD Boost devices from IP to FC connectivity ................................ 40
Redirecting backups from other devices to DD Boost .................................. 40
Migrating legacy save sets to new devices .................................................. 42
  Migration versus native Data Domain replication ................................... 43
  Migration methods .............................................................................. 44
  Migrating legacy save sets to DD Boost devices ..................................... 44
Migration scenarios ............................................................................... 45
  Migration to DD Boost from conventional tape or AFTD ....................... 45
  Migration to DD Boost from deduplicated VTL or AFTD storage ............. 47

Chapter 4  Software Configuration
DD Boost configuration road map .......................................................... 52
Configuring the Data Domain system for DD Boost .................................. 52
Configuring NetWorker for DD Boost devices ........................................... 54
  DD Boost device performance considerations ....................................... 54
  Methods to configure DD Boost devices ................................................. 54
Configuring DD Boost devices with the wizard ........................................... 54
Configuring DD Boost devices with NMC property windows .................... 57
  Adding a host Data Domain system to NMC Enterprise view .................. 57
Configuring a DD Boost device .............................................................. 58
Creating a volume label template for DD Boost devices ............................. 62
Creating pools to target DD Boost devices .............................................. 63
Labeling and mounting devices on the storage node .................................. 64
Configuring clients to back up to DD Boost devices .................................. 65
  Configuring a backup client with the wizard .......................................... 65
  Configuring a backup client with NMC property windows ...................... 66
Deactivating and removing DD Boost devices ........................................... 70
  Converting a device to read-only .......................................................... 70
  Disabling a device ................................................................................ 70
  Deleting an AFTD device ..................................................................... 70

Chapter 5  Cloning and Replicating Data
DD Boost clone and replication support .................................................. 74
  Datazone requirement ......................................................................... 74
  Clone pool requirement ....................................................................... 74
  Clone reports ...................................................................................... 74
Clone formats .......................................................................................... 74
  CCR format ....................................................................................... 74
  Normal clone format ......................................................................... 75
Data Domain native replication considerations ........................................ 75
Configuring a backup group and pool for CCR .......................................... 76
Configuring the CCR environment .......................................................... 76
Configuring clone operations .................................................................... 78
Starting scheduled clone operations manually ........................................... 81
  Manually starting a clone operation from the Configuration window ......... 81
  Manually starting a clone operation from the Monitoring window .......... 81
Contents

Chapter 6 Restoring Data
- Cloning with nsrclone ................................................................. 81
- Restoring DD Boost deduplicated data ........................................ 84
- Restore requirements for deduplicated data.......................... 84
- Supported NetWorker restore procedures .......................... 84
- Restoring by Client Direct over IP from an FC-enabled device ... 84
- Disaster recovery ......................................................................... 85
- Causes of disaster ................................................................. 85
- Potential losses ........................................................................ 85
- Disaster recovery requirements ............................................ 85
- Disaster recovery scenarios .................................................. 86

Chapter 7 Monitoring, Reporting, and Troubleshooting
- Monitoring Data Domain events, statistics, and logs ................. 88
  - Viewing the statistics, logs, and alerts ................................. 88
  - Viewing backup statistics in NMC ........................................ 89
  - Viewing backup alerts (SNMP traps) in NMC ..................... 89
  - Configuring SNMP for Data Domain .................................. 90
- Generating reports ..................................................................... 92
  - Configuring a report .......................................................... 92
  - Types of backup reports ..................................................... 93
  - Data Domain statistic reports ........................................... 95
  - Advanced reporting .......................................................... 95
- Replacing a failed or old storage node ..................................... 95
- Troubleshooting ....................................................................... 97
  - Name resolution issues ...................................................... 97
  - Network connection issues ............................................... 98
  - Device access errors ........................................................ 98
  - Backup fails for older NetWorker application modules ........... 99
  - Multiple ssid recovery fails on AIX clients with less than 2 GB RAM .... 99

Appendix A Upgrading from a NetWorker 7.6 SP1 release
- Changes to the folder structure and the backup sessions ........ 102
- Planning the upgrade ............................................................ 102

Glossary

Index
FIGURES

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Direct (DFA) backup versus traditional storage node backup</td>
<td>31</td>
</tr>
<tr>
<td>CCR for disaster recovery</td>
<td>32</td>
</tr>
<tr>
<td>CCR cascaded to multiple Data Domain systems</td>
<td>34</td>
</tr>
<tr>
<td>Data Domain system shared across two NetWorker datazones</td>
<td>35</td>
</tr>
<tr>
<td>Single datazone with dedicated storage nodes and one high-bandwidth link</td>
<td>37</td>
</tr>
<tr>
<td>Migration from conventional storage to DD Boost devices on a different storage node</td>
<td>46</td>
</tr>
<tr>
<td>Migration from conventional storage to DD Boost devices on the same storage node</td>
<td>47</td>
</tr>
<tr>
<td>Migration from VTL to DD Boost devices on a different storage node</td>
<td>48</td>
</tr>
<tr>
<td>Migration from VTL to DD Boost devices on the same storage node</td>
<td>49</td>
</tr>
<tr>
<td>Example of the device name and the access information for a DD Boost device</td>
<td>59</td>
</tr>
<tr>
<td>Clone properties in the Client resource general settings</td>
<td>79</td>
</tr>
<tr>
<td>NetWorker Administration showing DD Boost devices</td>
<td>89</td>
</tr>
<tr>
<td>Data Domain alerts to monitor</td>
<td>91</td>
</tr>
<tr>
<td>Report configuration</td>
<td>93</td>
</tr>
</tbody>
</table>
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 technical support professional if a product does not function properly or does not function as described in this document.

Note: This document was accurate at publication time. Go to EMC Online Support (https://support.emc.com) to ensure you are using the latest version of this document.

Revision history

The following table lists the revision history of this document.

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description of added or changed sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>October 2014</td>
<td>• Provided instructions to modify parallel cloning sessions, see step 7 in “Configuring the CCR environment” on page 76.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Corrected “non-parallel” to “parallel” save streams in “Multiple ssid recovery fails on AIX clients with less than 2 GB RAM” on page 99.</td>
</tr>
<tr>
<td>02</td>
<td>October 2013</td>
<td>Release of this document for General Availability (GA). Updated the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Features not supported by the integration” on page 16 - Second bullet, native Data Domain replication not fully supported on DD Boos devices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “DD Boost storage structures and limits” on page 22 - Last bullet, Data Domain MTree quotas are supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Configuring the CCR environment” on page 76 - Note. Data Domain encryption, global compression, and low-bandwidth optimization must match on both systems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “FC support” on page 26 “FC support” on page 26 - Sixth bullet. All hosts that use FC must have an HBA card and you must configure Access groups.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Configuring clone operations” on page 79. Removed extraneous step at end.</td>
</tr>
<tr>
<td>01</td>
<td>July, 2013</td>
<td>First release of this document for Directed Availability (DA) of EMC NetWorker and EMC Data Domain Boost Deduplication Devices Integration Guide.</td>
</tr>
</tbody>
</table>

Purpose

This document provides planning, practices, and configuration information for the use of DD Boost devices within an EMC NetWorker backup and storage management environment.

Audience

This document is intended for system administrators. Readers of this document must be familiar with the following tasks:

- Identifying the different hardware and software components that make up the NetWorker datazone.
- Following procedures to configure storage management operations.
Following guidelines to locate problems and implement solutions.

Related documentation

This document is part of the NetWorker documentation set. The following EMC publications provide additional information:

- **EMC NetWorker Software Compatibility Guide** provides a list of client, server, and storage node operating systems supported by the EMC information protection software versions.
- **EMC NetWorker Installation Guide** provides instructions on installing or updating the NetWorker software for clients, console, and server on all supported platforms.
- **EMC NetWorker Cluster Installation Guide** provides information on installation of the NetWorker software on cluster servers and clients.
- **EMC NetWorker Administration Guide** provides information on how to configure and maintain the NetWorker software.
- **EMC NetWorker Release Notes** provides information on new features and changes, fixed problems, known limitations, and environment and system requirements for the latest NetWorker software release.
- **EMC DD OS 5.3 Administration Guide** provides information on how to configure, manage, and maintain the Data Domain operating system.
- **EMC NetWorker Licensing Guide** provides information on licensing NetWorker products and features.
- **EMC NetWorker License Manager Installation and Administration Guide** provides information on installation, setup, and configuration of the NetWorker License Manager product.
- **EMC NetWorker Module for Databases and Applications** provides information on how to configure and maintain the NMDA software.
- **EMC NetWorker Module for Microsoft Applications** provides information on how to configure and maintain the NMM software.
- **EMC NetWorker Module for SAP with Oracle** provides information on how to configure and maintain the NMSAP software.
- **EMC NetWorker Error Message Guide** provides information on common NetWorker error messages.
- **EMC NetWorker Command Reference Guide** provides reference information on NetWorker commands and options.
- **EMC NetWorker and EMC Avamar Integration Guide** provides information on planning, practices, and configuration of Avamar deduplication nodes within an integrated NetWorker environment.
- **EMC NetWorker and VMware Integration Guide** provides information on planning, practices, and configuration of VMware and the vStorage API for Data Protection (VADP) within an integrated NetWorker environment.
- **EMC NetWorker Management Console Online Help** provides information on how to perform the day-to-day administration tasks in the NetWorker Management Console and the NetWorker Administration window.
EMC NetWorker User Online Help provides information on how to use the NetWorker User program to back up, recover, archive, and retrieve files over a network. The NetWorker User program is the Microsoft Windows client interface for the NetWorker server.

Conventions used in this document

EMC uses the following conventions for special notices:

**Note:** A note presents information that is important, but not hazard-related.

**NOTICE**

An important notice contains information essential to software or hardware operation.

Typographical conventions

EMC uses the following type style conventions in this document:

- **Normal** Used in running (non-procedural) 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, file names, directory names, computer names, links, groups, service keys, file systems, and notifications

- **Bold** Used in running (non-procedural) 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, file names, 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 non-essential 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, go to EMC Online Support at:

https://support.emc.com

**Technical support** — Go to EMC Online Support and click Service Center. You will see several options for contacting EMC Technical Support. 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 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:

BRSdocumentation@emc.com
CHAPTER 1
DD Boost Features and Environment

This chapter includes the following sections:

- DD Boost integration features ................................................................. 14
- Data Domain network environment ......................................................... 16
- Licensing in Data Domain systems .......................................................... 18
DD Boost integration features

The EMC® NetWorker® integration with EMC Data Domain® systems uses DD Boost deduplication devices, which offer the following integration features.

DD Boost and data deduplication

NetWorker client software uses DD Boost components to integrate with DD Boost logical storage devices on Data Domain systems and perform data deduplication backups. Data deduplication is a type of data compression that removes duplicate information to dramatically reduce the amount of backup data sent to the storage devices and reduce the bandwidth required for the data transport.

DD Boost can run up to 60 concurrent sessions (save streams) per DD Boost device for backup and recovery. This high throughput reduces the number of devices needed and thereby reduces the impact on the Data Domain system’s performance and maintenance. The resulting performance gain provides an advantage over conventional advanced file type device (AFTD) or virtual tape library (VTL) interfaces that do not handle these high session rates.

The NetWorker client software includes two DD Boost software components to enable deduplication operations on the client:

- The DD Boost library API, which enables the NetWorker software to communicate with the Data Domain system.
- The distributed segment processing (DSP) component, which reviews the data already stored on the Data Domain system and adds only unique data to storage.

During recovery to a NetWorker client, the Data Domain system converts the stored data to its original non-deduplicated state.

Client Direct data handling

The Client Direct feature enables clients with a direct network connection to the Data Domain system to send and receive data directly to Data Domain AFTD and DD Boost devices. Client Direct is also known as direct file access (DFA). Client Direct supports multiple concurrent client data backup and restore operations that bypass the NetWorker storage node, thereby eliminating a potential bottleneck. The storage node manages the devices that the clients use but does not handle the backup data.

When the connection is available, NetWorker enables Client Direct by default and also uses Client Direct to recover duplicated backups that NetWorker had performed with a storage node.

DD Boost storage devices

A Data Domain system stores deduplicated NetWorker backups on DD Boost storage devices that appear as folders on the Data Domain system. The NetWorker server, storage nodes, and Client Direct clients can all access the DD Boost devices.
Retention tier storage restriction

The Data Domain Extended Retention software option, available with DD OS 5.2 and later, extends the Data Domain storage structure with internal tiers for long-term retention of deduplicated backup data. You can use Data Domain operations to migrate the data from the active tier to the retention tier.

On a Data Domain system with Extended Retention software enabled, NetWorker software works with the active tier only and is not aware of any migration activity between the internal storage tiers.

DD Boost synthetic full backups

The NetWorker synthetic full backup feature is an efficient way to create new full backups by combining existing full and partial backups. This feature integrates the NetWorker 8.1 synthetic full backup feature and DD OS 5.3 and later virtual-synthetics feature. Synthetic full backups are created directly on the DD Boost devices. Both NetWorker and Data Domain are configured by default to enable DD Boost synthetic full backups.

The *EMC NetWorker Administration Guide* provides details.

DD Boost clone operations

You can create clones of backups stored on DD Boost devices and copy them to remote offsite storage for added protection and efficient disaster recovery. The NetWorker clone feature configures the clone operations and indexes the clone copies for the retention periods that are configured by NetWorker storage policies. All data movement for NetWorker clone operations must use IP network connectivity.

There are two types of clone operations, both of which require the DD Boost software on the NetWorker storage nodes:

- You can perform NetWorker clone-controlled replication (CCR or optimized clone) operations to replicate data from a DD Boost device to another DD Boost device at a different location. CCR preserves the deduplicated data format and minimizes bandwidth usage between the Data Domain systems.

- You can perform clone to native format operations that clone data from DD Boost storage to conventional storage media, such as disk or tape. This operation reverts the data to its native non-deduplicated format, which is required for the data to be recoverable from a conventional disk device or tape device.

NMC management of DD Boost operations

All configuration, monitoring, and reporting operations for DD Boost devices can be efficiently managed from NMC software. The NMC server must have network access to each Data Domain system that it manages.

The NMC Device Configuration Wizard simplifies the configuration of DD Boost storage devices, backup clients, storage pools, volume label operations, and save set clone operations.
Features not supported by the integration

The integration does not support the following Data Domain or NetWorker features:

- Data Domain Retention Lock is not supported on DD Boost devices.
- Native Data Domain directory replication (MTree replication) does not fully support DD Boost devices, which are rendered as read-only directories. “Data Domain native replication considerations” on page 75 provides details.

Data Domain network environment

A NetWorker with Data Domain network environment can include the following components.

FC and IP network connectivity

DD Boost devices support data transport over both Fibre Channel (FC) and Ethernet IP network connections for data backup and data recovery operations. FC connectivity for DD Boost devices requires NetWorker 8.1 and DD OS 5.3 or later and the FC network must be deployed as a SAN.

The NetWorker server also requires Ethernet IP connections to communicate with all hosts involved in DD Boost operations and for data movement during NetWorker clone-controlled replication operations.

A pre-sales qualifier is required for all DD Boost over FC configurations. Qualifiers must be submitted and approved by the EMC Solution Validation Center. DD Boost over FC qualifiers can be found a the following location: http://gig.corp.emc.com.

Note: Client Direct backup to DD Boost devices is not supported over FC for 32-bit Linux NetWorker clients installed on 64-bit Linux systems. The Client Direct backup will revert to a storage node backup.

Data Domain storage system

A Data Domain system that runs DD OS 5.0 or later can store deduplicated backup or cloned data on DD Boost devices.

A Data Domain system can support mixed environments that may include DD Boost devices, VTLs, and CIFS or NFS AFTD disk configurations. The Data Domain system may require additional licenses for the DD Boost functionality.

For full compatibility with NetWorker, install the latest upgrade of the DD OS.

Data Domain Archiver

A Data Domain Archiver system is a special model for long-term data retention. You can create DD Boost devices on a Data Domain Archiver system that runs DD OS 5.0 or later software. The archive tier does not require additional capacity licensing.

This model of a Data Domain system can support mixed environments that may include DD Boost devices, VTL, and CIFS or NFS AFTD disk configurations.
NetWorker client host

A NetWorker client is a supported host whose data requires backup and restore services. The NMC server, NetWorker server, and NetWorker storage nodes are also NetWorker clients:

- NetWorker clients that use Client Direct deduplication must have NetWorker client 8.0 or later installed and must have direct network access to the Data Domain system that will store their data. This client software includes DD Boost 2.4.1 and later for NetWorker 8.0.x releases, and DD Boost 2.5 and later for NetWorker 8.0 SP1 and later. NetWorker enables Client Direct by default.
- Other NetWorker clients that do not use Client Direct deduplication may use a supported earlier NetWorker release, preferably 7.6 or later.
- Client Direct with FC connectivity to DD Boost devices requires NetWorker client 8.1.

The *EMC NetWorker Software Compatibility Guide* provides information on supported releases.

NetWorker server host

You must install NetWorker 8.0 or later on the NetWorker server that either stores, clones, or recovers client data on Data Domain systems. NMC provides a graphical user interface to NetWorker server operations.

The *EMC NetWorker Release Notes* provides details on supported Data Domain features.

NetWorker storage node

NetWorker storage nodes manage DD Boost and other storage devices. Backup data from NetWorker clients that do not use Client Direct deduplication is deduplicated by the NetWorker storage node and sent to the DD Boost devices.

You must install NetWorker 8.0 or later on each storage node that stores or clones data on DD Boost devices. All storage nodes within the same NetWorker datazone that use the DD Boost devices must run the same release, including the service pack.

Client Direct with FC connectivity to DD Boost devices requires the NetWorker storage node 8.1.

NetWorker application modules

NetWorker 8.0 and later supports Client Direct deduplication backup and recovery on clients with supported NetWorker application modules, such as NetWorker Module for Databases and Applications (NMDA), NetWorker Module for Microsoft Applications (NMM), and NetWorker Module for SAP with Oracle (NMSAP). The clients must have direct network access to the Data Domain system. The release notes for the application module provides details.
Licensing in Data Domain systems

A fresh installation of a NetWorker release (not an upgrade) enables evaluation of all features, including Data Domain features, with no enabler (license key) required for 30 days. You can extend this evaluation period by 15 additional days by typing the word grace as an authorization code before the end of the 30-day period. After the evaluation period, you cannot perform a backup unless you install permanent enablers.

