



EMC® NetWorker®
Data Domain® Deduplication Devices
Version 7.6 Service Pack 1

Integration Guide
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Preface

Chapter 1 Introduction

NetWorker Data Domain integration features 10

 Deduplication backup..... 10

 NetWorker Data Domain storage devices 10

 Cloning and remote storage of backups 10

 Data Domain configuration and monitoring..... 10

Versions and licensing requirements 11

 Version requirements..... 11

 Licensing requirements 11

Hosts and software 12

 Data Domain storage server 12

 NetWorker Management Console server 12

 NMC portal 12

 NetWorker server 13

 NetWorker client 13

 NetWorker storage node 13

Chapter 2 Planning and Practices

About NetWorker Data Domain devices 16

Deduplication ratio and efficiency 17

 Retention period 17

 Data types 17

 Change rate..... 17

 Frequency of full backups 18

 Compression and encryption..... 18

 Reclaiming expired storage space 18

 Cleaning up unused pools 18

Naming guidelines 19

 Examples..... 19

Network connectivity and firewall 20

 Firewall requirements..... 20

Example environments 21

 Replication to an offsite Data Domain environment..... 21

 Backup to a Data Domain server shared across two datazones 22

 Single datazone with dedicated storage nodes 23

Transition to the NetWorker Data Domain devices..... 25

 Retaining or migrating existing save sets 25

	Roadmap to redirect backups to the new devices	25
	Roadmap to migrate existing save sets to the new devices	26
Chapter 3	Software Configuration	
	Configuring Data Domain for NetWorker	30
	Configure the Data Domain system for NetWorker	30
	Configuring NetWorker for Data Domain	31
	Methods	31
	Create a NetWorker Data Domain device with the wizard	32
	Configure Data Domain storage devices with the property windows	33
	Add a host Data Domain system to NMC Enterprise view	33
	Configure a NetWorker Data Domain device	34
	Create a volume label template for NetWorker Data Domain devices	36
	Create pools to target NetWorker Data Domain devices.....	37
	Label and mount devices on the storage node	39
	Configuring clients to back up to Data Domain.....	39
	Configure backup clients with the client wizard	39
	Configure backup clients with the property windows	40
Chapter 4	Cloning and Replicating Data	
	About cloning and replicating with Data Domain.....	44
	Datazone requirement.....	44
	Clone pool	44
	Data Domain replication support.....	44
	Clone formats.....	44
	Clone-controlled replication format.....	45
	Clone to native format.....	45
	Cloning methods	45
	Auto-clone.....	45
	Scheduled clone.....	45
	nsrclone command.....	46
	Cloning requirements	46
	Scheduling a clone operation	47
	Cloning by pools	49
	Starting a scheduled clone job manually on demand.....	50
	Manually start a clone job from the Configuration window	50
	Manually start a clone job from the Monitoring window.....	50
Chapter 5	Monitoring, Reporting, and Troubleshooting	
	Monitoring NetWorker Data Domain devices	52
	Configure Data Domain monitoring and alerts	52
	Monitor Data Domain operations in the Devices view	53
	Monitor Data Domain backup statistics, log, and events	54
	Backup reports.....	55
	Configure a report.....	55
	View a report	56
	Advanced Reporting	59
	Troubleshooting.....	60
	Network issues	60
	Connectivity issues	60

Glossary

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

If a product does not function properly or does not function as described in this document, please contact your EMC representative.

Audience This document is part of the NetWorker documentation set, and is intended for use by system administrators. It contains planning, practices, and configuration information for the use of NetWorker Data Domain devices within an EMC NetWorker backup and storage management environment.

Readers of this document should be familiar with the following tasks:

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

NetWorker product documentation

Documentation related to the use of NetWorker software can be found at the EMC Powerlink website, <http://Powerlink.EMC.com>, including:

- ◆ *EMC NetWorker Release 7.6 Service Pack 1 Installation Guide* provides instructions for installing or updating the NetWorker software for clients, console, and server on all supported platforms.
- ◆ *EMC NetWorker Release 7.6 Service Pack 1 Cluster Installation Guide* contains information related to installation of the NetWorker software on cluster servers and clients.
- ◆ *EMC NetWorker Release 7.6 Service Pack 1 Administration Guide* describes how to configure and maintain the NetWorker software.
- ◆ *EMC NetWorker Release 7.6 Service Pack 1 Release Notes* contain information on new features and changes, fixed problems, known limitations, environment, and system requirements for the latest NetWorker software release.
- ◆ *EMC NetWorker Licensing Guide* provides information about licensing NetWorker products and features.

- ◆ *NetWorker License Manager 9th Edition Installation and Administration Guide* provides installation, setup, and configuration information for the NetWorker License Manager product.
- ◆ *NetWorker 7.6 Service Pack 1 Error Message Guide* provides information on common NetWorker error messages.
- ◆ *NetWorker 7.6 Service Pack 1 Command Reference Guide* provides reference information for NetWorker commands and options.
- ◆ *NetWorker Management Console Online Help* describes how to perform the day-to-day administration tasks in the NetWorker Management Console and the NetWorker Administration window.
- ◆ *NetWorker User Online Help* describes how to use the NetWorker User program, which is the Microsoft Windows client interface for the NetWorker server, to back up, recover, archive, and retrieve files over a network.