NetWorker licenses

Two alternative types of licensing can enable the NetWorker server to interact with a Data Domain system, as described in the following sections. Some of the earlier NetWorker releases may require upgrade enablers.

Note: Unlike earlier releases, NetWorker 8.0 and later requires only a single enabler to support multiple interfaces and multiple network identities for Data Domain systems. Earlier NetWorker releases required an ifgroup software configuration of NICs on the Data Domain system, which enabled multiple storage nodes to use a single network identity and a single Data Domain Storage System Enabler. Although ifgroup is no longer needed to share licensing, ifgroup for DD Boost devices is still a valid and recommended practice for bandwidth aggregation.

The EMC NetWorker Licensing Guide and an EMC sales representative can provide licensing details.

Traditional licensing

Traditional licensing requires you to install individual enablers on the NetWorker server for each client, module, storage device, and any other licensed component, including Data Domain storage. For Data Domain storage, this licensing requires an enabler for Data Domain usage and an enabler that specifies the capacity of this usage as follows:

- The Data Domain Storage System Enabler (DD Boost Enabler) enables an unlimited number of Data Domain systems and DD Boost devices within the datazone.
- The Data Domain Capacity Entitlement Enabler enables the use of Data Domain systems within the datazone up to the purchased capacity.

NetWorker capacity entitlement licensing

NetWorker capacity entitlement licensing enables you to use an unlimited number of clients, modules, storage devices, and associated components within a datazone, including Data Domain storage. This type of licensing requires the following enablers:

- The NetWorker Source Capacity Datazone Enabler enables all the NetWorker components or features in the datazone, including Data Domain storage.
- The Tiered Capacity Entitlement License Enabler enables protection up to the purchased capacity for all the supported components or features in the datazone, including Data Domain storage.

The EMC NetWorker Licensing Guide provides requirements for environments that use a NetWorker Capacity Entitlement license. Contact an EMC sales representative for details.
Data Domain licenses

You must enable either the Data Domain system or the Data Domain system with Extended Retention software by using the following licenses for DD Boost operations:

- DDBOOST license
- REPLICATION license if you use CCR

To list the enabled licenses on the Data Domain system, type the `license show` command. The list includes OPENSTORAGE if a DD Boost license is installed, and REPLICATION if a replication license is installed. “Configuring the Data Domain system for DD Boost” on page 52 provides details.

For license inquiries, go to the Data Domain portal for service and support at https://my.datadomain.com.
CHAPTER 2
Planning and Practices

This chapter includes the following sections:

◆ DD Boost storage characteristics ................................................................. 22
◆ Network requirements .................................................................................. 25
◆ Deduplication efficiency .............................................................................. 27
◆ Host naming guidelines ............................................................................... 28
◆ Example backup environments ...................................................................... 30
DD Boost storage characteristics

NetWorker enables the integration with Data Domain systems by storing backup data on DD Boost devices.

**Note:** NetWorker 8.0 and later releases, unlike earlier releases, do not create read-only mirror devices. “Features not supported by the integration” on page 16 provides details.

The *EMC NetWorker Software Compatibility Guide* provides information on supported releases.

DD Boost storage structures and limits

DD Boost devices use a folder structure on the Data Domain system that has the following characteristics:

* The Data Domain storage consists of separate logical partitions called storage units (SUs) or managed trees (MTrees). These SUs are the parent folders that contain the DD Boost devices, which appear as subfolders.

* By default, the NetWorker Device Configuration Wizard creates each SU to handle a single NetWorker datazone and names the SU after the short hostname of the NetWorker server. You can define up to 99 SUs.

* For some Data Domain models with systems earlier than DD OS 5.3, running more than 14 active SU folders on a single Data Domain system at one time can impair performance. The *EMC NetWorker Administration Guide* provides details.

* Each DD Boost device is an SU child subfolder associated with a single NetWorker storage volume. However, a single NetWorker volume can share multiple DD Boost devices, which can result in performance gains in some environments. “DD Boost volume sharing” on page 22 provides details.

* NetWorker does not limit the number of DD Boost devices that you can create. For best performance, use fewer devices and more backup sessions on each device.

* Data Domain MTree quotas, added in DD OS 5.2, manage the usable capacity of SUs and directly impact the associated DD Boost devices. When an SU reaches its MTree quota setting, configured on the Data Domain system, a running DD Boost backup operation terminates. The Data Domain documentation provides details.

DD Boost volume sharing

Multiple DD Boost devices, specified by different names or aliases, can concurrently share a single NetWorker storage volume:

* Each DD Boost device operates with a single NetWorker storage volume and you must specify each device by its device access pathname.

* You can create multiple devices with the same device access pathname, provided you give each device a different name as an alias. You can use the different device aliases, for example, to manage different client hosts that share the same volume.
“Configuring a DD Boost device” on page 58 provides details on device access information.

**DD Boost performance**

DD Boost devices use multiple concurrent `nsmmd` (media mover) processes per device and each `nsmmd` process uses multiple concurrent save sessions (streams or threads). For optimal backup or clone operations, reduce the number of active devices. This reduces the performance and maintenance impacts on the Data Domain system.

Balance the session load among the available DD Boost devices so that new sessions attach to devices with the least load. To enable best performance, you can adjust the device’s Target Sessions, Max Sessions, and Max nsmmd Count attributes.

“Configuring a DD Boost device” on page 58 provides details on session settings.

The Data Domain documentation provides additional details on save sessions and performance.

**Memory requirements for DD Boost**

The physical memory requirement for a NetWorker storage node and a Client Direct client depends on the peak usage of the DD Boost devices.

Ensure the following memory requirements:

- A storage node that hosts DD Boost devices with other typical devices and typical services must have a minimum of 8 GB of RAM.
- A DD Boost client requires a minimum of 4 GB of RAM at the time of backup to ensure best performance for Client Direct backups.
- Each DD Boost device requires an initial 24 MB of RAM on the storage node and Client Direct client. Each DD Boost save session requires an additional 24 MB. For example, to run 10 sessions requires 24 + 240 MB. The default maximum sessions value of 60 sessions per DD Boost device requires 24 + 1440 MB.

**Devices in mixed device environments**

A Data Domain system can support mixed NetWorker environments, which can include DD Boost devices, VTLs, and CIFS or NFS AFTD disk configurations. Each different storage environment must use a different interface connection, either NIC for IP data transport or FC port for SAN data transport. You can migrate legacy data stored in these traditional storage environments to DD Boost devices through a NetWorker clone process over IP connections.

**DD Boost devices and media pools**

You can use media pools to direct client backups or clone copies of backup data to specific storage devices. You must configure pools for DD Boost devices with the following important consideration.

A pool that contains the DD Boost devices must not contain any other type of storage media and must not contain devices on more than one Data Domain system.
This practice ensures the optimal backup window and deduplication ratio with the least interference. When you store each backup on a single Data Domain system, you simplify recovery and Data Domain file replication.

Periodically review and remove unused pools that are no longer relevant to the storage environment.

Reclaiming expired storage space

When a backup on a Data Domain system reaches its retention expiry date, all references to the data become invalid. However, unlike conventional storage systems, the Data Domain system does not immediately free up space on the device because other existing backups or other clients may continue to have deduplication references to the same data.

For example, the deletion of 1 GB of data, even of unique data from a NetWorker perspective, does not mean that 1 GB of space is immediately available on the Data Domain system.

The DD OS `filesys show space` or `df` command shows the data that is eligible for deletion under the Cleanable GiB column.

The Data Domain system periodically reviews deduplication references and storage space and performs a cleanup. By default, these cleanups occur weekly.

**Note:** If a DD Boost device becomes full during a backup, the backup immediately fails. The device does not pause or wait for space to become available.

The DD OS `filesys clean` command describes all the available options that you can use to reclaim and recycle expired NetWorker save sets and other redundant or expired data.

Removing a DD Boost device

You must use special procedures to remove DD Boost devices.

“Deleting an AFTD device” on page 70 provides details.

DD Boost devices on Data Domain Archiver systems

You can use SU folders or MTrees and DD Boost devices on Data Domain Archiver systems, similar to those on standard Data Domain systems, with the considerations described in this section.

The Data Domain documentation provides details on Data Domain Archiver features.

Active and archive tier structure

On Data Domain Archiver systems, you can store data in two tiers of SUs. There is an active tier and an archive tier:

- Data Domain places all incoming data first in the active file system tier, which is for short-term data storage and is similar to standard Data Domain systems.

You can use the active tier for client backups, provided that you apply appropriate data movement and data retention policies. As a best practice, create separate SUs for backup operations.
You can move data from the active tier to the archive tier, based on data movement policies that you apply at the SU level.

DD OS 5.0 and 5.1 support up to 14 active and 99 defined SUs with the Extended Retention software feature. NetWorker does not limit the number of DD Boost devices that you can create on the system.

Data movement between tiers

Each SU has a single data movement policy that applies to all the devices that the SU serves within the corresponding NetWorker datazone, whether the devices are NetWorker AFTD or DD Boost devices.

You can create a Data Domain SU data movement policy to specify when the data moves from devices in the active tier to devices in the archive tier. Typically, you would not move data to the archive tier for less than 30 days retention. The policy and movements are internal to the Data Domain Archiver system, and the NetWorker software has no awareness of them.

You can assign alternative data movement policies to the client data by using additional SUs, created by NMC or nsradmin, specific to this purpose. For example, you can store data to different archive DD Boost devices in separate SUs with different archive policies. Also, you can move data within the same Data Domain Archiver system by using CCR.

For CCR on the same Data Domain system that includes the Extended Retention software feature, you must replicate between two different SUs. You can apply different retention policies to manage the data efficiently.

Network requirements

DD Boost devices support data transport over both Ethernet IP networks and FC SAN environments for both data backup and data recovery operations.

The NetWorker server requires Ethernet IP connections to control all hosts involved in its DD Boost operations.

Ethernet IP support

The recommended minimum Ethernet IP network connectivity to the Data Domain system includes two 1 GbE network links. One link is used for administration and the other for data backup, if FC is not used. Various types of network connections can improve data throughput, depending on the Data Domain system model.

You can maximize data throughput of the Data Domain system by using multiple connections or high-bandwidth connections. For example, you can use multiple 1 GbE connections for dedicated storage nodes and storage devices. Connections for 10 GbE are also available, and you can use these instead of or with 1 GbE interfaces.

In environments where 10 GbE connectivity is not available, two alternatives are available:

- Use a dedicated 1 GbE data connection from a storage node directly to the Data Domain system. This connection provides a private, high-bandwidth data connection and avoids the latency and complexity of a shared Ethernet connection. You also need a separate conventional Ethernet connection for administration and NMC access.
Use two or more NICs on the Data Domain system with 1 GbE connections aggregated together by using the Data Domain `ifgroup` command. This grouping provides increased data capacity and can offer some resiliency. The Data Domain system provides automatic Advanced Load Balancing and Link Failover for NIC connections. The Data Domain documentation provides details.

TCP/IP over LAN, WAN, and MAN support

DD Boost devices do not distinguish TCP/IP network types (LAN, WAN, or MAN) and can successfully operate where packet loss is strictly 0% and latency is less than 20 ms. DD Boost devices support networks that meet the Data Domain Network Class Definition 1. Networks with greater latency that fall within Data Domain Network Class Definition 2 could require special consideration. To ensure support, you can submit a request for product qualification (RPQ).

The *EMC DD OS 5.3 Administration Guide* provides more information on network class definitions and the RPQ process.

FC support

NetWorker supports data backup and data recovery operations to DD Boost devices over Data Domain Fibre Channel (DFC or FC) connections, configured as a SAN, as follows:

- The NetWorker storage nodes and all Client Direct clients must have FC SAN network access to the Data Domain systems that have FC-enabled DD Boost devices
- The environment must also have an Ethernet IP network. The NetWorker server uses IP connections to communicate with its clients, storage nodes, and the Data Domain system. DD Boost devices involved in CCR operations must have IP connectivity for the data transport.
- FC-enabled NetWorker clients must run on a supported Windows or Linux operating system.
- The NetWorker clients and NetWorker storage nodes must run NetWorker 8.1.
- The Data Domain system must run DD OS 5.3 or later.
- All hosts that use FC must have an HBA card with at least 4 Gbps bandwidth capacity. You must devote an initiator port on each card to FC for DD Boost devices. You must configure Access groups. The *EMC DD OS Administration Guide* provides details.
- FC-enabled DD Boost devices support Client Direct backup and restore over FC, provided that you have enabled the clients with FC connections and settings:
- Data Domain systems support the coexistence of FC-enabled DD Boost devices together with VTL devices on the same Data Domain system. However, the FC-enabled DD Boost devices must not share an initiator with VTL devices on the same Data Domain system.
- You can convert an existing DD Boost device from IP to FC connectivity and settings without the loss of the stored data. You can restore the data to FC-enabled Data Direct clients through their FC connection and to IP-only clients through the storage node. “Converting DD Boost devices from IP to FC connectivity” on page 40 provides details.
The NetWorker server can migrate legacy backup data stored on a VTL or tape device to an FC-enabled DD Boost device. You can create a clone pool for this migration. “Migrating legacy save sets to new devices” on page 42 provides details.

Clone-controlled replication is supported between FC-enabled DD Boost devices provided there is IP connectivity between the Data Domain systems. CCR is not supported over a fibre channel network.

The EMC NetWorker Software Compatibility Guide provides the latest details of supported versions.

Firewall requirements

Regardless of the network connections used, communication through a firewall requires the use of specific ports and specific protocols for backup, monitoring, and replication across sites. The following table lists firewall ports are required to be open between the Data Domain, NetWorker, and NMC servers:

<table>
<thead>
<tr>
<th>Port</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 111</td>
<td>NFS portmapper</td>
</tr>
<tr>
<td>TCP 161</td>
<td>For the NMC server to query for alerts and statistics</td>
</tr>
<tr>
<td>TCP 162</td>
<td>SNMPTRAP for NMC server to monitor status and monitor events</td>
</tr>
<tr>
<td>TCP 2049</td>
<td>NFS</td>
</tr>
<tr>
<td>TCP 2051</td>
<td>Replication, if you use CCR, Data Domain to Data Domain systems</td>
</tr>
</tbody>
</table>
| TCP xxxx | Select a random port for NFS mountd, 2052 is the default. On the Data Domain system, type the following command from SE mode: 
  # nfs set mountd-port xxxx
  Restart the Data Domain system. |

The Data Domain system provides functionality to review the network configuration and network capabilities and provides SSH Telnet to help diagnose issues.

Deduplication efficiency

The deduplication ratio measures the efficiency of reduction in storage space that results from the data deduplication/compression technology. Ratios of 20:1 are broadly achievable and reductions of even 5:1 are extremely valuable.

Several factors can contribute to the deduplication ratio:

- Retention periods
- Types of data backed up
- Change rates
- Frequency of full backups
- Use of encryption and compression

For the best use of storage space, consider the factors in the following sections, along with the periodic clearing of expired storage space and the removal of unused pools.
Retention periods

The deduplication ratio increases with longer data retention periods. The longer you retain the stored save sets, the greater the chance that identical data exists in storage that will be used to deduplicate each subsequent backup, and the greater is the efficiency of the storage usage.

Types of data backed up

Some types of data, such as text documents, slide presentations, spreadsheets, email, source code, and most database types, contain redundant data and are good deduplication candidates.

Some other types of data, such as audio, video, and scanned images already consist of compressed data. Typically, the first full deduplication backup of these data types yields low reductions, but subsequent backups generally produce high deduplication ratios if the data has a low change rate.

Change rate

Data with a low change rate changes little between backups, produces high deduplication ratios, and is a good candidate for deduplication. Deduplication removes data that is already in storage and only stores new data.

When a new save set is deduplicated, the number of unique blocks within it can vary widely depending on the data type, and often there is little that can be deduplicated. Yet because the Data Domain system compresses the data blocks, there is typically a 2:1 to 3:1 (50%–75%) data reduction.

The storage savings increase with each subsequent backup of the save set because a deduplication backup writes to disk only those data blocks that are unique to the backup. In conventional business operations, the data change rate is typically low and unique data may represent only 1%–2% of the data present in each additional backup set. The remainder of the backup is deduplicated against the data already stored on the system.

Frequency of full backups

Frequent full backups result in high deduplication ratios, but also increase the data processing operations on the NetWorker storage node or Client Direct client. For example, compare daily full deduplication backups with weekly full and added daily incremental deduplication backups. Both of these schedules require essentially the same amount of storage space and the same network bandwidth between the storage node and the Data Domain system. The backups send only unique data to storage, even for full backups.

A daily full backup schedule, however, sends a greater amount of data from the client to the storage node for processing than the weekly full with daily incremental schedule.

Host naming guidelines

The network environment has an impact on hostname resolution methods and you need to follow the manufacturer recommendations. Use the local hosts file to help diagnose and resolve naming issues. You can use the net hosts add command on the Data Domain system to add hosts to the /etc/hosts file.
Use the following guidelines to create consistent, easy-to-identify hostnames that improve the configuration, report generation, and troubleshooting experience in the DD Boost environment:

◆ Create names that are unique across all NetWorker datazones. Use names that identify the network role, such as administration, backup, cloning, or production. A name can also include a location or a server name.

◆ Use a single hostname associated with each NIC, IP, or FC interface within the same NetWorker datazone.

◆ Names can include abbreviations for the source or the target to quickly identify whether the network connections are correct. For example, add an abbreviation of the storage node hostname in the Data Domain name and an abbreviation of the Data Domain hostname in the storage node name. Be sure to include these names in the Data Domain /etc/hosts file.

◆ Specify all aliases, such as long and short names, IP addresses, etc. for the NetWorker server and the storage nodes in their respective Client resources. Specify the aliases on the Globals 1 of 2 tab of a Client resource.

◆ Test to ensure that you can consistently resolve all hostnames in the network from multiple locations in both directions. For example, ensure that you can resolve the short name to IP address, long name to IP address, IP address to short name, and IP address to long name.

◆ In general, use short, easy-to-identify, descriptive names instead of IP addresses or fully qualified name strings for devices and storage nodes. Long names may not fit into some views. The following examples include a long name and a short name:

  NWDD365-1.burloak.lab.mycorp.com:/NWDZ_Dr1
  NWDD365-1:/NWDZ_Dr1

◆ Except for pool names and hostnames, use standard alphanumeric characters, including dot (.), hyphen (-), and underscore (_), with no spaces and no special characters. Pool names and hostnames may not use underscores (_).

◆ Use consistent formats, in terms of text field length and text case, and include leading zeros in numbers, with a maximum of 50 characters.

◆ Avoid the use of dates in names where the dates could change or become meaningless in the future.

**IP addresses**

Avoid IP addresses because numbers are more difficult to identify and troubleshoot than descriptive names. However, there are exceptions:

◆ The Data Domain system requires the use of IP addresses to interface with an ifgroup for Advanced Load Balancing and Link Failover features.

◆ For CCRs, the hosts file on the source Data Domain system must list the IP address of the target Data Domain system. Otherwise, the CCR will use the same network access that the backup and restore operations use.

The Data Domain documentation provides details.
Example name formats

The following examples provide some name formats.

DD Boost devices

Format: Data_Domain_system_name-device_name
For example: dd-tenendo-device01

Folders on Data Domain system

Create DD Boost device names that refer to the NetWorker storage node and indicate whether you use them for either backup or clone operations.

Format: storage_node_name-operation-device_name
For example: dzburl-back-dd01

Volume labels for Data Domain

Format: media_type-label_number
For example: ddmedia-001

Example backup environments

This section provides some examples of how you can deploy the Data Domain integration in NetWorker backup environments. As a best practice for Ethernet IP networks, use two interfaces, 1 GbE for administration and 10 GbE for data. For FC environments, use IP interfaces for administration and clone operations, and a SAN interface for backup operations. Use the following examples to plan your environment.

Client Direct deduplication environment

“Client Direct data handling” on page 14 describes the Client Direct feature, which leverages client DSP software to send deduplicated data directly from a client to a Data Domain system and bypass the storage node.

Client Direct functionality is the default selection in the Client resource settings for data backup or recovery operations. If the client does not have a direct network connection to the Data Domain system, then these operations automatically use the traditional storage node workflow.

The following figure shows an example Client Direct environment.

Client Direct deduplication provides the following advantages:

◆ Deduplication on the client host dramatically reduces the bandwidth for the backup data transfer.
◆ You can share a single storage volume among DD Boost devices and among multiple backup hosts and multiple storage nodes. You can improve performance and maintainability by configuring multiple hosts and multiple sessions per device, instead of creating multiple devices.
Client Direct deduplication offers an alternative to an environment that uses a NetWorker client installed with a dedicated NetWorker storage node, as described in “Dedicated storage node environment” on page 36. The dedicated storage node environment requires additional licensing and configuration, and the backup clients or the applications on the clients may not support a dedicated storage node.

Figure 1  Client Direct (DFA) backup versus traditional storage node backup

Disaster recovery environment

A disaster recovery environment can use CCR to copy individual save sets or complete volumes from one Data Domain system to another at a geographically distant location. Each cloned replication (optimized clone) is a complete and independent copy of the source deduplicated data. NetWorker policies manage both the source (primary) and the clone (secondary) data. For additional protection, NetWorker can clone some or all of the stored data from the secondary system to tape storage.

You must configure, enable, and manage both the primary and secondary Data Domain systems within a single NetWorker datazone. You must configure target devices on the secondary Data Domain system. You can use either a single storage node or separate storage nodes for the local and remote operations within the datazone.

Note: NetWorker does not support CCR across datazones or to Data Domain devices that NetWorker does not manage.

The figure in this section illustrates an example of a disaster recovery environment. The NetWorker server requires two Data Domain Storage System Enablers, one for the primary Data Domain system and one for the remote secondary Data Domain system. DD in the figure signifies Data Domain:
1. The NetWorker server initiates the backup of client groups within its datazone.

2. Two storage nodes in the datazone write the backup data to media pools, which target specific DD Boost devices on the primary system.

3. The storage nodes communicate with the primary Data Domain system and store deduplicated backup data on the system’s devices over dedicated 10 GbE network connections.

**Note:** An ifgroup software configuration of 1 GbE NICs on the Data Domain system enables multiple storage nodes to use the same network identity. This bandwidth aggregation can improve performance for DD Boost devices. The Data Domain documentation provides details.

4. You can use CCR to store optimized clone copies of backups from the primary Data Domain system over a network to a geographically distant secondary Data Domain system for disaster recovery.

5. An additional option enables a further clone to conventional disk or conventional tape media. A NetWorker storage node, attached to the secondary Data Domain system, creates an additional NetWorker clone copy of the data for one of the backup groups, which NetWorker stores on conventional media. NetWorker reverts the data in this copy to the native non-deduplicated format, which is necessary for storage on conventional media.

![Figure 2  CCR for disaster recovery](Image)
Cascaded replication environment

A variation of the disaster recovery environment is the cascaded replication environment. Once a deduplicated backup has successfully completed, you can use the backup to create multiple clone copies in other locations, either simultaneously from the original deduplicated backup or in sequence from CCRs of the original. Each clone replication is a complete and independent copy of the source backup, complete with NetWorker policies. NetWorker does not limit the number of cascaded clone copies you can make, provided that the source save set for each clone successfully completes.

As with the previous example, you must configure, enable, and manage each Data Domain system in a cascaded environment within a single NetWorker datazone. You must configure target devices on the Data Domain systems that receive the clone copies.

The figure in this section illustrates an example of a cascaded replication environment with three separate Data Domain systems at three different sites. The NetWorker server requires three Data Domain Storage System Enablers, one for each Data Domain system. DR in the figure signifies disaster recovery:

- The first site is the primary backup location and is the production site.
- The second site is a local site with good communication links to the production site, typically within the same geographic location as the first site.
- The third site serves as the disaster recovery site, located at a geographically distant location. Communication to this more distant site is subject to greater restrictions on bandwidth and latency. This distant site could be in a different country or 250 kilometers (150 miles) or more distant from either of the other two sites.

This example environment operates as follows.

1. The NetWorker server initiates the backup of production site client groups within its datazone.
2. The production site storage node assigns the backup data to media pools, which target specific DD Boost devices on the primary Data Domain system.
3. The storage node communicates with the primary Data Domain system and stores deduplicated backup data on the system’s devices over dedicated 10 GbE network connections.
4. Once the backup successfully completes, you can use CCR to store optimized clone copies of the backups on the primary Data Domain system over a network to Data Domain systems at other locations. You can create these clone copies by either a sequential or concurrent method:
   - In the sequential method, NetWorker performs only one clone operation at a time in sequence. This method allows the production system to continue to function without the need to create additional clones for a distant site.

   For example, NetWorker uses the original backup on the primary Data Domain system to create an optimized clone copy on a local secondary Data Domain system. Once this process completes, NetWorker uses this copy to create an additional optimized clone copy on the geographically distant Data Domain system.

   The figure in this section illustrates data paths 1a and 1b for this method.
In the concurrent method, NetWorker may be able to perform the clone operations simultaneously. This method impacts the production system and requires more replication bandwidth.

**Note:** The concurrent method depends on many factors, and you would need to validate and test the performance at the individual sites.

For example, NetWorker uses the original backup on the primary Data Domain system as the source to create simultaneous clones on two target Data Domain systems.

The figure in this section illustrates data paths 2a and 2b for this method.

**Figure 3**  CCR cascaded to multiple Data Domain systems

### Shared datazones environment

You can store backups from two separate datazones on a single Data Domain system. In this configuration, consider dividing the stream counts and the memory resources to manage the two datazones as separate entities. Do not let one datazone impact the performance of the other datazone. The total number of streams and devices cannot exceed the total capacity of the Data Domain system.
The figure in this section illustrates a dedicated 10 GbE network connection shared by three storage nodes in two datazones. Two storage nodes belong to the DZ-A datazone, and one storage node belongs to the DZ-B datazone.

1. The two NetWorker servers begin backups of client groups within their respective datazones.
2. The three storage nodes write the backup data to specific pools that target storage devices on the Data Domain system.

**Note:** You cannot share a DD Boost device across datazones.

“Memory requirements for DD Boost” on page 23 provides details on save stream usage requirements and memory requirements. “Traditional licensing” on page 18 provides details on Data Domain system enablers.

3. The storage nodes store the deduplicated backup data on the DD Boost devices over a shared 10 GbE connection.
4. You can perform an additional backup to tape storage operation, either directly from a storage node or by a NetWorker clone operation from the Data Domain system.

**Figure 4** Data Domain system shared across two NetWorker datazones
Dedicated storage node environment

NetWorker supports deduplication backups for high-volume clients that each have a dedicated storage node. For example, you can deploy a dedicated storage node on a client that runs NetWorker Module for Databases and Applications (NMDA). NetWorker supports this configuration with the other application modules except NetWorker Module for Microsoft Applications (NMM) 2.2 SP1 or earlier, which does not support dedicated storage node operation.

This environment can coexist with client groups that use shared NetWorker storage nodes in the same datazone. However, because this is a private network, the connection and the devices it uses are not available to other NetWorker clients.

Note: The Client Direct (DFA) feature can provide similar benefits without the need for storage node licenses.

The figure in this section illustrates a mixed environment of shared and dedicated storage nodes.

1. The NetWorker server begins backups of its various client groups and the module clients on the dedicated storage nodes.

2. The storage nodes write the backup data to specific pools, which you have targeted to storage devices on the Data Domain system.

   “Memory requirements for DD Boost” on page 23 provides details on save stream usage requirements and memory requirements.

3. The storage nodes store the deduplicated backup data on the DD Boost devices.

   Note: An ifgroup software configuration of 1 GbE NICs on the Data Domain system enables multiple storage nodes to use the same identity on an IP network. This aggregation of bandwidth can improve performance for DD Boost devices. The Data Domain documentation provides details.

4. A high-volume storage node uses an additional dedicated 10 GbE direct connection.

   The EMC NetWorker Software Compatibility Guide provides information on NetWorker application modules compatible with Data Domain systems.
Figure 5  Single datazone with dedicated storage nodes and one high-bandwidth link
CHAPTER 3
DD Boost Conversion and Upgrade

This chapter includes the following sections:

- Upgrading from legacy DD Boost configurations .................................................. 40
- Converting DD Boost devices from IP to FC connectivity .................................... 40
- Redirecting backups from other devices to DD Boost ......................................... 40
- Migrating legacy save sets to new devices ........................................................ 42
- Migration scenarios ............................................................................................ 45
Upgrading from legacy DD Boost configurations

NetWorker 8.0 and later provides both write and read functionality on all upgraded and new DD Boost devices. Earlier releases had separate read-only DD Boost mirror devices for restore operations. The NetWorker 8.0 and later upgrade removes legacy read-only DD Boost mirror devices.

**Note:** After an upgrade to NetWorker 8.0 or later from an earlier release that used read-only devices, do not revert back to the earlier release. If you revert, DD Boost devices created by NetWorker 8.0 or later will be unavailable and the legacy devices will require manual reconstruction.

An upgrade from the NetWorker 7.6 SP1 integration with Data Domain requires special procedures. Appendix A, “Upgrading from a NetWorker 7.6 SP1 release,” provides details.

Converting DD Boost devices from IP to FC connectivity

After you have met the FC support requirements, you can convert existing DD Boost devices that use Ethernet IP connections to use FC connections deployed as a SAN. No data is lost by the conversion and full DD Boost features are retained, including Client Direct operations for backup and restore.

Plan your device conversion with the following high-level road map that outlines the sequence of basic tasks that you need to perform.

1. Ensure that you meet all FC support requirements.
   
   “FC support” on page 26 provides details.

2. Configure the **Fibre Channel Options** of the DD Boost devices.
   
   “Configuring DD Boost devices with NMC property windows” on page 57 provides details.

3. Configure the **Data Domain Interface** field of the NetWorker clients for FC.
   
   “Configuring a backup client with NMC property windows” on page 66 provides details.

Redirecting backups from other devices to DD Boost

After you upgrade to the NetWorker and Data Domain releases that support DD Boost devices, you can redirect the backups of existing NetWorker clients that do not use DD Boost devices and begin using the new DD Boost devices.

Clients are members of backup groups, which use pools to associate the backups with storage devices. If you redirect the backups at the pool level as described in this procedure, then minimal effort is required to configure the redirection.
Begin the new redirected backups with a full backup. This practice avoids a dependency on the last full backup in the legacy storage environment and the potential need to restore from two different environments. Begin with a full backup by using either of the following methods:

- Configure the redirection at a time when the next scheduled backup will be a full backup.
- Configure the redirection and change the backup schedule to accommodate an initial full backup.

Plan and perform the redirection operation carefully. Read the following overview of procedures before you begin.

**Note:** “Upgrading from a NetWorker 7.6 SP1 release” on page 101 provides information on redirecting backups from existing legacy DD Boost devices.

You can complete the following steps to redirect existing scheduled backups to begin using storage on DD Boost devices.

1. Ensure that the required network connection, hostname resolutions, and licenses are available and ready to use. The following sections provide details:
   - “Licensing in Data Domain systems” on page 18
   - “Host naming guidelines” on page 28
   - “Network requirements” on page 25

2. Configure the Data Domain system for use with NetWorker. “Configuring the Data Domain system for DD Boost” on page 52 provides details.

3. If you plan to migrate existing save sets to the new DD Boost devices, migrate the save sets before scheduled redirected backups begin. Migration will “seed” the Data Domain system and help to reduce the bandwidth requirements for future backups. “Migrating legacy save sets to new devices” on page 42 provides details.

4. Perform this step if you upgrade from a NetWorker 7.6 or earlier server on a Microsoft Windows system, which used an existing CIFS AFTD on a Data Domain system. This step removes the local administrator account (created to match the Data Domain system user account) from the NetWorker Remote Exec Service:
   b. Right-click NetWorker Remote Exec Service, and select Properties.
   c. On the Log On tab, select This Account, and click Browse.
   d. Type the local administrator username that matches the Data Domain system user account, and click OK.
   e. Type the password for the account, and click OK.
   f. Right-click the NetWorker Remote Exec Service, and click Stop.
      The NetWorker Backup and Recovery Service and the EMC GST service also stop.
g. Right-click the **NetWorker Backup and Recovery Service**, and click **Start**.
   The NetWorker Remote Exec Service also starts.

h. If the NetWorker server is also the NMC server, right-click the **EMC GST Service**, and click **Start**.

5. Run the NMC Device Configuration Wizard to complete the following tasks that are specific to DD Boost devices. “Configuring DD Boost devices with the wizard” on page 54 provides details:
   a. Select or create DD Boost devices on the Data Domain system.
   b. Select or create a Pool resource that targets the save sets to the devices.

   **Note:** The wizard ensures that a NetWorker pool created for the Data Domain system uses only DD Boost devices. You can verify this in the NMC property windows (Media Pool, Selection Criteria tab) for Target Device > Devices. The wizard also sets Target Media > Media type required to Data Domain.

   c. Select or create a NetWorker storage node on which to label and mount the new devices.
   d. Complete the wizard pages.

6. Complete the following steps in the NMC **NetWorker Administration** window. “Creating pools to target DD Boost devices” on page 63 provides details:
   a. In the Media view, open the pool created or modified in step 5.
   b. In the Data Source field, ensure that the groups selected for this pool specify DD Boost devices.
   c. Ensure that these backup groups are not members of their legacy pools.

   **Note:** Individual legacy NetWorker Client resources do not require any changes to their settings, including the Data Domain backup field. You can more efficiently configure the redirection in the Pool resource.

7. Test the backup environment to ensure that the new configuration operates correctly and existing backups that are unaffected continue to run as expected. For backups to new devices, test a restore from those devices.

8. Start the redirection with a full backup to the new devices. This practice avoids a dependency on the last full backup stored with the legacy storage environment and the potential need to restore from two different environments.

9. Monitor backup performance, and adjust the backup schedule to optimize the configuration for maximum throughput or additional clients. “Monitoring Data Domain events, statistics, and logs” on page 88 provides details.

**Migrating legacy save sets to new devices**

When you successfully redirect client backups to the DD Boost devices, the existing save sets stored on the legacy devices or file systems become redundant. You can retain the legacy stored data until expiry or you can migrate the legacy data to the new devices.
The decision to retain or migrate the legacy data depends on requirements that will differ between sites, clients, and backup types. For example, you may want to retain most of the legacy data and migrate only the backups of sensitive and high-priority clients or certain backup types.

When making the transition to DD Boost devices, consider the pros and cons for either retaining or migrating the existing save sets as follows:

- Retain the existing save sets on the legacy storage system until they expire:
  - This option provides the easiest way to make the transition; no migration is necessary.
  - You must maintain the legacy storage for the life of the legacy data.
  - If you need to restore any of the data, you must use either the legacy storage environment or the new devices, depending on when the backups occurred.
  - Features for storage, recovery, and clone operations will be different between the legacy data and the new data.

- Migrate the existing save sets to the new DD Boost devices. The advantages are as follows:
  - Frees the legacy storage system for removal or use by other clients.
  - Allows you to “seed” the new devices with the legacy client data. Seeding ensures that subsequent client backups will be deduplicated against the legacy data. This practice reduces the bandwidth and time required for the first backup window with the new devices.
  - Offers more flexible storage features for storage, recovery, and cloning, such as multiple concurrent operations.
  - Maintains the NetWorker browse and retention policies and ensures that NetWorker manages all save sets.

Migration versus native Data Domain replication

Avoid using the native Data Domain replication feature to migrate data from one Data Domain system to another. NetWorker cannot track, manage, or recover legacy save sets that Data Domain replicates.

An exception is where you can seed a new system to migrate the data. For example, you can perform native Data Domain replication over a local connection to quickly seed a new target Data Domain system, which you can then physically ship to a distant location. Although NetWorker cannot immediately manage or restore the seeded data, this practice has advantages. The seeded data reduces the otherwise heavy bandwidth required either for a data migration by a NetWorker clone operation, or if there is no migration, for the initial full backups to the target system. This practice can be especially effective if the remote location has limited network bandwidth.
Migration methods

Data migration is essentially a one-time NetWorker clone operation that you must tailor to the different device types and different time scales. You can include all the data in the migration or you can select a limited amount of data from a specific time frame or a specific backup type, such as weekly full backups.

The details of the migration procedure depend on the method that you use and the granularity of the data that you want to migrate:

- To perform a NetWorker scheduled clone operation, refer to “Migrating legacy save sets to DD Boost devices” on page 44.
- To run a NetWorker nsrclone script from a command line, refer to the EMC NetWorker Administration Guide for details.
- To perform a NetWorker staging (data movement) operation, refer to the EMC NetWorker Administration Guide for details.