Data Domain product documentation

Documentation related to the use of Data Domain systems can be found at the Data Domain Support Portal (support account required), <https://my.datadomain.com/>, including:

- ◆ *Data Domain Software Release 4.8 Release Notes*
- ◆ *Data Domain Administration Guide*
- ◆ *Data Domain Command Reference*
- ◆ *Data Domain CLI Guide*
- ◆ *Data Domain System Hardware Guide*
- ◆ *Installation and Setup Guide* for each Data Domain system
- ◆ *Data Domain Initial Configuration Guide*

NetWorker related documentation

The following documentation resources provides more information about NetWorker software:

- ◆ *EMC Information Protection Software Compatibility Guide* provides a list of client, server, and storage node operating systems supported by EMC information protection software versions.
- ◆ E-lab Issue Tracker database offers online queries of NetWorker known problems and fixed bugs searchable by such details as issue number, product feature, host operating system, and fixed version.
- ◆ NetWorker Procedure Generator (NPG) is a downloadable Microsoft Windows application with periodic updates available to NetWorker customers and support staff. By means of user-selectable prompts, NPG tailors single focused documents from high-demand information drawn from the NetWorker product guides and the latest advice supplied by expert users.
- ◆ Technical notes and white papers provide in-depth technical reviews of products regarding business requirements, applied technologies, and best practices.

These resources are available at <http://www.Powerlink.EMC.com>. You must have a service agreement to use the Powerlink site.

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.



CAUTION

A caution contains information essential to avoid data loss or damage to the system or equipment.

IMPORTANT

An important notice contains information essential to operation of the software.

Typographical conventions

EMC uses the following type style conventions in this document:

Normal	Used in running (nonprocedural) text for: <ul style="list-style-type: none"> 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, utilities URLs, pathnames, filenames, directory names, computer names, filenames, links, groups, service keys, file systems, notifications
Bold	Used in running (nonprocedural) text for: <ul style="list-style-type: none"> Names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system calls, man pages
Bold	Used in procedures for: <ul style="list-style-type: none"> Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus) What user specifically selects, clicks, presses, or types
<i>Italic</i>	Used in all text (including procedures) for: <ul style="list-style-type: none"> Full titles of publications referenced in text Emphasis (for example a new term) Variables
Courier	Used for: <ul style="list-style-type: none"> System output, such as an error message or script URLs, complete paths, filenames, prompts, and syntax when shown outside of running text
Courier bold	Used for: <ul style="list-style-type: none"> Specific user input (such as commands)
<i>Courier italic</i>	Used in procedures for: <ul style="list-style-type: none"> Variables on 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 indicate content that you must specify (that is, x or y or z)
...	Ellipses indicate nonessential information omitted from the example

Where to get help

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

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

<http://Powerlink.EMC.com/>

Technical support — For technical support, go to Powerlink and choose **Support**. On the Support page, you will see several options, including one for making a service request. Note that to open a service request, you must have a valid support agreement. Please contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.

Data Domain — Data Domain customer service and technical support provides an online portal for searches and inquiries related to Data Domain products.

<https://my.datadomain.com/>

A valid Data Domain support account is required to access the resources on the Data Domain support site.

Your comments

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

BSGdocumentation@emc.com

If you have issues, comments, or questions about specific information or procedures, please include the title and, if available, the part number, the revision (for example, A01), the page numbers, and any other details that will help us locate the subject you are addressing.

This chapter includes the following sections:

- ◆ NetWorker Data Domain integration features..... 10
- ◆ Versions and licensing requirements..... 11
- ◆ Hosts and software 12

NetWorker Data Domain integration features

The EMC® NetWorker® version 7.6 Service Pack 1 integration with EMC Data Domain® offers the following features.

Deduplication backup

The Data Domain “distributed segment processing” feature allows backup data to be deduplicated on NetWorker storage nodes before it is sent for storage on a Data Domain system. It also enables multiple concurrent storage and recovery operations on the storage devices, unlike virtual tape library (VTL), and CIFS or NFS AFTD conventional disk file system interfaces.

These capabilities dramatically reduce the amount of data sent to be stored on the NetWorker Data Domain device and reduce the need for large bandwidths to the storage device.

NetWorker Data Domain storage devices

Deduplicated data backups are stored on special NetWorker Data Domain storage devices that are accessed by the NetWorker storage node. Each device represents a storage unit and is associated with a named storage volume. Each device appears as a folder on the Data Domain system.

Cloning and remote storage of backups

Backups that are stored on a Data Domain system may be copied to remote storage for added protection and efficient disaster recovery. These copies are configured and launched by the NMC clone feature and are indexed and retained according to NetWorker storage policies. There are two types of clone operations, both of which require distributed segment processing on the storage nodes:

- ◆ The “clone-controlled replication” or “optimized clone” feature is used to replicate data from a NetWorker Data Domain device to another NetWorker Data Domain device, usually at a remote location. This option preserves the deduplicated data format and minimizes bandwidth usage between the Data Domain systems.
- ◆ The clone to native format feature is used to clone data from Data Domain storage to traditional disk or tape storage. This option reverts the data to its native non-deduplicated format, which is required for data stored on a traditional disk or tape system to be recoverable.

Data Domain configuration and monitoring

Configuration, monitoring, and reporting of backup and restore operations on NetWorker Data Domain devices is provided by the NetWorker Management Console (NMC) portal. The NMC server is accessible from any supported remote Internet browser.

The NMC Device Configuration Wizard simplifies the configuration of storage devices, backup clients, storage (target) pools, volume labeling, and save set cloning.

Versions and licensing requirements

This section describes version and licensing requirements for the NetWorker Data Domain backup and recovery environment.

Version requirements

The hosts in NetWorker Data Domain backup and recovery datazone should meet the following version requirements:

- ◆ The NetWorker server must be installed with NetWorker 7.6 SP1 software.
- ◆ The Data Domain Operating System (DD OS) must be version 4.8 or later.
- ◆ NetWorker Management Console (NMC) must be version 7.6 SP1.
- ◆ Any storage node that uses NetWorker Data Domain devices must be running NetWorker 7.6 SP1.
- ◆ NetWorker clients may be earlier versions, although version 7.5 SP 3 or 7.6 is recommended.
- ◆ Other NetWorker storage nodes and clients that are not directly managing or sending data to the Data Domain system can be earlier versions, although version 7.5 SP 3 or 7.6 is recommended.

Licensing requirements

A fresh installation of a NetWorker release (not an upgrade) allows evaluation of all features, including Data Domain features, with no license required for 30 days. You can extend this evaluation period by 15 additional days by typing “grace” as an authorization code before the 30-day expiry period. After expiration, backups cannot be performed unless permanent enablers are applied.

Contact your EMC BRS sales representative for details on how to obtain temporary licenses to configure the new Data Domain devices with NetWorker 7.6 SP1 and the DD Boost/Replicator licenses.

NetWorker

The NetWorker server requires a Data Domain Storage System Enabler for each Data Domain system that will be included in the integrated backup environment.

The amount of Data Domain raw storage available in a NetWorker datazone is provided by a Data Domain Device Type Capacity Entitlement license. There is no restriction on the number of NetWorker Data Domain Device resources that can be created, other than the overall device limits for the datazone.

The *EMC NetWorker Licensing Guide* provides requirements for environments that use a NetWorker source capacity license. Contact your EMC sales representative for licensing details.

Data Domain

The Data Domain server must be enabled with a DD Boost license. If clone-controlled replication will be used, an additional Replicator license is required.

Each Data Domain system NIC that is used as device with the **Media type** attribute set to **Data Domain** will require a Data Domain Storage System license. [“Configure a NetWorker Data Domain device” on page 34](#) provides the **Media type** attribute setting.

To verify the license key on the Data Domain system, type the **license show** command. For versions 4.8.x and 4.9x, the output should read OPENSTORAGE if the DD Boost license is installed and additionally REPLICATION if the Replicator license is installed. “Configure the Data Domain system for NetWorker” on page 30 provides details.

For upgrade and other inquiries, contact the Data Domain services and support portal at: <https://my.datadomain.com/>

NMC on AIX, HP-UX, or Solaris AMD limitation

If the NMC server is running on AIX, HP-UX, or Solaris AMD systems, the Device Configuration Wizard’s Browse button is *not* supported. Browsing is used to associate a Data Domain storage unit (lsu) with a NetWorker Data Domain device.

Indirect use of the Browse button is supported if the NMC server is installed on a fully supported operating system and a supported web browser on the AIX, HP-UX, or Solaris AMD system is used as a portal to access NMC.

As a manual alternative, to the Browse button, the Data Domain storage units can be created with the Data Domain **ost lsu create** command before the wizard is run. In the wizard, the pathnames of these devices can be manually typed by using the wizard’s **Manual Configuration** option.

“Configure the Data Domain system for NetWorker” on page 30 provides an optional step to manually create storage units.

Hosts and software

This section describes hosts and software used in the NetWorker Data Domain devices backup and recovery environment.

Data Domain storage server

The Data Domain server stores deduplicated backup or cloned data on special NetWorker Data Domain storage devices that are accessed by the NetWorker storage node. A Data Domain server can support mixed environments that may include NetWorker Data Domain devices, virtual tape libraries (VTL), and CIFS or NFS AFTD disk configurations.

NetWorker Management Console server

The NMC server provides a user interface for NetWorker configurations and monitoring. The NMC server must run NetWorker 7.6 SP1 software and have network access to NetWorker storage nodes and Data Domain systems.

If the NMC server is running on an AIX, HP-UX, or Solaris AMD system, the browsing function of the Device Configuration Wizard is *not* supported. Some manual procedures are required to create devices with an NMC server on those platforms. “NMC on AIX, HP-UX, or Solaris AMD limitation” on page 12 provides details.

NetWorker portal

The NMC server may be accessed and operated from a portal on a remote computer with a supported Internet web browser and Java Runtime Environment (JRE) software installed. Multiple users can access the NMC server concurrently from different portals.

The *EMC NetWorker Installation Guide* provides information on supported web browsers and versions of the JRE.

NetWorker server

NetWorker 7.6 SP1 software must be installed on the NetWorker server that stores or clones data on Data Domain systems.

The NetWorker software provides services to back up and recover data for client computers within a NetWorker datazone. Deduplicated backup data is stored on a Data Domain system by the use of special NetWorker Data Domain devices, which are created and managed by the NetWorker software. The NetWorker software also provides features to create clone copies of stored deduplicated data.

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

NetWorker client

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

NetWorker client software must be installed and running before NetWorker Data Domain devices are configured. Clients may use a supported earlier version of NetWorker client software than the NetWorker server or storage node.

The *EMC Information Protection Software Compatibility Guide* provides information on supported versions.

NetWorker storage node

NetWorker 7.6 SP1 software must be installed on each storage node that stores or clones data on Data Domain systems. It is recommended that storage nodes within the same NetWorker datazone be of the same version and patch level.