Migrating legacy save sets to DD Boost devices

After you choose a migration scenario, you can migrate the existing save sets to DD Boost devices. Part of this procedure requires the creation of a special clone pool and a NetWorker scheduled clone operation.

1. Decide which migration scenario you need. “Migration scenarios” on page 45 provides details.

2. Plan the migration schedule to ensure that sufficient DD Boost devices and bandwidth are available and that there will be minimal impact to the usual backup window. Perform migrations before the scheduled NetWorker client backups begin using the new devices. Migration will seed the Data Domain system and help to reduce the bandwidth requirements for future backups.

   Note: When you migrate existing deduplicated VTL or CIFS/NFS AFTD save sets, the deduplication software reverts the save sets to their native non-deduplicated format. The storage node then reads and stores the save sets in deduplicated format on the new DD Boost devices. This reversion process occurs for both Data Domain and non-Data Domain storage.

3. Create a clone pool for the DD Boost devices to be used for the migration:
   - In the Data Source field, select groups for the migration. Typically, you will migrate the same groups that you selected for the redirection of backups. “Redirecting backups from other devices to DD Boost” on page 40 provides details.
   - In the Target Devices field, select the DD Boost devices to store the migrated data. “Creating pools to target DD Boost devices” on page 63 provides details.

4. Configure a NetWorker scheduled clone operation with the Write Clone Data to Pool field selected for the clone pool.
   “Configuring clone operations” on page 78 provides details on the scheduled clone option.
5. Run the clone operation, either according to its schedule or by manual start.
   “Starting scheduled clone operations manually” on page 81 provides details.

6. After the clone operation completes, verify the cloned data on the target devices.
   Chapter 7, “Monitoring, Reporting, and Troubleshooting,” provides details on the
   verification of NetWorker operations.

7. After you have verified the cloned save sets, remove the original save sets as required.

8. If you remove the original save sets, remove unused devices and pools as required.
   You cannot delete a pool until you delete or relabel in other pools all the volumes that
   belong to that pool.

9. Monitor the Data Domain system to ensure that adequate storage capacity is
   available. Monitor a complete backup cycle of all clients, including save set
   expirations.
   Chapter 7, “Monitoring, Reporting, and Troubleshooting,” provides details.

Migration scenarios

This section offers some typical migration scenarios to help you migrate existing backup
data from legacy devices or file systems to DD Boost devices. The best scenario for your
situation will depend on the storage environment configuration and the available
capacities and bandwidth.

Migration to DD Boost from conventional tape or AFTD

In these first two migration scenarios, you have added a new Data Domain system to the
existing NetWorker storage environment. You want to migrate and deduplicate the current
legacy data, stored on tape or conventional disk, to DD Boost devices on the new system.
The reason for this migration could be that you want to remove the old tape or disk system
or free up space on the old system for other clients.

The number of client migrations you will perform depends on whether you want to seed
the devices for future backups or migrate all the legacy save sets. Because the new Data
Domain system contains no data, at least some minimal seeding is preferable. If you
migrate the data for one client to seed the DD Boost devices and some of the same data
exists on other clients, then migrating the data for the additional clients has diminishing
seed value.

There are two scenarios for this type of migration. In the first case, you create the DD Boost
devices on a new storage node. In the second case, you create the devices on the existing
storage node.

Migration to new devices on a different storage node

The figure in this section illustrates a scenario where the storage node named CASSIE
stored backups of the client named OLIVE on tape or conventional disk. You want to
migrate these backups to a different storage node named ERIC for storage on the Data
Domain system.
In this scenario, you use the IP network to transfer the data from the original storage node CASSIE to the new storage node ERIC. The time required for the transfer will depend on the capacity and bandwidth available on the IP network, regardless of the fact that the tape library is on a SAN. If restore operations need to use the IP network during the transfer, then it will take additional bandwidth to ensure that the data transfer does not impact these operations.

Migration to new devices on the same storage node

You can eliminate data migration over the IP network between storage nodes by migrating between devices on the same storage node. The figure in this section illustrates a scenario where you migrate to DD Boost devices created on the original storage node named CASSIE. During the migration, the storage node reads the data stored on tape or conventional disk and sends deduplicated data to the Data Domain system for storage.

Although this scenario appears to be an ideal solution that avoids IP network restrictions, consider the following factors:

- The existing storage node is likely to be older and already at or near capacity. This situation will limit the number of devices that you can add and the amount of data that you can transfer during backup operations.
- The existing storage node is not likely to have extra network connections available. If you need the legacy connections for backup and restore operations, this situation leaves limited bandwidth available for the additional DD Boost format.
- The network connection is less likely to have the recommended 10 GB capacity to maximize throughput from the storage node to the DD Boost devices.
- Although you will use the same storage node for the same backup clients, you still need to change the device allocations and the pools. These changes can add confusion and result in configuration errors.
There are also advantages to this scenario. For smaller sites, it can be a better to avoid network restrictions by migrating to new devices on the same storage node. This scenario could also be an option for larger sites where you want to reuse multiple storage nodes or reconfigure the storage nodes to share one or more Data Domain systems. You can configure a storage node for data migration to seed the DD Boost devices as an interim step.

Migration to DD Boost from deduplicated VTL or AFTD storage

In the following two migration scenarios, you are already using an existing Data Domain system for VTL or CIFS/NFS AFTD deduplication storage. You want to migrate the stored data to new DD Boost devices on this same Data Domain system. Because the data is already present on the Data Domain system, you do not need to migrate to seed the DD Boost devices. The global deduplication format ensures that NetWorker does not resend data that already exists on the Data Domain system.

These migration scenarios offer multiple concurrent operations for storage and recovery and more flexible storage options for cloning.

Although these migration scenarios use the same Data Domain system, you still need to change the pools and the device allocations to redirect the backups to the DD Boost devices. You need to copy or clone the save sets to migrate the data.

When you migrate existing deduplicated VTL or CIFS/NFS AFTD save sets, the process initially reverts the save sets to their native non-deduplicated format. The storage node then reads and concurrently stores the save sets in deduplicated format on the new DD Boost devices. Data that already exists in deduplicated format on the Data Domain system will not be deduplicated again. During the migration, only the metadata for the save sets will be unique.
Migration to new devices on a different storage node

The figure in this section illustrates a legacy scenario where the storage node CASSIE stored backup data from the client named OLIVE in VTL format over a SAN connection. You want to migrate this data to the new DD Boost devices on a different storage node named DOVE.

This migration will use the SAN and the IP networks in two separate stages. First, the original storage node CASSIE reads the non-deduplicated data provided by the Data Domain system over the SAN connection. Then the new storage node DOVE reads this data and concurrently stores only unique data, in this case only the storage metadata, across the IP network to the Data Domain system. The limiting factor is the speed of transfer across the IP network.

![Diagram](image)

**Figure 8** Migration from VTL to DD Boost devices on a different storage node

Migration to new devices on the same storage node

The figure in this section illustrates a scenario where you want to migrate legacy backup data from the client named OLIVE to new DD Boost devices on the original storage node named CASSIE. The existing storage node configuration is for VTL storage on a SAN. You have added the configuration for the new DD Boost devices that use the IP network.

Because this migration is between devices on the same storage node, this scenario fully utilizes the speed of the existing SAN connection. The storage node CASSIE reads non-deduplicated data over the SAN and concurrently stores only unique data, in this case only the storage metadata, across the IP network to the Data Domain system.
Figure 9  Migration from VTL to DD Boost devices on the same storage node
CHAPTER 4
Software Configuration

This chapter includes the following sections:

◆ DD Boost configuration road map ................................................................. 52
◆ Configuring the Data Domain system for DD Boost ........................................ 52
◆ Configuring NetWorker for DD Boost devices ............................................... 54
◆ Configuring DD Boost devices with the wizard .............................................. 54
◆ Configuring DD Boost devices with NMC property windows ......................... 57
◆ Configuring clients to back up to DD Boost devices .................................... 65
◆ Deactivating and removing DD Boost devices ............................................. 70
DD Boost configuration road map

Plan the DD Boost configuration with a high-level road map that outlines the sequence of basic configuration tasks that you need to perform.

1. Configure the Data Domain system for use with NetWorker.
   “Configuring the Data Domain system for DD Boost” on page 52 provides details.
2. Configure NetWorker for use with the Data Domain system by using either the Client Configuration Wizard or the NMC property windows.
   “Configuring NetWorker for DD Boost devices” on page 54 provides details.
3. Configure NetWorker clients to back up to the Data Domain system.
   “Configuring clients to back up to DD Boost devices” on page 65 provides details.

Configuring the Data Domain system for DD Boost

You can enable the Data Domain system for storage operations with DD Boost devices by completing the following steps that use the Data Domain CLI. The Data Domain documentation provides information on using the Data Domain Enterprise Manager GUI for these same steps.

1. Ensure the network requirements. “Network requirements” on page 25 provides details.
2. On the Data Domain system, log in as an administrative user and then run the Data Domain CLI.
3. Type the following commands to verify that the file system is running and NFS services are running:
   
   ```bash
   filesys status
   nfs status
   ```
   
   If NFS services are not running, type the following command:
   ```bash
   nfs enable
   ```

   **Note:** For DD Boost functionality, you need to enable NFS services on the Data Domain system, even if no users or shares are configured. You do not need to enable NFS on the NetWorker server, NetWorker storage nodes, or NetWorker clients.

4. If you need to verify the installed version number of Data Domain operating system type the following command:
   ```bash
   system show version
   ```

5. Create the backup user and then set the DD Boost username:
   ```bash
   user add username
   ddboost set user-name username
   ```

   **Note:** Use the same `username` in both of these commands. Only one DD Boost (OST) user may have access to the Data Domain system at a time.
6. Add the OPENSTORAGE license key:

   `license add license_key`

7. (Optional) If you will use CCR or optimized cloning, add the REPLICATION license key:

   `license add license_key`

8. Apply the modifications by disabling and then reenabling the Data Domain services:

   `ddboost disable`
   `ddboost enable`

9. Specify and enable users to monitor backup events captured by SNMP traps and add the host to receive traps:

   `snmp add ro-community community_name`
   `snmp enable`
   `snmp add trap-host hostname[:port]`

   The typical value for `community_name` is “public,” which allows all users to monitor events.

10. Enable `ddboost` DSP, which is required for deduplication operations on the NetWorker storage nodes and NetWorker clients:

    `ddboost option set distributed-segment-processing enabled`

    **Note:** You must enable the `ddboost` option. Production use does not support the disabled setting.

11. (Optional) Verify that DSP is enabled.

    `ddboost option show`

12. If you plan to enable FC connectivity on DD Boost devices, obtain the Data Domain FC server name to use in the NetWorker device configuration procedure. Use the following command:

    `ddboost fc dfc-server-name show`

    For example, in the following output, the DFC server name is `dd-tenendo`:

    `ddboost fc dfc-server-name show`
    `DDBoom dfc-server-name: dd-tenendo`

    **Note:** Clients enabled for FC can back up only to FC-enabled devices. Clients enabled for IP can back up only to IP-enabled devices.

13. Use the Device Configuration Wizard to create DD Boost devices and the Data Domain SU folders that contain them.

    “Configuring DD Boost devices with the wizard” on page 54 provides details.
Configuring NetWorker for DD Boost devices

After you have configured a Data Domain system for the DD Boost environment, you can configure the NetWorker resources for devices, media pools, volume labels, clients, and groups that will use the DD Boost devices. Keep the following NetWorker considerations in mind:

- Each DD Boost device appears as a folder on the Data Domain system. A unique NetWorker volume label identifies each device and associates it with a pool.
- NetWorker uses the pools to direct the backups or clones of backups to specific local or remote devices.
- Pools manage NetWorker groups and the groups specify the backup and cloning schedules for member clients. It is best to create groups dedicated solely to DD Boost backups.

DD Boost device performance considerations

NetWorker does not limit the number of DD Boost devices that you can create. The number of devices that you need to create depends on device usage for backup and restore operations.

- Increasing the number of DD Boost devices can impact Data Domain performance and maintenance. Typically, if you do not need multiple concurrent sessions or streams for recovery, then you can configure the device Target Sessions and Max Sessions settings for multiple concurrent backup sessions.
- Avoid the removal of DD Boost devices. “Deleting an AFTD device” on page 70 provides details.

Methods to configure DD Boost devices

The Device Configuration Wizard, which is part of the NMC user interface, is the recommended method to create and modify DD Boost devices. The wizard can also create and modify volume labels and the storage pools for DD Boost devices.

After the wizard creates a DD Boost device, you can modify the device configuration by using the NMC property windows as an alternative method.

Configuring DD Boost devices with the wizard

You can complete the following steps to create or modify a DD Boost device with the Device Configuration Wizard:

1. Ensure the network requirements. “Network requirements” on page 25 provides details.
2. In the NMC Enterprise view, select the NetWorker server name and double-click the NetWorker application to launch it.
3. In the NetWorker Administration window, click the Devices tab.
4. In the left panel, right-click Data Domain Systems and select New Device Wizard.
Use the wizard to specify the options and values you need for the backup configuration.

**Note:** To modify completed wizard pages, click the links in the steps panel. The number of steps may vary according to the type of configuration chosen.

5. On the **Select the Device Type** page, specify **Data Domain** device type.

6. On the **Data Domain Preconfiguration Checklist** page, review the requirements.

7. On the **Specify the Data Domain Configuration Options** page specify the following settings:
   
a. In the **Data Domain System Name** field, select an option:
      
      – In the **Use an existing Data Domain System** field, select an existing system.
      
      – In the **Create a New Data Domain System** field, specify the FQDN or IP address of the Data Domain system.

   b. In the **Data Domain OST Username** and **Data Domain OST Password** fields, specify the DD Boost username and password, respectively.

   **Note:** You can define only one DD Boost (OST) username and password. All NetWorker storage nodes and NetWorker servers that access the Data Domain system must use the same username and password. “Configuring the Data Domain system for DD Boost” on page 52 provides details on setting the DD Boost username.

   c. In the **Configuration Type** field, select **Browse and Select**.

8. On the **Select Folders to use as Devices** page, create a new DD Boost device as follows:

   **Note:** The wizard does not show existing devices that you previously created with NetWorker 7.6 SP1. Appendix A, “Upgrading from a NetWorker 7.6 SP1 release,” provides details.

   a. Select the Data Domain system, and click **New Folder**.

      A new folder appears in the navigation tree. This folder is the new device.

      **Note:** For NetWorker 7.6 SP2 and later, the navigation tree does not show the SU folder under the Data Domain system folder. However, the SU folder is verifiable in the final **Review Configurations Settings** wizard page. The wizard names this SU folder after the short hostname of the NetWorker server and places the devices that you create into this SU folder.

   b. Type a name for the new device.

      To list the details of any device, select its checkbox. The table lists the full NetWorker device name and the storage pathname.
Note: For NetWorker 7.6 SP2 and later, the device name refers to the subfolder created within the SU. The folder path must not contain and folders deeper than these device folders.

c. (Optional) To rename a DD Boost device as it will appear in NMC, select the device in the table and type a new name in the NetWorker Device Name field. Do not use special characters other than dot (.) and underscore (_). The Storage Path field remains unchanged.

NOTICE

Implicit in the SU folder pathname on the Data Domain system are the hidden mount point folders: /backup/ost (DD OS 4.9) or /data/col1 (DD OS 5.0 and later). Do not modify this folder structure, which all NetWorker server hosts use. The final Review Configurations Settings wizard page shows the complete location.

The /backup folder stores NFS service data and clients that are configured for NFS access also have the ability to view, change, and delete the /data/col1 directory that contains the DD Boost devices. If you use NFS devices, you can avoid the risk of potential interference by using alternative pathnames.

9. On the Configure Pool Information page, specify the following settings:

- Select the Configure Media Pools for Devices option.
- Specify the pool that will target clients to the devices, either Backup for backups or Backup Clone for cloning or staging operations, or create a new pool.

Note: If you create a new pool, do not select an existing pool.

- Select the Label and Mount device after creation option.

10. On the Select Storage Nodes and Fibre Channel Options page, specify the following settings:

a. Select or create the NetWorker storage node that handles the devices.

b. Specify the following settings to enable FC data transport to this device:

- Select Enable Fibre Channel for this device.
- In the Fibre Channel Host Name field, type the hostname that the Data Domain system uses to identify itself for FC operations. By default, this hostname is the same one used for IP operations, but the hostnames can be different.

This hostname must match the Server Name displayed on the Data Domain system in the Data Domain Enterprise Manager’s Data Management > DD Boost > Fibre Channel tab. The name is case-sensitive.

“Configuring clients to back up to DD Boost devices” on page 65 provides details on client configuration for FC.

11. On the SNMP Monitoring Options page, type the name of the Data Domain SNMP community string and specify the events you want to monitor.

If you do not know the name of the community, then clear the Gather Usage Information selection.
SNMP monitoring enables NMC to display the Data Domain system status and to list the backup and the recovery events. The monitoring feature also provides a launcher link for the Data Domain interface.

12. On the Review Configuration Settings page, review the information and then click Configure.

**Note:** For NetWorker 7.6 SP2 and later, the name listed as the SU is really the pathname for the device folder. The format is: SU/device_name, where SU is the short hostname of the NetWorker server.

NetWorker configures, mounts, and labels the DD Boost device for the specified pool.

13. The final Device Configuration Results page is informational only. Click Finish to exit the wizard.

14. In the NMC Devices view, verify that NetWorker has labeled and mounted the device, ready for use. This view also lists the volume name for the device.

### Configuring DD Boost devices with NMC property windows

The Device Configuration Wizard is the recommended method to create DD Boost devices. You can follow the manual procedures in the NMC property windows to modify the devices and perform the tasks in the following sections.

### Adding a host Data Domain system to NMC Enterprise view

It is best to add a Data Domain host to NetWorker by using the Device Configuration Wizard. As an alternative method, you can use the Add New Host Wizard.

NetWorker lists the Data Domain systems as hosts in the NMC Enterprise view. This view shows the Data Domain system status and the backup and recovery events that NetWorker has run. The Enterprise view also provides a live link to launch the Data Domain Enterprise Manager GUI.