Data that is backed up on NetWorker Data Domain devices is deduplicated on a NetWorker storage node, with the distributed segment processing feature, before it is sent to the Data Domain system for storage. The storage node reviews the data that is already stored on the Data Domain system and sends only unique data for storage.

This chapter includes the following sections:

- ◆ About NetWorker Data Domain devices 16
- ◆ Deduplication ratio and efficiency 17
- ◆ Naming guidelines..... 19
- ◆ Network connectivity and firewall..... 20
- ◆ Example environments..... 21
- ◆ Transition to the NetWorker Data Domain devices 25
- ◆ Roadmap to redirect backups to the new devices 25
- ◆ Roadmap to migrate existing save sets to the new devices 27

About NetWorker Data Domain devices

The NetWorker 7.6 Service Pack 1 software enables the integration of Data Domain storage systems with NetWorker software features and storage node processes. The integration uses special NetWorker Data Domain storage devices created by the NetWorker software. Each device represents a storage volume and appears as a folder on the Data Domain system.

Number of devices and save streams

A Data Domain system supports up to 16 read/write NetWorker Data Domain devices and the corresponding 16 read-only devices.

Optimum performance is achieved when the number of concurrent save streams running on each device is minimized. This ensures that each different save set from the storage node will attach to a new device, if available, or to the device that is currently running the fewest save streams. To support this, the Target sessions value for a device is set to a default value of one. The Max sessions value is set to a default value of four and cannot be set to a value greater than 10.

Memory and network considerations

Each read/write device (active **nsrmmd** process) that takes four save streams requires about 96 MB of RAM on the storage node. Each read-only device requires about 20 MB, regardless of the number of save streams. Thus, a fully loaded Data Domain system that is running four save streams per device would require about $(96 \times 16) + (20 \times 16) = 2.3$ GB, of physical memory on the storage node.

The recommended minimum memory requirement for a storage node is 4 GB of RAM. The use of two interfaces (1 GB or 10 GB) is also highly recommended.

[“Network connectivity and firewall” on page 20](#) provides details on network bandwidth and connections.

Mixed environments

A Data Domain system can support mixed NetWorker environments, which may consist of NetWorker Data Domain devices, virtual tape libraries (VTL), and CIFS or NFS AFTD disk configurations. Each different storage environment should use a different interface connection, either NIC for IP or FC port for SAN data transport. Data stored on these other environments may be migrated to NetWorker Data Domain devices through a NetWorker clone process.

Note: Currently, NetWorker Data Domain devices support only an IP network and do *not* support SAN (Fibre Channel) data transport.

The *EMC Data Domain Storage system with EMC NetWorker Best Practices Planning* white paper provides details on deployments of NetWorker with Data Domain in a VTL or CIFS/NFS AFTD environment.

Deduplication ratio and efficiency

Deduplication is typically measured by the deduplication ratio. This ratio represents the reduction in storage space that results from the data deduplication/compression technology. Ratios of 20:1 are considered to be broadly achievable, although reductions of even 5:1 are extremely valuable.

A number of factors can contribute to the deduplication ratio, including retention periods, the type of data being backed up, change rate, the frequency of full backups, and the use of encryption and compression.

For optimal use of storage space, these factors and the periodic clearing of expired storage space and the removal of unused target pools need to be considered, as described in the following sections.

Retention period

The deduplication ratio increases with longer data retention periods. The longer the stored save sets are retained, the greater the chances that identical data already exists in storage that can be used to deduplicate each subsequent backup, and the greater the efficiency of the storage usage. However, longer retention can also result in more preprocessing, which can lengthen backup throughput.

Data types

Some types of user data such as text documents, slide presentations, spreadsheets, most database types, source code, and e-mail are known to 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 will typically produce high deduplication ratios if the data has a low change rate.

Change rate

Data that does not change much between backups (low change rate) produces high deduplication ratios and is a good candidate for deduplication. Data that has already been stored will not be stored again.

When a completely 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 percent) data reduction.

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

Frequency of full backups

Frequent full backups result in high deduplication ratios, but also increased data processing on the NetWorker storage node. For example, compare deduplication backups performed on a daily full basis with those performed on a weekly full with daily incremental basis. 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 because the storage node sends 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.

Compression and encryption

Compression and encryption of source data interfere with the ability to find duplicate data and are *not* recommended for deduplication.

- ◆ A compressed file will be deduplicated in subsequent backups only if it remains unchanged.
- ◆ An encrypted file will be deduplicated in subsequent backups only if it is unchanged and the encryption key and method are not changed.

Reclaiming expired storage space

When a backup on a Data Domain system reaches its retention expiry date, all its references to the data become invalid. However, unlike traditional storage systems, space is not immediately freed up on the device because other backups or clients may 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 result in 1 GB of space made immediately available on the Data Domain system.

The DD OS **filesys show space** or **df** command shows the data that is eligible to be deleted from the Data Domain under the Cleanable GiB column.

A review of deduplication references and storage space occurs during a periodic cleanup operation, which is scheduled to run once per week by default.

Note: If a NetWorker Data Domain device becomes full during a backup, the backup fails immediately. It does not pause or wait for space to become available.

The DD OS **filesys clean** command describes all the available options for managing how expired save sets will be deleted from the Data Domain system. The Data Domain documentation also provides details on reclaiming storage space.

Cleaning up unused pools

Media or “target” pools are used to sort backups into the different types for storage on different devices and storage volumes. Periodically review and remove unused pools if they are no longer relevant to the storage environment.

Naming guidelines

The following guidelines are offered to help you create consistent, easily identifiable names that facilitate configuration, reporting, and troubleshooting in the NetWorker Data Domain environment.

The network environment affects name resolution methods and you should 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:

- ◆ Create names that are unique across all NetWorker datazones. They should identify the network role, such as administration, backup, cloning, or production, with possibly a location or server name.
- ◆ Include source and target abbreviations in names to quickly identify whether 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. Ensure that these names are included in the Data Domain `/etc/hosts` file.
- ◆ Specify all aliases (long and short names, IP address, etc.) for the NetWorker server and storage nodes in their respective Client resources (Globals 1 of 2 tab).
- ◆ Ensure that all hostnames in the network can be consistently resolved from multiple locations in both directions. For example: Shortname to IP, Longname to IP, IP to Shortname, IP to Longname.
- ◆ 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 might not fit into some views. Examples of a long and short name:
 NWDD365-1.brloa.lab.remcy.com:/DatazNW_Dir1
 NWDD365-1:/DatazNW_Dir1
- ◆ Use fixed formats (text field length and case) and include leading 0s in numbers.
- ◆ Use standard ASCII characters with no spaces or special characters. Pool names may not use underscores.
- ◆ Avoid the use of dates in names where the dates might change.

Examples

The following are some example name formats.

NetWorker Data Domain devices

DD-DDsystem name-Device00-99
 Example: DD-Brandza-Device01

Folders on Data Domain system

NetWorker Data Domain device names should refer to the NetWorker server and indicate whether they are for backup or cloning operation.

NW server or storage node_BACK or CLON_SU00-99
 Example: DZBurl_BACK_SU01

Volume labels for Data Domain

DD-MEDIA or 5-letter descriptor-000-999
 Example: DD-MEDIA-001

Network connectivity and firewall

Because NetWorker Data Domain devices are network based, supported on Ethernet IP networks, consideration should be given to hostname resolution, connectivity, and capacity.

The network hostname resolution method depends on your environment and manufacturer recommendations. Review [“Naming guidelines” on page 19](#) for details.

The recommended minimum connectivity is to use two 1 GB network links, one of which is dedicated to administration and the other to data backup. Network connections and types can improve on this depending on the Data Domain system model.

You can maximize throughput of the Data Domain system by using multiple or higher bandwidth connections. For example, you can use multiple 1 GB connections for dedicated storage nodes and storage devices. 10 GB connections are also available and these can be used instead of, or in addition to, 1 GB interfaces.

In environments where 10 GB connectivity is not available or cost prohibitive, two alternatives are available:

- ◆ Use a dedicated 1 GB or 10 GB connection from a storage node directly to the Data Domain system. This provides a private, high-bandwidth data connection and avoids the latency and complexity of a shared Ethernet connection. However, a separate traditional Ethernet connection is also required for administration and NMC access.
- ◆ Use two network connections aggregated together. This will provide increased capacity and can offer some resiliency. The Data Domain system provides automatic Advanced Load Balancing and Link Failover for NIC connections.

Firewall requirements

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

- ◆ TCP 111 (NFS portmapper)
- ◆ TCP 161 (for NMC server to query for alerts and statistics)
- ◆ TCP 162 (SNMPTRAP for NMC server to receive traps to monitor status and events)
- ◆ TCP 2049 (NFS)
- ◆ TCP 2051 (Replication, if clone-controlled replication is used, Data Domain to Data Domain systems)
- ◆ 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 your network configuration and capabilities, as well as SSH Telnet to help diagnose issues.

Example environments

This section provides some examples of how the NetWorker Data Domain integration may be deployed in backup environments. The use of two interfaces (1 GB or 10 GB), one for administration and one for data, is recommended.

Replication to an offsite Data Domain environment

In [Figure 1 on page 22](#), client backups are cloned from the primary Data Domain storage system to a remote Data Domain system and one group of client backups is further cloned from the remote system to tape storage.

The NetWorker server must be configured so that both the primary and secondary Data Domain systems are configured, enabled, and managed on the same or separate storage nodes within the same datazone.

Clone-controlled replication across datazones or to Data Domain devices that are *not* managed by NetWorker are not supported.

For example, the processes in this environment might be as follows:

1. The NetWorker server initiates the backup of several client groups within its datazone.
2. Two storage nodes for the datazone sort the backup data into storage pools, which are targeted to storage devices and their volumes on the primary Data Domain system.
3. The storage nodes store deduplicated backup data on the primary NetWorker Data Domain devices over dedicated 10 GB direct connections.
[“Network connectivity and firewall” on page 20](#) gives suggestions on network connections.
4. Clone-controlled replication is used to store optimized clone copies of backups from the primary Data Domain system to a remote Data Domain system.
5. A NetWorker storage node at the remote site creates a further clone copy of the data from one of the backup groups, which it sends to tape storage for disaster recovery. The data in this copy is reverted to its native non-deduplicated format, which is necessary for storage on tape.

Note: A fallback plan might include a storage node at the local or remote site, which will revert the data to its native non-deduplicated state. this storage node must have access to the devices on the primary Data Domain system.