1. Ensure the network requirements. "Network requirements" on page 25 provides details.

2. From the File menu, select New > Host to run the Add New Host wizard.

3. Complete the wizard screens:
   - Type the Data Domain hostname.
   - Select Data Domain.
   - Select Capture Events.
   - Type the name of the SNMP community where NMC will retrieve Data Domain status information. By default, NMC uses the value configured on the Data Domain system with the `snmp add ro-community community_name` command. "Configuring the Data Domain system for DD Boost" on page 52 provides details.
Software Configuration

- Type a value for the **SNMP Process Port**. By default, NMC uses the value configured on the Data Domain system with the `snmp add trap-host hostname[:port]` command. “Configuring the Data Domain system for DD Boost” on page 52 provides details. This configuration must agree with the firewall configuration on the Data Domain system. “Firewall requirements” on page 27 provides details.

- Select the **SNMP Traps** that you want to monitor.

  “Configuring SNMP for Data Domain” on page 90 provides details on monitoring and alerts.

**Configuring a DD Boost device**

It is best to create a DD Boost device by using the Device Configuration Wizard. You may use this manual procedure to modify an existing device. A device appears as a folder on the Data Domain system. You can associate each device with a single NetWorker volume by the label and mount procedure.

**Note:** If you manually create a device with this procedure, NMC will list the device but this procedure does not create a corresponding device folder on the Data Domain system. If you try to label and mount such a device, an error appears.

You can complete the following steps to modify a DD Boost device.

1. Ensure that the required versions and licenses are installed.

   “Data Domain network environment” on page 16 and “Licensing in Data Domain systems” on page 18 provide details.

2. In the NMC window for the NetWorker server, click the **Devices** view.

3. In the folder tree, expand **Data Domain Systems** and select the Data Domain system that stores the save sets.

4. In the right panel, right-click the name of the device to modify and select **Properties**.

5. On the **General** tab, identify the DD Boost device by typing its name and access information:

   **Note:** Multiple devices can share a single volume. “Configuring volume sharing on multiple devices” on page 61 provides details.

   a. In the **Name** field, type a name for the Data Domain device.

      For example:

      dd_1

      Figure 10 on page 59 uses the following example values:

      - NetWorker server short hostname = dzone1
      - NetWorker remote storage node hostname = dzone1_sn2
      - Data Domain hostname = ddr1
      - DD Boost device name = dd_1
If you configure the device on a separate storage node host that is not the NetWorker server host as shown in Figure 10 on page 59, it is a remote device. You must specify the Name field in the following format:
\[ \text{rd=remote_storagenode_hostname:device_name} \]
For example:
\[ \text{rd=dzone1_sn2:dd_1} \]

b. In the Device access information field, type the Data Domain hostname followed by a colon and the path to the device folder.

Use the following format:
\[ \text{DD_hostname:/DD_storage_unit_name/device_name} \]
where, as a best practice, \text{DD_storage_unit_name} is the short hostname of the NetWorker server and \text{device_name} is a name for the device, which appears as a folder.

For example, the following figure uses the following name:
\[ \text{ddr1:/dzone1/dd_1} \]

NetWorker does not limit the number device folders that you can create, but the Device access information field accepts one device folder only. Do not create any folders within a device folder.

**Note:** Implicit in this pathname are the hidden mount point folders, \text{/backup/ost} (DD OS 4.9) or \text{/data/coll1} (DD OS 5.0 and later). You must not modify this folder structure, which All NetWorker servers use.

![Figure 10](image)

**Figure 10** Example of the device name and the access information for a DD Boost device

c. In the Media type field, select Data Domain from the list.

6. In the Configuration tab, in the Save Sessions area, set the number of concurrent save sessions (streams) and the number of nsrmmd (media storage) processes that the device can handle:

- In the Target sessions field, specify the number of save sessions that a nsrmmd process on the device will handle before for another device on the Data Domain host will take the additional sessions. Use this setting to balance the sessions load among nsrmmd processes. If another device is not available, then another nsrmmd process on the same device will take the additional sessions.
Typically, set this field to a low value. The default value is 6. The maximum value is 60.

- In the **Max sessions** field, specify the maximum number of save sessions that the device can handle. At the maximum limit, if no additional devices are available on the host, then another available Data Domain system takes the additional sessions. If no other Data Domain hosts are available, then the system retries the save sessions until a **nsrmmd** process become available.

  The default value is 60. The maximum value is 60.

  **Note:** The **Max sessions** setting does not apply to concurrent recovery sessions.

- In the **Max nsrmmd count** field, specify the maximum number of **nsrmmd** processes that can run on the device. Use this setting to balance the **nsrmmd** load among devices.

  If **Dynamic nsrmmds** is enabled on the storage node, this value is automatically adjusted by the formula max/target + 4, with the default value being 14. Otherwise, the default value is 4.

  To modify this value, first adjust the two sessions fields, apply and monitor the effects, and then update the **Max nsrmmd count** value.

  **Note:** NetWorker reserves at least one **nsrmmd** process for restore and clone operations.

7. In the **Remote user** and **Password** fields, type the DD Boost username and password, respectively.

   Only one DD Boost (OST) user can be defined. All NetWorker storage nodes and servers that access the Data Domain system must use the same username and password.

8. Complete the following steps if you want the DD Boost device to use FC connectivity:
   a. Select the **Enable fibre channel** field.
   b. In the **Fibre channel hostname** field, type the hostname that the Data Domain system uses to identify itself for FC operations. By default, this hostname is the same one used for IP operations.

   This hostname must match the **Server Name** displayed on the Data Domain system in the Data Domain Enterprise Manager's **Data Management > DD Boost > Fibre Channel** tab. The hostname is case-sensitive.

   “**Configuring the Data Domain system for DD Boost**” on page 52 provides details.

   **Note:** All NetWorker clients that use an FC-enabled DD Boost device must be enabled for FC in the **Data Domain Interface** field.

9. Click **OK** to save the device settings.

   The NetWorker **Administration** window displays the Data Domain system and details of the device.
10. Ensure that the device is associated with a NetWorker storage volume before you try to use the device. Otherwise, an error appears. "Labeling and mounting devices on the storage node" on page 64 provides the procedure.

Configuring volume sharing on multiple devices

A single NetWorker storage volume can be concurrently mounted on and shared by multiple DD Boost devices. This setup can result in greater flexibility and performance gains, but there can also be disadvantages:

- A volume that is simultaneously mounted on both an IP-enabled DD Boost device and an FC-enabled DD Boost device provides greater flexibility. Clients, including Client Direct clients, can back up and restore their data on the same volume over either IP or FC networks, provided they are configured to do so. “Restoring by Client Direct over IP from an FC-enabled device” on page 84 provides details on a volume sharing solution for restore operations.

- Multiple devices for shared volumes can be created on the same storage node or on separate storage nodes.

- For clients that are not Client Direct clients, a shared volume can improve bandwidth for backup or restore operations to a DD Boost device because NetWorker can use the storage node that is closest to the requesting client.

- In some environments however, concurrent read or write operations to a volume from multiple storage nodes or Client Direct clients can result in disk thrashing that impairs performance.

Each device must be created separately, must have a different name, and must correctly specify the path to the storage volume location.

For example, you want to create three devices, one on the NetWorker server host named dzone1 that uses the server's local storage node and two remote devices (rd) on remote storage nodes. You can specify the Name fields for the three devices, each created separately, by different aliases such as follows:

```
dd_1a
rd=dzone1_sn2:dd_1b
rd=dzone1_sn3:dd_1c
```

The device's Device access information field for each of these aliases would specify the same single directory as a valid complete path.

For example, for a directory named dd_1 on the Data Domain storage host named ddr1, specify the correct pathname:

- If the storage node uses an automounter, you can specify the following pathname:
  `/net/ddr1/dzone1/dd_1`

- If the storage node uses an explicit system mount point, you can specify one of the following pathnames:
  `/mnt/ddr1/dzone1/dd_1`
  `/mnt/dzone1/dd_1`
Creating a volume label template for DD Boost devices

Typically, use the Device Configuration Wizard, which automatically creates a label template for the volumes that a new device will use. This procedure describes the alternative manual method that uses the NMC property windows.

**Note:** The Device Configuration Wizard automatically creates a label template for the volumes, and this procedure does not apply if you use the wizard.

Each DD Boost device must be mounted with a single NetWorker storage volume, which is associated with a specific volume name and membership within a pool. A label template must be created to provide a volume name and numbering to all storage volumes that belong to the same pool.

A label template defines the components of a volume label. All the volumes in the same pool will have the same label name, for example, `dd_myvol`, but different volume numbers, for example, `.001–.003`.

For example, a Data Domain system may have three devices, each of which is mounted with a storage volume (Volume Name). If each device/volume is associated with the same pool, the volume names would be as follows:

- `dd_myvol.001`
- `dd_myvol.002`
- `dd_myvol.003`

You can complete the following steps to create a volume label.

1. In the **NetWorker Administration** window, click **Media**.
2. In the browser tree, select **Label Templates**, and from the **File** menu, click **New** to open the **Create Label Template** window.
3. In the **Name and Comment** fields, type a name and description for the label template. The label will associate a storage pool to a device.
4. In the **Fields** field, type components of the label. Place each label component on a separate line. The template must include at least one volume number range component. The label template will be applied to the volumes mounted on DD Boost devices in a Data Domain system.
   
   For example:
   ```
   dd_myvol
   001-999
   ```

   “Host naming guidelines” on page 28 provides guidelines for creating names.

5. Select a **Separator**, and click **OK**.
6. In the **Next** field, specify the next volume label in the sequence to be applied during the next label and mount operation, for example, `dd_myvol.001`.
7. Click **OK**.
Creating pools to target DD Boost devices

Typically, use the Device Configuration Wizard, which automatically creates a media pool. The following procedure describes the alternative manual method that uses the NMC property windows.

Each NetWorker client stores data to a media or target pool. This pool is used to direct the data from backup clients, or the data from storage volumes for clone operations, to the storage devices that are members of the pool.

Each DD Boost device is associated with a storage volume label when it is mounted. The Volume Name value of the storage volume implicitly associates the device with the specified pool.

Note: Dynamic Drive sharing (DDS) is not supported for DD Boost devices.

You can complete the following steps in the NMC property windows to manually create a pool for Data Domain backups.

1. Ensure that the devices that will target the pool have already been created.
2. Ensure that a label template has been created for the pool. “Creating a volume label template for DD Boost devices” on page 62 provides details.
3. From the NetWorker Administration window, click Media.
4. In the browser tree, select Media Pools, and from the File menu, select New to open the Create Media Pool window with the Basic tab selected.
5. In the Name field, type a name for each pool. Create names that clearly indicate whether the pool is for Data Domain backup or Data Domain clone operations. For example:

   DDsite1
   DDCLsite2

For example, a pool name that starts with DD would be a Data Domain pool, and a pool name that starts with DDCL would be a Data Domain clone pool. The pool name can also include the physical location where the backup will be stored. These conventions make the name easier to use for scripting and reporting.

“Host naming guidelines” on page 28 provides guidelines for creating names.
6. In the optional Comment field, type a description of the pool.
7. Select Enabled.
8. Select the Pool type:
   • To use the pool for backups, select Backup.
   • To use the pool for clone copies, select Backup Clone. Chapter 5, “Cloning and Replicating Data,” provides details on clones.

Note: The Pool type value cannot be modified after it is created.
9. In the Label Template field, select a label template, created earlier, to associate with the pool.
You can later apply the pool to DD Boost devices. “Labeling and mounting devices on the storage node” on page 64 provides details.

10. In the **Data Source** field, select the groups and the implicit backup schedules that the clients in this pool may belong to.

An alternative way to configure a client to use a pool is to specify the **Target Pool** field of the client resource. “Configuring a backup client with the wizard” on page 65 provides details.

**Note:** A client may belong to multiple groups through multiple client definitions.

11. Click the **Selection Criteria** tab.

12. Under **Target Devices**, select all the DD Boost devices that this pool may use for storage. The pool may store data on any of these devices. Use the following practices:

   - Select only DD Boost devices for the pool. Do not mix DD Boost devices with other types of storage devices. Be aware that the pool **Selection Criteria** may show client fields that are not up to date.

     **Note:** If you modify an existing pool in this step, ensure that the pool excludes all devices that are not DD Boost devices.

   - Consider whether to include only FC-enabled or only IP-enabled DD Boost devices in the pool.

     **Note:** Including DD Boost devices with different connectivity allows the possibility that a client will use an FC device one time and an IP device another time. If this is a concern, then do not mix FC and IP devices in the same pool.

   - Do not select devices on more than one Data Domain system.

     Otherwise, backups from a single NetWorker client can target any of these Data Domain systems. This behavior will impair the backup window and deduplication ratio.

13. Under **Media type required**, if you intend to use the pool for a Data Domain backup only, set this field to **Data Domain**. This setting ensures that only Data Domain devices use this pool.

   **Note:** As a best practice, do not include different media types in a single pool. “Backup fails for older NetWorker application modules” on page 99 provides further details.

14. Click **OK**.

The *EMC NetWorker Administration Guide* provides details on media pools.

**Labeling and mounting devices on the storage node**

Typically, use the Device Configuration Wizard, which automatically labels and mounts the devices. The following procedure describes the alternative manual method that uses the NMC property windows.
A DD Boost device must have a volume name as a label to identify its pool, and the storage node must mount the device ready for use.

You can complete the following steps to label and mount a device.

1. In the NetWorker Administration window, click Devices.
2. In the browser tree, select the Data Domain system.
3. In the right panel, right-click the device you want to label and select Label.
4. In the Label window and Pools list box, select a pool to associate with the device.
   A label for the selected pool appears in the Volume Label field. This label will become the volume name for the device.
5. Select Mount After Labeling, and click OK.
   The NMC list shows the device with its associated volume name.

The EMC NetWorker Administration Guide provides details.

Configuring clients to back up to DD Boost devices

NMC provides different methods to create NetWorker clients and their schedules. The wizard method is usually the best, but you may use the NMC property windows method as described in the following sections.

Configuring a backup client with the wizard

Use the NetWorker Client Configuration Wizard to create and modify NetWorker backup clients and their backup schedules.

If you want to redirect existing client backups to new DD Boost devices, “Redirecting backups from other devices to DD Boost” on page 40 provides details.

The details for the settings referred to in this simplified wizard procedure are found in the next procedure “Configuring a backup client with NMC property windows” on page 66.

You can complete the following steps to create or modify a client and the client’s scheduled backup with the wizard.

1. If the client is to use a Client Direct backup, which is the default configuration, ensure the client has access to the same network connectivity (IP or FC) that the target DD Boost devices use.
2. In the NMC Enterprise view, select the NetWorker server name, and double-click the NetWorker managed application to launch it.
3. In the Configuration view, under the NetWorker server name, right-click Clients and select Client Backup Configuration > New.
4. Complete the fields on the following wizard pages:
   • Show the Client Name
   • Specify the Backup Configuration Type
Software Configuration

- Specify the **Backup Options**:
  - In the **Deduplication** settings, select **Data Domain Backup**, if applicable. This setting ensures that the client will back up only to DD Boost devices if the pool used also contains other types of devices such as AFTDs. It is best not to have mixed devices in pools.
  - Set **Target Pool** to a pool associated with DD Boost devices.

  An alternative way to configure a client to use a pool is to specify the client or its group in the **Data Source** field of the Pool resource. “Creating pools to target DD Boost devices” on page 63 provides details.

  **Note:** Current versions of NetWorker application modules support backup to DD Boost devices. Some earlier versions of modules do not support the client fields for **Data Domain backup** and **Pool**. In these cases, do not set these fields. “Backup fails for older NetWorker application modules” on page 99 provides details.

- Select **Files to Back Up**
- Select the **Client Properties**
- Select the **Backup Group**
- Specify the **Storage Node Options**

5. Complete the wizard.

For details of the settings referred to in this simplified wizard section, see “Configuring a backup client with NMC property windows” on page 66

### Configuring a backup client with NMC property windows

Typically, use the Client Configuration Wizard to create and modify NetWorker clients. The following procedure describes the alternative manual method that uses the NMC property windows.

You can complete the following steps to configure a NetWorker client for scheduled backups to a DD Boost device.

1. If the client is to use a Client Direct backup, which is the default configuration, ensure that the client has access to the same network connectivity (IP or FC) that the target DD Boost devices use.

2. In the NMC **Enterprise** view, select the NetWorker server name and double-click the **NetWorker** application to launch it.

3. In the window for the NetWorker server, click **Configuration**.

4. In the browser tree, select **Clients**:
   - To create a new Client resource, select the **Clients** icon, and from the **File** menu, select **New**.
   - To edit an existing Client resource, select the client name from the list in the right panel, and from the **File** menu, select **Properties**.
5. To create a new Client resource, perform the following steps. Otherwise skip these steps:

   **Note:** You do not need to modify the following fields for clients whose backups you have redirected to DD Boost devices. “Redirecting backups from other devices to DD Boost” on page 40 provides details.

   a. On the **General** tab, in the **Name** field, type the hostname for the client and, optionally, type a comment in the **Comment** field.

   b. Select values for **Browse Policy** and **Retention Policy**:
      - The browse policy determines how long NetWorker maintains the details of individual backed-up files in a browseable index for quick recovery through the GUI or command line.
      - The retention policy determines how long NetWorker maintains backed-up data available for recovery although the browse policy has lapsed. Recovery of old backups can require NetWorker to rebuild an index.

   c. Select the **Scheduled Backups** checkbox.

   d. In the **Save Sets** field, click the **Browse** button to open the **Choose Directory** window. Browse to and select all the directories or the individual files you want to back up. When finished selecting, click **OK**.

      You must type each item on a separate line. For example:

      ```
      D:\accounting
      sales
      ```

      To back up all client data, type **All** in the **Save Sets** field.

      **Note:** For Microsoft Windows systems, you must back up the SYSTEM or Volume Shadow Copy Service (VSS) SYSTEM on a periodic basis to prepare for disaster recovery of the client system.

      The *EMC NetWorker Administration Guide* provides details for this step.

6. On the **General** tab, in the **Backup** area, complete the following steps:

   a. Select the **Client Direct** field to enable deduplicated backup data from this client to bypass the NetWorker storage node and be sent directly to the Data Domain system. Ensure the following requirements:
      - Ensure you have not selected the **Checkpoint restart** field. If selected, backups will revert to traditional storage node backups.
      - Ensure the client interface configuration, whether FC or IP, matches the DD Boost device interface configuration. If the interfaces do not match, then the storage node will perform the backup and restore operations.
      - Ensure you have configured the Data Domain system to use the DD Boost devices. “Configuring the Data Domain system for DD Boost” on page 52 provides details.
Ensure you have configured the NetWorker Device resource for the Data Domain system with a **Remote User** field that specifies a DD Boost (OST) username. “Configuring a DD Boost device” on page 58 provides details.