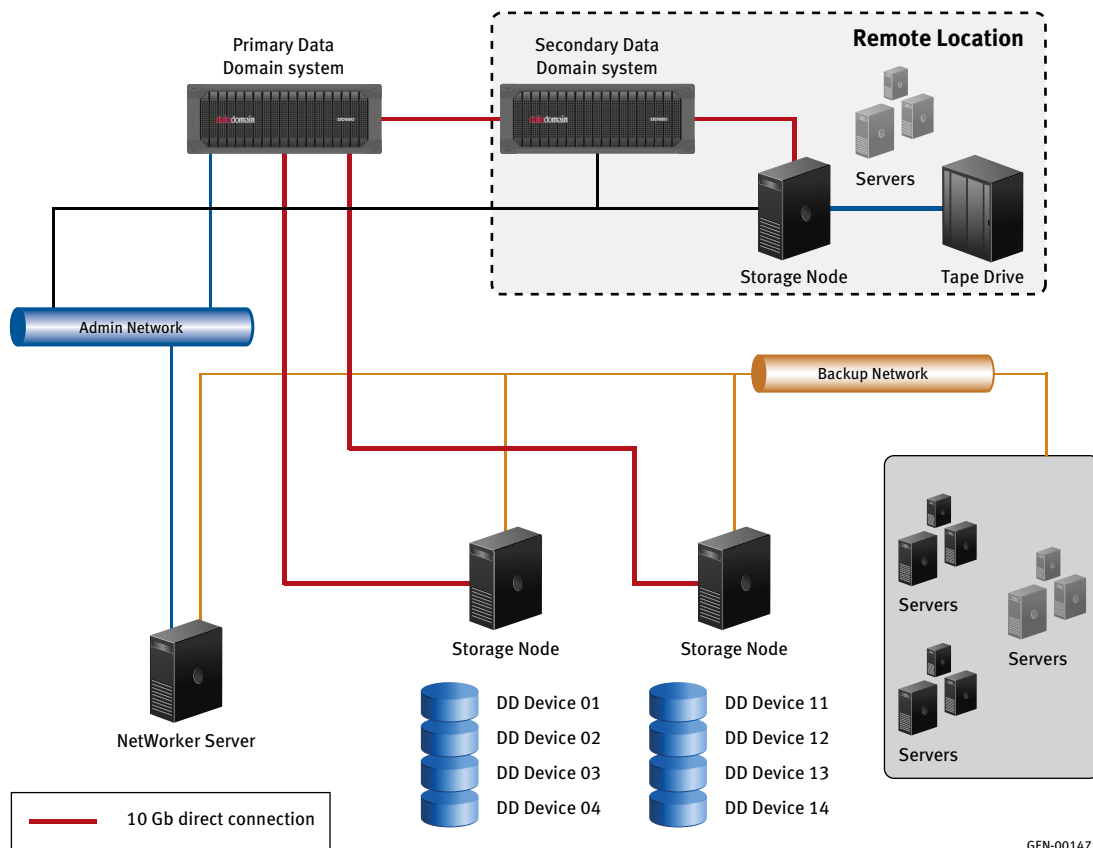


Figure 1 Dual Data Domain servers with a dedicated backup network

Backup to a Data Domain server shared across two datazones

In [Figure 2 on page 23](#), backups from two datazones are stored on one Data Domain system. Consideration must be given to dividing the stream counts and memory resources to manage the two datazones as separate entities.

For example, the processes in this environment might be as follows:

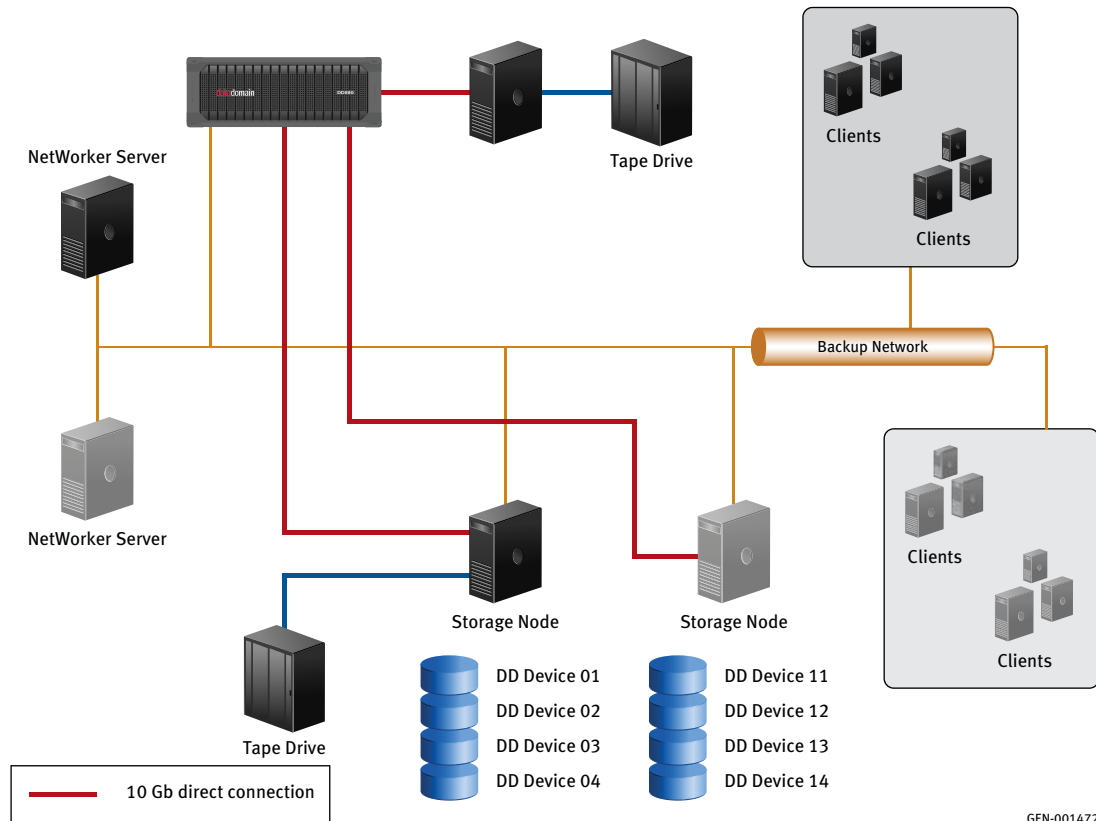
1. The two NetWorker servers initiate backups of client groups within their respective datazones.
2. The two storage nodes, one for each datazone, sort the backup data into storage pools, which are targeted to storage devices and volumes on the Data Domain system. A NetWorker Data Domain device must *not* be shared with more than one datazone.