Ensure you have selected **Data Domain backup** on the Client’s **Apps and Modules** tab as described later in this procedure.

**Note:** Client Direct access from a Linux host to a Data Domain system requires a glibc 2.3.4 or later library on the Linux system.

b. In the **Group** field, select a backup group. A backup group consists of clients that use the same backup schedule.

This field may show pre-selected groups based on the selected pool. Do not disassociate groups from their pools at the client level.

**Note:** The use of groups devoted exclusively to deduplication backups can help you monitor deduplication operations and configure backup schedules for either deduplication or conventional storage.

c. In the **Pool** field, select a pool that targets the DD Boost devices you want to use. The pool selected in this field overrides any other pool that you may have configured for the client or its save sets.

An alternative way to configure a client to use a pool is to specify the client or its group in the **Data Source** field of the Pool resource. “Creating pools to target DD Boost devices” on page 63 provides details.

d. (Optional) If you want the backup to include the NetWorker server’s bootstrap and index files to a DD Boost device, create a Pool resource for the bootstrap and index files. In the pool’s **save sets** field, specify the following values:

```
bootstrap*
index*
```

Traditionally, the NetWorker server backs up its bootstrap and index files to a locally attached disk or a tape device each time it performs a scheduled backup.

e. In the **Schedule** field, select a backup schedule.

The schedule selected in this field overrides any other schedules that you may have configured for the client or its save sets.

7. Select the **Apps & Modules** tab.

8. In the **Deduplication** area, select **Data Domain backup**. This ensures that NetWorker will back up the client data only to DD Boost devices, even if the selected pool contains DD Boost and other types of devices. It is best not to include different device types in a single pool.

**Note:** Current versions of NetWorker application modules support backup to DD Boost devices. Some of the earlier module versions do not support the client fields for **Data Domain backup** and **Pool**. In this case, do not set these fields. “Backup fails for older NetWorker application modules” on page 99 provides details.
9. In the **Data Domain Interface** field, select the type of connectivity the client will use for DD Boost devices:

- Select **IP** for TCP/IP connectivity only.

   **Note:** Do not select IP if **Enable fibre channel** is selected in the Device resource of the target DD Boost device (on the **Configuration** tab). This conflict in settings could cause backups to fail and restores to operate only through the storage node.

- Select **Fibre Channel** for FC connectivity only.

   **Note:** The FC-only setting is not configurable on the NetWorker server’s Client resource because the NetWorker server requires IP connectivity to communicate control information to the hosts within its datazone.

- Select **Any** to enable both FC and IP connectivity to the devices.

If the NetWorker server contains multiple definitions of this Client resource, any changes to this field propagate to the other instances of the client.

10. To redirect an NDMP client from a tape backup to a DD Boost backup, change the **Backup** fields as follows:

   a. Select the **NDMP** option.

   b. In the **Backup Command** field, type the following command:

      ```
      nsrcmdmp -T backup_type -M
      ```

      where `backup_type` is `dump`, `tar`, or `vbb`.

      The `-M` option specifies a backup with the Data Service Agent (DSA) option.

      The [EMC NetWorker Administration Guide](#) provides details on the `nsrcmdmp` command.

   c. On the **General** tab, ensure that the client is a member of a pool that targets the DD Boost device you want to use.

   d. On the **Apps & Modules** tab, select **Data Domain backup**.

11. Select the **Globals (2 of 2)** tab.

12. In the **Configuration** area, configure the following settings:

   a. In the **Storage Nodes** field, type the hostnames of storage nodes that the client will use to back up its data, other than the NetWorker server’s storage node.

   b. In the **Recover Storage Nodes** field, type the hostnames of storage nodes for the client to use when restoring data.

13. When you have completed the client configuration, click **OK**.

   The NetWorker server window shows a check mark in the **Scheduled backup** column of clients enabled for scheduled backup.

   The [EMC NetWorker Administration Guide](#) provides details on NetWorker Client resource configurations.
Deactivating and removing DD Boost devices

Use one of the following procedures to deactivate a DD Boost device so it does not interfere with normal backup operations.

Converting a device to read-only

Conversion of a device to read-only prevents the use of the device for backup operations. You can continue to use the device for read operations, such as restore and clone operations.

1. In the NMC window for the NetWorker server, click the Devices view and select the Devices folder in the navigation tree.
2. In the Devices table, right-click the device you want to convert to read-only and select Unmount.
3. Right-click this unmounted device, and select Properties.
4. In the Device Properties window, select Read-only and click OK.
5. Right-click the device, and select Mount.

Disabling a device

Disabling a device prevents further operation of the device. You can reenable the device to restore old data retained on the device.

1. In the NMC window for the NetWorker server, click the Devices view and select the Devices folder in the navigation tree.
2. In the Devices table, right-click the device you want to disable and select Unmount.
3. Right-click this unmounted device, and select Enable/Disable to disable the device.
4. Inspect the Enabled column of the table to verify that you have disabled the device.

Deleting an AFTD device

The procedure for deleting an AFTD includes an option for also erasing the volume, denoted by the access path, that stores the device’s data. You can erase the volume only if no other device in the system shares the volume.

1. In the NetWorker server Device view, click Devices in the navigation tree.
2. In the Devices table, right-click the device you want to remove and select Delete.
   A confirmation window appears.
3. Specify the required setting in the confirmation window:
   • To delete the device from the NetWorker configuration only without erasing the device’s data, click Yes.
   • To delete the device and erase the device’s data and volume access path, select Permanently erase all data and remove media and index information for any selected AFTDs or Data Domain devices, and then click Yes.
Note: If another device shares the volume that you want to erase, then an error message shows the name of the other device. You must delete all other devices that share the volume until the last one remaining before you can erase the volume.

4. If you have not unmounted the device or have not removed it from all pools, then a confirmation window shows these details. To confirm the device unmount, the removal of the device from the pool, and the deletion of the device, click Yes.

The Data Domain documentation provides further details.
CHAPTER 5
Cloning and Replicating Data

This chapter includes the following sections:

◆ DD Boost clone and replication support ................................................................. 74
◆ Clone formats ........................................................................................................... 74
◆ Configuring a backup group and pool for CCR ...................................................... 76
◆ Configuring the CCR environment ......................................................................... 76
◆ Configuring clone operations ................................................................................. 79
◆ Starting scheduled clone operations manually ...................................................... 81
◆ Cloning with nsrclone ........................................................................................... 82
DD Boost clone and replication support

For additional data protection, you can use the NetWorker clone-controlled replication (CCR) or normal clone feature to copy save sets on a DD Boost device to a different location. A clone is a complete and independent copy of the data that you can use for data recovery or to create further clones. You can clone single save sets or the entire volume of a DD Boost device. A NetWorker clone retains the original NetWorker browse and retention policies by default, but you can change these policies for the clone copy.

You can configure clones to run immediately after each save set completes, known as “immediate clone,” or you can configure clones to run in an independently defined maintenance window after the entire group backup completes in the main backup window.

Datazone requirement

For NetWorker to manage and monitor clone operations, the storage nodes at both the source and target locations must be clients of the same NetWorker server. Do not create a clone in a different datazone. The NetWorker server maintains browse and retention policies for all cloned copies and can monitor and report on their storage operations.

Clone pool requirement

To enable the NetWorker software to copy save sets from one device to another, you must create a special clone pool and assign devices on the target system to this pool. “Creating pools to target DD Boost devices” on page 63 provides details. The EMC NetWorker Administration Guide provides additional details.

Clone reports

You can use the NMC Reports view to access reports of NetWorker clone operations on a Data Domain system. “Generating reports” on page 92 provides details.

Clone formats

The type of NetWorker clone you produce depends on the type of storage media you use for the clone. NetWorker will use either CCR when cloning to DD Boost devices or a normal clone when cloning to conventional storage media.

CCR format

When NetWorker clones data from a source DD Boost device to a target DD Boost device, usually at a geographically distant location, the operation uses CCR, also known as optimized clone or DD format clone. CCR is a fast process that uses low bandwidth and low storage capacity. You can use CCR clones for data recovery or to create additional copies with minimal impact on the primary operations of production, backup, or recovery.

CCR operations use only IP connectivity between DD Boost devices on separate Data Domain systems, whether you have configured the participating devices for FC or IP.
**Note:** For CCR operations on the same Data Domain system, it is best to replicate between two different SUs (MTrees) so you can apply different retention policies and manage the data independently.

During the CCR process, the storage node reviews the incoming clone for data that NetWorker has already stored on the target DD Boost device. The storage node stores only unique data and creates any necessary reference pointers to data that already exists on the device.

### Normal clone format

When NetWorker clones data from a DD Boost device to conventional media, such as disk or tape, the data reverts to the native non-deduplicated format. This procedure creates a normal clone. The normal clone format is necessary for the data on conventional disk or tape storage to be fully recoverable, for example, for disaster recovery, without the need of a Data Domain system.

### Data Domain native replication considerations

Avoid native Data Domain replication operations, which are normally used to copy deduplicated data stored in CIFS, NFS, or VTL formats from one Data Domain system to another for disaster recovery purposes. These native operations are independent of DD Boost and NetWorker knowledge or control.

An exception would be to seed a new Data Domain system to assist the migration of existing data. “Migration versus native Data Domain replication” on page 43 provides details.

**Note:** If you need to use Data Domain replication for non-DD Boost directories on the same system, ensure that the system and the network has enough capacity to enable NetWorker CCR operation with DD Boost devices.

Considerations for native Data Domain replication with DD Boost devices:

- Native Data Domain directory replication or MTree replication does not support DD Boost devices.

- Data Domain collection replication, which is the replication of the entire stored contents of a Data Domain system, renders DD Boost devices as read-only. This operation will replicate all DD Boost devices and their stored data onto a target Data Domain system. However, you cannot use the replicated DD Boost data for other replication operations, such as NetWorker CCR.

**NOTICE**

When you perform a collection replication of a Data Domain system, NetWorker will not be aware of any DD Boost devices on that system. NetWorker awareness and data recovery of the replicated DD Boost data requires additional procedures, tests, and qualifications. Ask assistance from EMC Professional services.
Cloning and Replicating Data

Configuring a backup group and pool for CCR

Use NetWorker scheduled clone operations in environments where you need to regularly create copies of save sets. You can clone by predetermined clients, pools, save sets, or devices.

You can configure CCR to run immediately after each save set completes, known as immediate clone, or you can configure CCR to run in an independently defined maintenance window after the entire group backup completes in the main backup window.

Immediate CCR is best used where:
- there are many save sets in the backup queue
- there are many save sets of different sizes

To configure whether a group of clients will run backups in immediate clone mode or with group clone mode, set the Group resource attributes as follows.

1. In the NetWorker Administration window, select Configuration.
2. In the navigation tree, right-click Groups and select New.
3. In the Setup tab, select the Clones checkbox and select a Clone mode option:
   - Select Start on save set completion to start a CCR operation after each save set has backed up. This is immediate mode.
     If you select this option, set the NetWorker server parallelism attribute to a value of 2 or greater. To access the server parallelism attribute, right-click the NetWorker server name in the left panel of the Administration window, select Properties, and select the Setup tab.
   - Select Start on group completion to start the CCR operation only after all save sets in the group have backed up. This is the group clone mode.
4. Select a Clone pool. This clone pool will manage the group.

   “Creating pools to target DD Boost devices” on page 63 provides details on creating a clone pool.

   “Configuring clone operations” on page 79 provides scheduling details.

Configuring the CCR environment

You can complete the following steps to configure the network environment for clone-controlled replications.

1. Ensure that you have enabled valid licenses to the Data Domain systems that you will use for the CCR operations, including a Replication license.

   “Configuring the Data Domain system for DD Boost” on page 52 provides details.

2. Ensure that both the source and target storage nodes are clients of the same NetWorker server.

3. Ensure Ethernet IP connectivity between the source and target Data Domain systems. CCR occurs only over TCP/IP connectivity.
4. If a DD Boost device participating in the CCR also has an FC connection, ensure IP access to the DD Boost device.

Data Domain FC and IP hostnames are the same by default but they can be different and you must map the host Data Domain FC server name to its own IP address as follows:

a. Open the Data Domain Enterprise Manager’s Data Management > DD Boost > Fibre Channel tab and note the Data Domain Server Name.

Alternatively, you can type the `ddboost fc dfc-server-name show` command.

b. Map this server name to the system’s IP address in the `/etc/hosts` file with the following command:

```
net hosts add server_name IP_address
```

For example, you see that the Data Domain system with the IP address 10.99.99.99 has the IP hostname dd555-5.lss.mcm.com but its DFC server name is dd-tenendo. Type the following command:

```
net hosts add dd-tenendo 10.99.99.99
```

5. If you want to use Data Domain encryption, global compression, or low-bandwidth optimization, enable these configurations on both the source and target Data Domain systems.

**Note:** If any of these configurations do not match (either enabled or disabled) on both the source and target Data Domain systems, backups will fail.

- Global compression can be set to type 1 (previous type) or type 9 (new type). You must enter the `filesys disable` and `filesys enable` commands for the change to take effect. For example:

  ```
  filesys option set global-compression-type 1
  filesys disable
  filesys enable
  ```

  If the file system is over 40 percent full, the command fails with an error message.

- Low-bandwidth optimization is recommended for CCR to remote sites with limited bandwidth. If you set this feature, perform the required cleaning cycle on both the source and target systems with the following command:

  ```
  filesys clean start
  ```

  Ensure there is sufficient bandwidth for the CCR operations.

The *EMC DD OS Administration Guide* provides details on these settings.

6. On the NetWorker server and both storage nodes, configure the Client resource Aliases field on the Globals 1 of 2 tab with a lists of all the names and aliases in use for the CCR. Include the fully qualified name, short name, aliases, and IP address.

7. By default, NetWorker performs up to 30 parallel concurrent cloning sessions or threads from each source clone pool per CCR operation. This is the recommended setting but you can change it as follows.
Cloning and Replicating Data

**Note:** If you try to clone a save set that must be read from more than one source pool, then NetWorker will queue the backup pools. To avoid this, use a separate CCR operation for each pool.

a. Create a file named nsrcloneconfig, with no file extension, in the following location on the host that runs the CCR.
   - On Microsoft Windows systems: C:\Program Files\EMC NetWorker\nsr\debug
   - On UNIX systems: /nsr/debug

b. In this file, you can type the following two global parameters and the following two resource-specific parameters.

   max_threads_per_client=max concurrent save sets
   max_client_threads=max clients

   nsrclone_resource_name_max_threads_per_client=max concurrent save sets
   nsrclone_resource_name_max_client_threads=max clients

   where:
   - *max concurrent save sets* limits the number of parallel clone sessions that NetWorker will run on any one source client, for example, 15.
   - *max clients* limits the number of source clients that NetWorker will include in the parallel cloning operations, for example, 2.
   - *nsrclone_resource_name_* is the name of the specific NetWorker Clone resource you will use, added as a prefix to the parameter.

   The numeric values multiplied must not exceed 30 or an error message results. If you use both global and resource-specific settings, then the specific settings override the global settings. To disable parallel cloning, set both values to 0. This will result in a queue with sequential cloning only.

8. Create a target pool for the CCR, configured for Backup Clone type with the Media Type Required field set to Data Domain.

   If a DD Boost device targeted by the pool is not available during a CCR, and the media type required specifies Data Domain, then NMC will display a “Media Waiting” message.

   **Note:** You cannot reconfigure the Media type required setting in the Default Clone Pool.

   “Creating pools to target DD Boost devices” on page 63 provides details.

9. Open the Client resource attribute for the source storage node and specify the hostname of the target storage node in the Clone Storage Node field.

   If you do not specify the Clone Storage Node, then the NetWorker server’s storage node will be used.

   If the Clone Storage Node field targets a non-Data Domain volume, and the target pool’s Media Type Required field does not specify Data Domain, then CCR creates only normal clones on those volumes.
10. Mount the source DD Boost device on the source storage node.

11. Mount the target DD Boost device on the target storage node. The pool for the device must specify Backup Clone pool type.

12. Ensure that the target clone pool is properly specified for the clone method you use. Backup save sets will be written to this pool. You may need to use multiple or mixed approaches for control and flexibility.

The following methods use myccrpool as a the name of a clone pool you created:

- For scheduled clone operations, open the client’s storage node Clone resource and select the target pool (myccrpool) in the Write clone data to pool field. “Configuring clone operations” on page 79 provides details.

- For immediate clone of a backup group, in the Group resource’s Clone pool field, select myccrpool.

- For CLI clone operations, you would use the command nsrclone -b myccrpool. “Cloning with nsrclone” on page 82 provides details.

Configuring clone operations

You can configure NMC for a clone operation at a scheduled time, for either a CCR, also known as optimized clone or DD format clone, or a normal non-deduplicated clone.

1. Configure the clone operation. “Configuring the CCR environment” on page 76 provides details.

2. In the NetWorker Administration window, click Configuration.

3. In the browser tree, click Clones, and from the File menu, select New to open the Create Clone window. Figure 11 on page 80 shows the General tab settings.

4. In the Name field, create a unique name to identify the scheduled Clone resource. Type any additional information in the Comment field.

5. Set the Browse Policy and Retention Policy fields if you want the clones to use different policies than the original backup.

6. In the Write clone data to pool field, specify the clone pool that targets the devices that will store the clones.

7. If you enable diagnostic mode, you can specify values to the Storage node to WRITE save sets field and the Storage node to READ save sets field. These fields enable you to use multiple storage as targets or sources.

8. To skip invalid save sets, select Continue on save set error. Otherwise, an invalid save set will stop the clone operation and generate an error message.

9. Ensure that the Limit number of save set clones field has the default value of 1. This setting allows NetWorker to create only one save set clone in the target pool.

This setting of 1 is useful, for example, if you need to manually restart an interrupted clone operation where NetWorker successfully created clones of some save sets but fails to clone all the save sets. You want to create only the missed clones.

A zero (0) setting places no limit on the number of duplicate clones.
**Note:** NetWorker will store only one unique save set clone on a single volume. If you create multiple clones of a save set, NetWorker stores each clone on a different volume in the pool.

10. Configure the schedule for the clone operation as described after the following figure, which shows an example schedule.

![Clone properties in the Client resource general settings](image)

**Figure 11** Clone properties in the Client resource general settings

a. Select **Enable** to enable the clone operation to run at its scheduled times.

b. In the **Start Time** field, set the start time.

   To reduce the use of resources, schedule clone operations after the backup window has completed.

c. Select either **Weekly by day** or **Monthly by day** to display either a calendar week or a calendar month. In the calendar, select the days on which you want the clone operation to run.

d. To repeat the clone operation within a day, specify an **Interval** time in hours.

   For example, if you set the start time to 6 a.m. and the interval to 6 hours, then the clone operations will run at 6 a.m., 12 p.m., and 6 p.m.

   The repeat clone operation will fail when it reaches the **Limit the number of save set clones** value.
11. Select the Save Set Filters tab and specify the source save sets to include in the scheduled clone operation.

There are two main options as follows:

- Select **Clone save sets that match selections** and select the save sets you want to clone according to the following selections:
  - Save groups
  - NetWorker clients
  - Pools
  - Save set levels
  - Save set name, as specified in the NetWorker Client resource
  - Save sets from the past number of days, weeks, months, or years

- Select **Clone specific save sets** and type the names of the source save sets you want to clone, either by save set ID (ssid) or by clone ID (clonid). Use a separate line for each save set name.

To find save set and clone IDs, in the NetWorker Administration window, click Media, select save sets in the browser tree, and specify values for the search. Alternatively, you may use the NetWorker mminfo command. The *EMC NetWorker Administration Guide* provides details.

12. Click **Preview Save Set Selection** to review the save set filter settings.

13. Select **OK** to save the scheduled clone operation.

14. After the clone operation completes, verify the cloned data on the target devices. If required, restore sample save sets as a test.

*Chapter 7, “Monitoring, Reporting, and Troubleshooting,”* provides details on the verification of NetWorker operations and the monitoring of clone operations in the NMC Clones window.

### Starting scheduled clone operations manually

You can manually start a scheduled clone operation at any time without affecting the regularly scheduled start time. There are two methods as follows.

#### Manually starting a clone operation from the Configuration window

You can complete the following steps to manually start a scheduled clone operation from the Configuration window

1. In the Administration window, click **Configuration**.
2. In the browser tree, select **Clones**.
3. Right-click a clone resource in the right panel listings and select **Start**.
Manually starting a clone operation from the Monitoring window

You can complete the following steps to manually start a scheduled clone operation from the Monitoring window.

1. In the Administration window, click Monitoring.
2. Select the Clones tab.
3. Right-click a clone resource and select Start.

Cloning with nsrclone

A NetWorker nsrclone command or nsrclone script will enable you to configure detailed CCR operations that you can launch either manually or by scheduling a task on the operating system or an external scheduler. This method is best for larger environments where flexibility and control of conditions are necessary. Some examples are as follows:

- Start clone job B, which clones to tape storage, if and only if clone job A, which performs CCR, has successfully completed.
- Clone only specific save sets to specified storage nodes or specified devices.
- Perform a CCR from a host other than the NetWorker server. This script or command must specify the NetWorker server by its primary hostname. Use the hostname listed in the NMC Enterprise view. Otherwise, the CCR operation may produce normal clones instead.

Scripted solutions require additional knowledge and have external dependencies, such as operating systems and scripting tools, that are beyond the scope of this guide.

The *EMC NetWorker Administration Guide* and the *EMC NetWorker Command Reference Guide* provide more details. EMC Professional Services can also provide assistance.
CHAPTER 6
Restoring Data

This chapter includes the following sections:

◆ Restoring DD Boost deduplicated data .............................................................. 84
◆ Disaster recovery .................................................................................................. 85
Restoring Data

Restoring DD Boost deduplicated data

You restore deduplicated data from DD Boost devices in the same way as you would restore non-deduplicated data. Each backup consists of two components that reside in different places:

- Deduplicated client backup data resides on the DD Boost devices on the Data Domain system.
- Backup metadata, which specifies how long you want to retain the data and allows you to browse the backups for recovery, resides on the NetWorker server.

Restore requirements for deduplicated data

The requirements for the restore of deduplicated data from DD Boost devices are as follows:

- All the deduplicated data to be restored must be available on the Data Domain system. The retention periods for the backups must not have expired.
- Both the Data Domain system and the NetWorker storage node must be online during the restore of deduplicated data.

Supported NetWorker restore procedures

The data restore procedures are the same as for non-deduplicated NetWorker backups:

- You can use NetWorker to browse the media index to select files or save sets to recover.
- You can perform directed restores for supported NetWorker clients and NetWorker storage nodes.
- You can try to restore expired backup data by using the NetWorker scanner program to reconstruct a media index from the surviving metadata.

The *EMC Administration Guide* provides procedures for data recovery.

Restoring by Client Direct over IP from an FC-enabled device

You can use Client Direct over an IP network to restore data from a volume that you have mounted on an FC-enabled DD Boost device. Share the volume with an IP-enabled device as follows.

1. Create an IP-enabled DD Boost device on which to mount the volume, but associate this device to a different storage node than the one that manages the FC-enabled DD Boost device.

   The storage node that you use for the IP restore must not have an FC-enabled DD Boost device available to the volume.

   “Configuring DD Boost devices with the wizard” on page 54 provides details.

2. Configure the devices to share the volume.

   “Configuring volume sharing on multiple devices” on page 61 provides details.
3. Modify the Client resource for the client that will receive the restored data.
   • Configure this client for Client Direct and IP connectivity.
   • On the Globals (2 of 2) tab, in the Recovery storage nodes field, specify the storage node that you associated to the IP-enabled DD Boost device.

   “Configuring a backup client with NMC property windows” on page 66 provides details.

4. Mount the volume on the new IP-enabled DD Boost device and perform the restore by using the new IP-restore Client resource.

Disaster recovery

In this guide, a disaster is any loss of data in which the computing environment required to restore that data is not available. Disaster recovery is necessary when ordinary data recovery procedures are not sufficient to recover the computing environment and its data to normal day-to-day operations.

Causes of disaster

A disaster can result from any of the following situations:
   - Debilitating hardware or software failures
   - Computer viruses that corrupt the computing system
   - Infrastructure interruptions, inconsistencies, or loss of services, such as problems with communications or the network connections that result in damage to the computing environment

Potential losses

Disaster recovery of the primary site must cover the potential loss of any or all the following systems at the primary site:
   - The Data Domain server that stores the deduplicated client backups
   - The NetWorker storage node that stores the deduplication metadata for the backups
   - The NetWorker server that stores the media indexes for the backups

Disaster recovery requirements

A complete disaster recovery environment provides a secondary site with systems that copy all the information involved in each completed backup at the primary site.

You can configure the two sites to provide disaster recovery for each other, with each serving as both a primary and secondary site with different datazones for different clients.

Disaster recovery requires the maintenance of the following systems:
   - Data Domain system with deduplicated client data cloned from the primary Data Domain system
   - Disaster recovery NetWorker storage node with deduplication metadata cloned from the primary NetWorker storage node
Restoring Data

- Disaster recovery NetWorker server with media indexes cloned from the primary NetWorker server

"Disaster recovery environment" on page 31 shows an example of a simple disaster recovery environment.

Disaster recovery scenarios

The procedures you use to recover from disaster will vary depending on the circumstances, which could include the following factors:

- The deployment of the disaster recovery environment
- Which systems the disaster has affected
- Time required to successfully recover from the disaster

The *EMC NetWorker Disaster Recovery Guide* provides details.
CHAPTER 7
Monitoring, Reporting, and Troubleshooting

This chapter includes the following sections:

◆ Monitoring Data Domain events, statistics, and logs ................................. 88
◆ Generating reports ......................................................................................... 92
◆ Replacing a failed or old storage node ...................................................... 95
◆ Troubleshooting ............................................................................................ 97
Monitoring Data Domain events, statistics, and logs

NMC provides several ways to view backup statistics, logs, and alerts of connected Data Domain systems.

Viewing the statistics, logs, and alerts

The NetWorker server window of NMC provides a comprehensive view of the backup status, log, and alerts for connected Data Domain systems:

**Note:** In some logs and notifications, NMC lists Client Direct operations variously as direct file assess (DFA), direct file save, or DIRECT_FILE operations.

1. Ensure that you have configured SNMP for the Data Domain system.
   
   “Configuring SNMP for Data Domain” on page 90 provides details.

2. In the NMC window for the NetWorker server, click the Devices view.

3. In the folder tree, select Data Domain Systems.

4. You can right-click a Data Domain system and select Properties to view its information, including its identity (name, hosts, model, OS version, serial number), configuration and SNMP community string, access credentials, capacity status information, save stream status information, and system details.

5. You can select a Data Domain system and view its backup information, as shown in the following figure:

   • The Devices area shows device and usage information, including the following:
     
     - Pre-Compression—indicates the amount of space that the backup would have used if the data had not been deduplicated and compressed. NetWorker tracks this value as the size of backups.
     
     - Compression (Reduction)—represents the data compression by two values:
       
       Pre-Compression ÷ Post-comp Used
       
       \[
       \frac{(1 - \text{Post-comp Used})}{\text{Pre-Compression}} \times 100\%
       \]
     
     - /backup: post-comp—indicates three values: the total capacity of the Data Domain system, the amount of disk space already in use, and the amount of space available.
     
     - /ddvar—indicates the amount of log file space in use on the Data Domain file system.

   • The Status area lists connectivity usage.

   • The Log table shows a chronological list of events that occur during backup operations.

   • The Alerts table lists messages for operational issues that can require administrative attention. Alerts are available only if SNMP traps are configured.

   **Note:** To delete individual messages from the Alerts table, open the NMC Events view, select the messages, right-click, and select Dismiss.
Viewing backup statistics in NMC

You can view the storage statistics for backups on a connected Data Domain system in NMC.

- In the NMC Enterprise view, select a Data Domain host.

A table shows the storage statistics for the selected system.

Viewing backup alerts (SNMP traps) in NMC

Alerts are messages for operational issues that can require administrative attention. You can view backup alerts on a connected Data Domain system in NMC.

1. Configure SNMP for the Data Domain system.
   “Configuring SNMP for Data Domain” on page 90 provides details.

2. In NMC, select the Events view.

A table lists the backup alerts (SNMP traps) in chronological order.

**Note:** The same alert messages also appear in the NetWorker Alerts table.
Deleting individual messages from NMC Events and NetWorker Alerts

You can delete individual messages from the NetWorker Alerts and NMC Events tables by removing the messages from the NMC Events table. The two views show the same messages.

1. In NMC, select the **Events** view.
2. Select the messages you want to remove from the Events table.
3. Right-click and select **Dismiss**.
   NSM deletes the selected messages.

Configuring SNMP for Data Domain

You can configure NMC to monitor Data Domain alerts (SNMP traps). Provided you have viewing privileges, the NMC **Enterprise** view lists the Data Domain systems as network hosts. “Adding a host Data Domain system to NMC Enterprise view” on page 57 provides details.

**Note:** NMC servers with HP-UX operating systems support status monitoring (SNMP) in the Enterprise view, but do not support event monitoring (SNMPTRAP) in the Events view.

1. Enable SNMP on the Data Domain system and configure the system to send traps to the NMC server. “Configuring the Data Domain system for DD Boost” on page 52 provides details.
2. In the NMC **Enterprise** view left panel, right-click the Data Domain system you want to monitor and select **Properties**.
3. In the **Properties** window, on the **Manage Data Domain** tab, select **Capture Events**.
   If the you do not select the checkbox, NMC will monitor the status of the DD Boost devices but will not monitor Data Domain SNMP traps required to monitor events.
4. On the **Configure SNMP monitoring** tab, type a value for **SNMP Community String**. The typical setting is public, which allows all users to monitor events. The following figure shows an example.
5. Type a value for the **SNMP Process Port**. The default value is 162. This setting must agree with the firewall setting on the Data Domain system. “Firewall requirements” on page 27 provides details.
6. Select the **SNMP Traps** that you want to monitor. Some traps are pre-selected. The following figure shows an example for Data Domain 4.8 alerts. Other versions may differ.
7. Click **OK**.
Figure 13 Data Domain alerts to monitor
Generating reports

Use the NMC Reports view to create statistical reports of NetWorker with Data Domain backup, recovery, and cloning activities.

Configuring a report

You can configure and display a Data Domain report for backup or clone in NMC.

1. In the NetWorker Management Console window, click Reports.

2. Expand the Reports folder, expand the Data Domain Statistics folder, and then select either a summary report or statement report to view.

   The Configure tab for the selected report type appears in the right panel.

3. In the Configure tab, customize the items that you want to include in the report. Select the item parameters and clicking the Remove ( ), Add ( ), Remove All ( ), or Add All ( ) buttons as required.

   If you do not specify Save Time values, the report will display all the available data.

   The following table lists details of report configuration parameters. The specific parameters available depend on the type of report selected.

   The following figure shows an example report configuration.

4. To display the report, select the View Report tab.

Table 2 Data Domain report configuration parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Name</td>
<td>Selects managed hosts within the enterprise.</td>
<td>Selected server names</td>
</tr>
<tr>
<td>Group Name</td>
<td>Selects one or more groups.</td>
<td>Selected group names</td>
</tr>
<tr>
<td>Client Name</td>
<td>Selects one or more clients.</td>
<td>Selected client names</td>
</tr>
<tr>
<td>Save Set Name</td>
<td>Selects one or more save sets. Values are</td>
<td>Selected save set names</td>
</tr>
<tr>
<td></td>
<td>case-sensitive and you cannot use wild cards.</td>
<td></td>
</tr>
<tr>
<td>Save Time</td>
<td>Limits the report to a specified time range.</td>
<td>Save time (within a range)</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The date/time format available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>depends on the language locale of the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>operating system.</td>
<td></td>
</tr>
</tbody>
</table>


Types of backup reports

Backup reports are available in various formats. Most are basic reports. The Backup Summary and Monthly Client Statement are drill-down reports:

- "Basic reports" on page 93 describes details of basic reports.
- "Drill-down reports" on page 94 describes details of drill-down reports.
- "Advanced reporting" on page 95 describes advanced reporting functionality with the optional EMC Data Protection Advisor (DPA).
- For clone operations, there is no specific report. You can query and list the copies of save sets in the NetWorker Administration, Media view, under Save Sets.

Basic reports

A basic report collects statistics for a specific datazone component, a time span, or a field. You can modify the scope of a report by adjusting the parameters on the Configure tab in NMC.
Table 3 on page 94 describes the basic reports available for Data Domain statistics.

**Table 3** Data Domain basic reports

<table>
<thead>
<tr>
<th>Report name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Summary</td>
<td>For all or specified clients, displays the following statistics:</td>
</tr>
<tr>
<td></td>
<td>• Amount of data—The amount of the data that NetWorker would have</td>
</tr>
<tr>
<td></td>
<td>moved by using a conventional backup (protected data).</td>
</tr>
<tr>
<td></td>
<td>• Target size—Size of the data after deduplication has taken place on</td>
</tr>
<tr>
<td></td>
<td>the Data Domain system (stored data).</td>
</tr>
<tr>
<td></td>
<td>• Deduplication ratio—Percentage of savings by using Data Domain</td>
</tr>
<tr>
<td></td>
<td>deduplication.</td>
</tr>
<tr>
<td></td>
<td>• Number of save sets—The number of save sets in the backup.</td>
</tr>
<tr>
<td></td>
<td>• Number of files—The number of files in the backup.</td>
</tr>
<tr>
<td>Save Set Summary</td>
<td>For all or specified save sets, displays deduplication statistics on</td>
</tr>
<tr>
<td></td>
<td>the following items:</td>
</tr>
<tr>
<td></td>
<td>• Amount of data—The amount of the data that NetWorker would have</td>
</tr>
<tr>
<td></td>
<td>moved by using a conventional backup.</td>
</tr>
<tr>
<td></td>
<td>• Target size—Size of the data after deduplication has taken place on</td>
</tr>
<tr>
<td></td>
<td>the Data Domain system.</td>
</tr>
<tr>
<td></td>
<td>• Deduplication ratio—Percentage of savings by using deduplication.</td>
</tr>
<tr>
<td></td>
<td>• Number of save sets—The number of save sets in the backup.</td>
</tr>
<tr>
<td></td>
<td>• Number of files—The number of files in the save set.</td>
</tr>
<tr>
<td>Save Set Details</td>
<td>Displays details about each save set, including backup duration and the</td>
</tr>
<tr>
<td></td>
<td>following statistics:</td>
</tr>
<tr>
<td></td>
<td>• Save Set ID</td>
</tr>
<tr>
<td></td>
<td>• Save time</td>
</tr>
<tr>
<td></td>
<td>• Backup level</td>
</tr>
<tr>
<td></td>
<td>• Save Set size—Protected data size</td>
</tr>
<tr>
<td></td>
<td>• Target size—Size of the data after deduplication has taken place on</td>
</tr>
<tr>
<td></td>
<td>the Data Domain system (stored data size).</td>
</tr>
<tr>
<td></td>
<td>• Deduplication ratio—Percentage of savings by using deduplication.</td>
</tr>
<tr>
<td></td>
<td>• Number of files—The number of files in the save set.</td>
</tr>
<tr>
<td>Monthly Summary</td>
<td>Displays statistics on a month-to-month basis.</td>
</tr>
<tr>
<td>Daily Summary</td>
<td>Displays statistics on a day-to-day basis.</td>
</tr>
</tbody>
</table>

**Drill-down reports**

A drill-down report consists of multiple basic reports, connected as layers and all configured with the same parameters that the top layer uses.

You can run reports for groups, clients, or save sets. You can modify the scope of a report by adjusting the parameters on the Configure tab in NMC.
Data Domain statistic reports

Use the Data Domain `gstclreport` command with a specified format to generate a specific Data Domain statistics report.

The Data Domain product documentation provides details.

Advanced reporting

NMC provides reports for only the recent backup history in a specific datazone. The optional EMC DPA software can provide extended reports of backups, trends, and analysis for one or multiple datazones, including reports of Data Domain systems. DPA is best for larger environments where you require additional analysis with forecasts and trends.

Replacing a failed or old storage node

If a storage node fails or if you replace a storage node, you can recover the data stored on the associated DD Boost devices on the replacement storage node or on a different storage node. The success of the recovery depends on the state of the devices at the time of the loss:

- If the storage volumes were unmounted when the disruption occurred, the structure and integrity of the data remains intact and you can expect a complete recovery.
- If the volumes were mounted but not reading or writing data during the disruption, then complete recovery is still likely.
- If the devices were reading or writing at the time of the disruption, then data loss or data corruption are more likely to have occurred and you cannot assure complete recovery.