[“Number of devices and save streams” on page 16](#) provides details on save stream usage and memory requirements.

3. The storage nodes store the deduplicated backup data on the NetWorker Data Domain devices over dedicated 10 GB direct connections.

[“Network connectivity and firewall” on page 20](#) gives suggestions on network connections.

- Backup to tape storage may be made either directly from a storage node or by a clone operation from the Data Domain system.



GEN-001472

Figure 2 Data Domain server shared across two datazones

Single datazone with dedicated storage nodes

In [Figure 3 on page 24](#), backups are made from various client groups that use shared storage nodes as well as four clients on NetWorker database modules, each of which has its own dedicated storage node.

For example, the processes in this environment might be as follows:

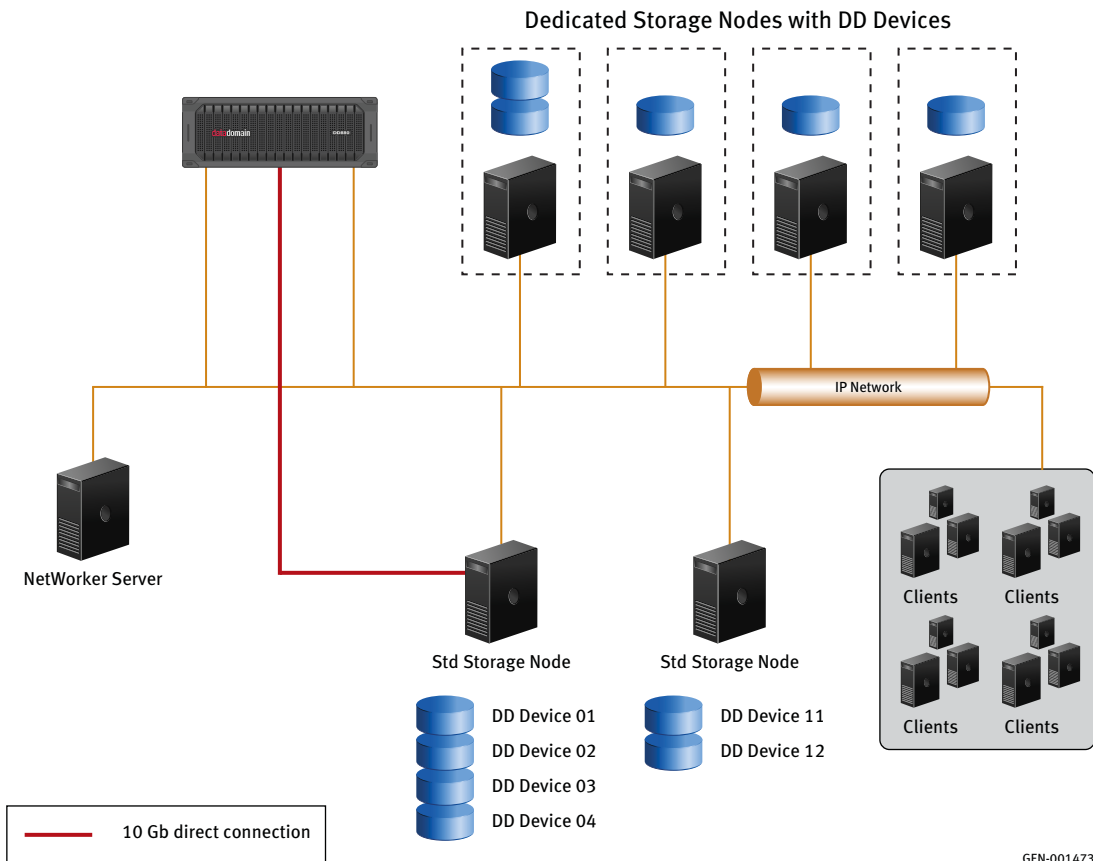
- The NetWorker server initiates backups of the various regular client groups as well as the module clients on the dedicated storage nodes.
- The storage nodes sort the backup data into storage pools, which are targeted to storage devices and volumes on the Data Domain system.

[“Number of devices and save streams” on page 16](#) provides details on save stream usage and memory requirements.

- The storage nodes store the deduplicated backup data on the NetWorker Data Domain devices. One heavy usage storage node uses a dedicated 10 GB direct connection.

[“Network connectivity and firewall” on page 20](#) gives suggestions on network connections.

The *EMC Information Protection Software Compatibility Guide* provides information on NetWorker modules compatible with Data Domain systems.



GEN-001473

Figure 3 Single datazone with dedicated storage nodes

Transition to the NetWorker Data Domain devices

Following upgrade to NetWorker 7.6 SP1, you can redirect the backups of existing NetWorker clients to begin using the new NetWorker Data Domain devices.