Provided the volume structure of the devices is intact, then the NetWorker server can continue its operations with the existing devices with minimal impact.
However, if the replacement storage node has a different name or if you use the NetWorker server as the storage node, then you need to re-create the devices in NetWorker as follows:

1. Ensure the following requirements:
   - The replacement storage node has access to the original Data Domain system.
   - The NetWorker server software is the same version as the original.
   - The NetWorker server has all the same indexes and the same media database entries as before the disruption.

2. From NMC, run the NetWorker application, select the Devices view, and select Devices in the navigation tree.

3. For each affected original remote (storage node-based) DD Boost device, right-click the device, select Properties, and record the following information:
   - General tab:
     - Name
     - Device Access Information
   - Operations tab:
     - Volume Name
     - Volume Pool

4. Remove the original DD Boost devices from the NetWorker application. The device folders will continue to exist on the Data Domain system:
   a. In the Devices view, Devices tree, right-click and unmount each affected device. Mounted devices have a Volume Name.
   b. In the Media view, Media Pool tree, right-click each affected media pool (Volume Pool), select Properties, and on the Selection Criteria tab, remove each affected device from the Target Devices list.
   c. In the Devices view, Devices tree, right-click and delete each affected device.

5. Re-create the devices on the NetWorker application associated with a replacement storage node:
   a. In the Devices view, right-click the Data Domain systems tree and then run the New Device Wizard.
   b. Specify the Data Domain system and DD Boost (OST) credentials to gain access the system.
   c. On the Select Folders to use as Devices page, select the DD Boost devices (device folders) associated with the failed storage node.
      When you leave this page, a message notifies you that NetWorker had previously associated the devices with a different storage node. Confirm the selection.
   d. On the Configure Pool Information page, specify the media pool for the devices and cancel the Label and Mount selection. You must manually mount the devices on the new storage node later in this procedure.
If you enable **Label and Mount** at this point, NetWorker will relabel the volume and you will lose all the data. You cannot undo this action.

- On the **Select the Storage Nodes** page, select a storage node to handle the new devices by doing one of the following.
  - Select an existing storage node.
  - Create a replacement storage node.
  - Use the NetWorker server’s storage node.

  The storage node must be running on the correct network and its hostname must be resolvable by DNS.

- Complete the wizard.

6. Manually mount each new device:

- In the NMC window for the NetWorker server, click **Devices**.
- In the navigation tree, select the Data Domain system.
- In the right panel, right-click each device you want to mount, and select **Mount**.

  The device mounts on the storage node and will use the label associated with the pool you have specified.

7. Review the NMC log for any error messages.

If this procedure reports no errors, then the device and its volume are available for use. Backup and recovery operations may require further configuration depending on the original settings and the purpose of the device recovery.

### Troubleshooting

The following sections will help you identify and resolve common issues of configuration and operation.

#### Name resolution issues

If connectivity issues are present, ensure that the network names are valid and consistent for the NetWorker server, the storage nodes, and the Data Domain systems. Use the same names that are consistent with the NetWorker software configuration.

Validate connections in both directions for both IP address and the network names. If you use aliases or short names, then verify these. Correct improper names by amending DNS entries or by populating the local hosts files:

- Use the NetWorker **nslookup** command to verify that network names resolve to the correct IP address on the storage nodes and the servers.
- On the Data Domain system, you may use the **net hosts** command.

“Host naming guidelines” on page 28 provides suggestions for names.
Monitoring, Reporting, and Troubleshooting

Network connection issues

You can test the network connections for a Data Domain system by using the `net lookup` command through an SSH telnet session, which requires administrator or system administrator permissions. The Data Domain system can also show the current network configuration by using the `net show` and the other network related commands, available through the Data Domain interface at `http://DDR_IP_ADDRESS`. Log in and go to the specific Data Domain system. Then select the Hardware > Network tabs to access the commands.

Diagram and verify all relevant network connections. A typical Data Domain network configuration provides a minimum of two network connections, one dedicated to administration and the other to backup data only. Although this is not a requirement, this is a strongly recommended practice. You can make effective use of 10 GbE connectivity or the use of multiple backup connections that you can aggregate or team together by using the `ifgroup` command on the Data Domain system.

“Network requirements” on page 25 provides suggestions for network connections.

Device access errors

The following error messages can occur when NMC cannot connect to a DD Boost device.

Volume unavailable error

If the Data Domain file system becomes inaccessible or disabled and then you reenable it, for example, for service or testing, you could leave the devices in an unmounted state. Backup operations for the devices will elicit the following error message:

```
Waiting for 1 writeable volume(s) to backup pool
```

Complete the following steps to mount and enable the device:

1. In the NetWorker Administration window, click the Devices view.
2. In the Devices table, right-click and select Mount for any unmounted DD Boost device.
3. To enable the device, in the Enabled column, right-click the device and select Enable/Disable.

NFS service errors

You must enable Data Domain NFS service for the NetWorker software to access DD Boost devices. Without NFS, an error such as the following results, typically when NetWorker tries to label a device:

```
Failed to contact the Data Domain system. Host could be unreachable, or
username/password could be incorrect. Do you wish to configure
manually?
```

The user has insufficient privilege

“Configuring the Data Domain system for DD Boost” on page 52 describes how to enable NFS access.
**Backup fails for older NetWorker application modules**

Some older NetWorker application modules do not support the NetWorker Client resource fields for Data Domain Backup and Target Pool or Pool and you must not use these fields for DD Boost backups. The Data Domain Backup field ensures that backups use only DD Boost devices, even if the configured pool contains other device types, although pools with mixed devices is not a good practice.

The *EMC NetWorker Administration Guide* provides details on how to configure a pool to target DD Boost devices only.

The release notes for the specific NetWorker application modules provide details on supported Data Domain configurations.

**Multiple ssid recovery fails on AIX clients with less than 2 GB RAM**

For NetWorker clients on AIX systems with less than 2 GB of RAM, a recovery that uses four or more parallel recovery save stream IDs may fail with a “memory no longer available” error, similar to the following example.

93124:recover: readv from DD failed for read size 262144: Reading from a file failed ([5001] memory no longer available)

To avoid this error, export the following environment variable on the client shell.

LDR_CNTRL=MAXDATA=0x70000000
APPENDIX A
Upgrading from a NetWorker 7.6 SP1 release

This appendix includes the following sections:

◆ Changes to the folder structure and the backup sessions ......................... 102
◆ Planning the upgrade.................................................................................. 102
Changes to the folder structure and the backup sessions

Before NetWorker 8.0, NetWorker used a different storage structure on Data Domain systems. Due to the changes in this structure, you must use special procedures to upgrade to the NetWorker 8.0 and later environment.

With NetWorker 7.6 SP1, NetWorker created DD Boost devices at the level of a Data Domain storage unit (SU) and there was only one DD Boost device for each SU folder. NetWorker did not limit the number of these device SUs.

NetWorker 7.6 SP2 and later creates DD Boost devices as subfolders of each SU folder. By default, the NMC Device Configuration Wizard names each SU folder after the short hostname of the NetWorker server that creates the devices. For best performance, use no more than 14 active SU folders. NetWorker does not limit the number of DD Boost devices that you can create within each SU folder. However, increasing the number of DD Boost devices can impact Data Domain system performance and maintenance.

**Note:** An exception to the limit of 14 active SUs would be for service providers to enable quota enforcements, or for reporting on capacity used and deduplication ratios for each application group or each customer.

The maximum number of backup sessions (save streams) that you can enable for each DD Boost device has increased:

- NetWorker 7.6 SP1 used DD Boost library 2.2.2, which enforced a maximum of 10 sessions on each DD Boost device (SU). Due to this restriction, some environments used many DD Boost devices.
  
  NetWorker 7.6 SP1 with DD Boost library 2.2.2 supports DD OS 4.8 and 4.9.

- NetWorker 7.6 SP2 and later uses DD Boost library 2.3.1 and later, which raises the number of sessions per device (**nsmmd** process) to a maximum of 60. Hence, fewer devices can handle the same sessions load as the previous devices.
  
  NetWorker 7.6 SP2 with DD Boost library 2.3.1 supports DD OS 4.9, 5.0, and later.

Planning the upgrade

An upgrade to NetWorker 7.6 SP2 and later does not modify in any way the DD Boost devices that you created as SU folders in NetWorker 7.6 SP1. The devices remain available without any changes. These old devices appear in the NetWorker Administration program’s Devices view, but they do not appear in the NMC Device Configuration Wizard.

With DD OS 5.0 and later, use no more than 14 SU folders to avoid impairment of performance. These 14 SU folders can handle the DD Boost devices for 14 NetWorker datazones. However, an existing DD OS 4.9 system could already have more than 14 DD Boost devices configured at the level of Data Domain SUs.

The *EMC NetWorker Software Compatibility Guide* provides details of the supported NetWorker and Data Domain versions and upgrade options.

The *EMC NetWorker Software Compatibility Guide* provides details.
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
Name or value property of a resource.

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

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.

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

browse policy
NetWorker policy that specifies the period of time during which backup entries are retained in the client file index. Backups listed in the index are browsable and readily accessible for recovery. See "retention policy."

C

client
Host on a network, such as a computer, workstation, or application server whose data can be backed up and restored with the backup server software.

Client Direct
Feature that enables clients to deduplicate backup data and send it directly to AFTD or DD Boost storage devices, bypassing the NetWorker storage node. The storage node manages the backup devices but does not handle the backup data.

client file index
Database maintained by the NetWorker server that tracks every database object, file, or file system backed up. The NetWorker server maintains a separate index file for each client computer.

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.

clone
1. Duplicate copy of backed-up data, which is indexed and tracked by the NetWorker server. Single save sets or entire volumes can be cloned.
2. Type of mirror that is specific to a storage array.
Glossary

clone-controlled replication (CCR) Creation of a replica of deduplicated data copied from one DD Boost device to another, which can be scheduled by the NMC clone feature and is indexed and tracked by the NetWorker server.

D
database 1. Collection of data arranged for ease and speed of update, search, and retrieval by computer software.
2. 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.

DD Boost Optimized library and communication framework with a special Data Domain API that allows the backup software to define and interact with storage devices on the Data Domain system.

DD Boost device Logical storage device created on a Data Domain system that is used to store deduplicated NetWorker backups. Each device appears as a folder on the Data Domain system and is listed with a storage volume name in NMC.

DD OS Data Domain operating system.
deduplication Process used to compress redundant data.
deduplication backup Type of backup that removes redundant blocks of data to decrease storage space usage. When the deduplicated data is restored, the data is returned to its original native format.
deduplication ratio Reduction in storage space required to store data as a result of deduplication technology, usually combined with data compression, for example, a 20:1 space reduction.
device 1. Storage unit that can contain a backup volume. A device can be a disk drive, autochanger, or tape drive that is 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.
disaster recovery Restore and recovery of data and business operations in the event of hardware failure or software corruption.
distributed segment processing (DSP) Part of the DD Boost interface that enables data deduplication to be performed on a host before the data is sent to the Data Domain system for storage.

E
enabler code Unique code that activates the software:
- Evaluation enablers or temporary enablers 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."

**G**

group  One or more client computers that are configured to perform a backup together, according to a single designated schedule or set of conditions.

**H**

host  Computer on a network.

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

**I**

ifgroup  A feature on a Data Domain system and other network devices used to aggregate two or more network interfaces to appear as a single network interface.

**L**

label  Electronic header on a volume used for identification by a backup application.

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  Physical storage, such as a disk file system or magnetic tape, to which backup data is written. See also "volume."

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.

metadata  Hash information that identifies stored sub-file information for deduplication, and is required to revert deduplicated client backup data to the regular nondeduplicated format.

MTree  Shortened from "managed tree," also referred to as storage units, logical partition of the namespace in a Data Domain file system that can be used to group a set of files for management purposes. MTrees are normally associated with a single NetWorker datazone.

**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.
Glossary

notification Message sent to the NetWorker administrator about important NetWorker events.

O

online indexes Databases located on the NetWorker server that contain all the information pertaining to the client backups (client file index) and backup volumes (media database).

optimized clone See "clone-controlled replication (CCR)."

P

pathname Set of instructions to the operating system for accessing a file:
- Absolute pathname indicates how to find a file by starting from the root directory and working down the directory tree.
- Relative pathname indicates how to find a file by starting from the current location.

policy Set of defined rules for client backups that can be named and applied to multiple groups.

pool 1. NetWorker sorting feature that assigns specific backup data to be stored on selected media volumes.
2. Collection of NetWorker backup volumes to which specific data has been backed up.

R

recover To restore data files from backup storage to a client and apply transaction (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.

replication Process of creating an exact copy of an object or data. This is different than NetWorker cloning. See also "clone."

resource Software component whose configurable attributes define the operational properties of the NetWorker server or its clients. Clients, devices, schedules, groups, and policies are all NetWorker resources.

resource database NetWorker database of information about each configured resource.

restore To retrieve individual data files from a backup and copy the files to a client without applying transaction logs. See also "recover."

retention policy NetWorker setting that determines the minimum period of time that backup data is retained on a storage volume and available for recovery. After this time is exceeded, the data is eligible to be overwritten. See also "browse policy."

retrieve To locate and recover archived files and directories.
S

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

save set  1. Group of tiles or a file system copied to storage media by a backup or snapshot rollover operation.

2. NetWorker media database record for a specific backup or rollover.

save set ID (ssid)  Internal identification number assigned to a save set.

save stream  Data and save set information that is written to a storage volume during a backup. A save stream originates from a single save set.

scheduled backup  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.

storage device  See “device.”

storage node  Computer that manages physically attached storage devices or libraries, whose backup operations are administered from the controlling NetWorker server. Typically a remote storage node that resides on a host other than the NetWorker server.

storage unit (SU)  Logical unit of disk storage on a Data Domain system that is associated with a NetWorker datazone.

T

trap  Setting in an SNMP event management program to report errors or status messages.

V

virtual tape library (VTL)  Software emulation of a physical tape library storage system.

volume  Identifyable unit of physical storage medium, such as magnetic tape or disk file system used to store data.

volume name  Name assigned to a backup volume when it is labeled. See also “label.”
Glossary
INDEX

A
Add New Host Wizard 57
AFTD disk configurations 23, 44
authorization code 18

B
backup
redirect 40
backup failure
   older NetWorker application modules 99
bootstrap 68

C
cascaded replication configuration 33
CCR. See clone-controlled replication 15
CIFS formats 23, 44
cleaning storage space 24
client
   configuration wizard 65
   non-wizard configuration 66
Client Direct
   configuration 67
description 14
cron
   auto 76
   feature 74
   immediate 76
   manually started 81
   native non-deduplicated 75
   normal 75
   nsrclone 81
   operations 15
   pool 74
   requirements 74, 76
   scheduled 76, 78
to native format 15
cloned replication
   cascade configuration 33
   feature 15
   for disaster recovery 31
   process 74
   scheduling 78
   shared datazones 34
compression not supported 16
configuring
   Data Domain for NetWorker 52
   NetWorker for Data Domain 54

D
daily summary report 94
Data Domain
   backup attribute 42, 66, 68
   replication 43, 75
RetentionPolicy not supported 16
server 16
Data Domain Archiver 16, 24
Data Domain backup storage 22
DD Boost
   enabling 53
   feature 14
   structure 14
   username 52
DD Boost devices
   creating 54
   creation by property windows 57
deduplication
   feature 14
   ratio 27
device
   creating 54
   deactivate 70
   delete 70
   disable 70
   erase data 70
   identity 58
   mounting 65
   non-wizard configuration 58
   removal 24
Device Configuration Wizard 54
direct file access (DFA) 14
disaster recovery configuration 31
distributed segment processing 14, 53
DPA advanced reports 95
dynamic drive sharing 63

E
Ethernet 16
evaluation period 18

F
FC conversion from IP 40
Fibre Channel 16
Fibre Channel support 26
filesys clean command 24
filesys show space command 24
firewall requirements 27
full device 24

I
ifgroup
   multiple storage nodes 32, 36
   NIC usage 26
   immediate clone 76
Index

L
label
  device error 98
  template 62
legacy save sets migration 44
license requirements 18

M
max nsrmmd count 60
max sessions 60
memory requirement, storage node 23
migration
  legacy save sets 42, 44
  scenarios 45
  tape to local devices 46
  tape to remote devices 45
  VTL to local devices 48
  VTL to remote devices 48
monitoring
  backup operations 88
  backup statistics 89
  devices 90
mounting a device 65
MTree 22
multiple datazones 34

N
naming guidelines 29
native non-deduplicated format 44
NDMP deduplication backup 69
net hosts add command 28
network connectivity 25
NetWorker
  application modules 17
  client 17
  server 17
  storage node 17
NetWorker Management Console
description 15
NFS formats 23, 44
NFS service errors 98
NFS services 52, 56
NIC connections 26
normal clone 75
nsrclone
  command 78
  script 81

O
openstorage license 53
optimized clone 15, 74
OST username 52

P
pool
  associated with device 62
  configuration 68
  removing 23

R
recover
  deduplicated data 84
  disaster 85
redirect backups 40
remote device 59
replication license 53
replication, Data Domain 75
reports
  advanced 95
  basic 93
  configuring 92
  drill-down 94
  reviewing 93

S
save streams 23
seed
  as a data migration step 47
  before redirected backups begin 41, 44
  by native Data Domain replication 43
  diminishing value of 45
  new device with legacy data 43
  not required on existing system 47
sessions 23
shared datazones 34
short names, preferred over long names 29
snmp
  add ro-community command 57
  add trap-host command 58
  traps 53, 58
storage node 23
  dedicated 36
  replace 95
storage space, cleaning 24
storage unit
  maximum on Data Domain 22
  structure 22
synthetic full backup 15

T
target
  devices 64
  sessions 59
throughput, maximize 25
troubleshooting
  connectivity issues 97
  device access errors 98
  IP addresses 29
  network connections 98
  network issues 98
  no writable volume 98

U
upgrade to latest NetWorker 102

V
version requirements 16
virtual tape library 23, 44
volume name 62
Volume Shadow Copy Service 67
volume sharing 22
volume, erase 70

W
wizard
    Add New Host 57
    Client Configuration 65
    device configuration 54