It is best to redirect backup clients to this new environment starting with a NetWorker level full backup. To start with an incremental backup would carry a dependency on the last full backup stored with the legacy storage environment. If a restore is needed, you would need to restore from these two different environments.

To transition clients starting with a full backup, you can do one of the following:

- ◆ Change the backup schedule to accommodate an initial full backup
- ◆ Wait until the backup clients are scheduled for their next full backup

Retaining and migrating existing save sets

Existing save sets, stored on legacy devices or filesystems, can either be retained until expiry or migrated to the new NetWorker Data Domain devices.

If you are redirecting client backups to the new devices from legacy VTL or CIFS/NFS AFTD formats on the same Data Domain system, the legacy data will not be re-sent from the clients for storage, even though the storage device or file system has changed. Data Domain uses a global deduplication format for all of its storage devices and filesystems and migration of the save sets is not required.

Retain existing save sets until expiry

The easiest transition to the NetWorker Data Domain devices is to redirect client backups to the new devices and simply allow the existing save sets stored on the legacy environment to expire according to their retention policies.

Migrate existing save sets to the new environment

As an option, you may copy your existing save sets from the legacy environment to the new NetWorker Data Domain environment, instead of allowing them to expire. To do this, you can create a special clone pool and set up a clone operation to migrate the save sets. [“Roadmap to migrate existing save sets to the new devices” on page 27](#) provides details.

Roadmap to redirect backups to the new devices

Scheduled backups of existing NetWorker clients may be redirected to storage on NetWorker Data Domain devices. Clients are members of backup groups, which point to pools. The pools point to the devices. If you maintain the settings at the higher level (pool) then minimal effort is required to make the transition work.

To redirect existing scheduled backups to storage on NetWorker Data Domain devices, use the following sequence of procedures:

1. Ensure that the required network connection, name resolution, and licenses are available and ready to use. The following sections provide details:
 - [“Network connectivity and firewall” on page 20](#)
 - [“Naming guidelines” on page 19](#)
 - [“Licensing requirements” on page 11](#)

2. Configure the Data Domain system. [“Configuring Data Domain for NetWorker” on page 30](#) provides details.
3. On NMC run the New Device Wizard. The following tasks are specific to NetWorker Data Domain devices:
 - a. Select or create NetWorker Data Domain devices (folders) on the Data Domain system where the backup save sets will be stored.
 - b. Select or create a Pool resource that will target the save sets to the devices.

Note: The wizard enforces that a NetWorker Media Pool created for the Data Domain system uses *only* NetWorker Data Domain devices. This can be verified in NMC (**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.

[“Create a NetWorker Data Domain device with the wizard” on page 32](#) provides details.
4. In the NMC **NetWorker Administration** window:
 - a. In the **Media** view, open the pool created or modified in [step 3](#).
 - b. In the **Data Source** attribute, ensure that the groups selected for this pool are intended for NetWorker Data Domain devices.

[“Create pools to target NetWorker Data Domain devices” on page 37](#) provides details.

Note: Existing individual NetWorker Client resources should *not* require any changes to their settings, including the **Data Domain backup** attribute. The redirection is more efficiently configured in the Pool resource.

5. Test the backup environment to ensure that the new configuration operates correctly and existing backups that should be unaffected continue to run as expected. For backups to new devices, the test should also include a restore from those devices.
6. Validate that the backup schedule used is valid and optimized for the new configuration. The benefits of the NetWorker Data Domain devices may require changes to the schedule to maximize throughput or accommodate additional clients.
7. If you are planning to migrate existing save sets from the legacy storage to the new NetWorker Data Domain devices *before* your redirected client backups are scheduled to begin, then you will need to create a special clone pool and set up a clone operation to migrate the save sets. [“Roadmap to migrate existing save sets to the new devices” on page 27](#) provides details.

Roadmap to migrate existing save sets to the new devices

Existing backup save sets from a legacy storage environment may be migrated to the new NetWorker Data Domain devices. Migration ensures that the save sets are managed by the NetWorker software and that NetWorker browse and retention policies are maintained.

Migration should be performed *before* NetWorker client backups are scheduled to begin using the new devices. This ensures that existing client data will not be deduplicated again on the new devices.

Note: It is strongly recommended *not* to use the native Data Domain replication feature to migrate save sets from one Data Domain system to another. NetWorker will not be able to track and manage save sets that are replicated in this fashion.

Migration may be done by different methods:

- ◆ NetWorker scheduled clone operation
- ◆ A `nsrclone` script to be run from a command line.
- ◆ NetWorker staging operation.

The details of the procedure depend on the method used and the granularity of the data to be migrated.

To migrate existing save sets to NetWorker Data Domain devices by using a NetWorker scheduled clone operation:

1. Plan a migration schedule to ensure that sufficient NetWorker Data Domain devices and bandwidth are available and impact to the backup window is minimized.

Note: When existing deduplicated VTL or CIFS/NFS AFTD save sets are migrated, the save sets are first reverted to their native non-deduplicated format, which the storage node reads and stores in deduplicated format on the new NetWorker Data Domain devices.

2. Create a clone pool to target NetWorker Data Domain devices for the migration:
 - Do *not* select devices on more than one Data Domain system.
 - Select a group for the migration.
 - Select Data Domain as the target device.

[“Create pools to target NetWorker Data Domain devices” on page 37](#) provides details.

3. Configure and perform a NetWorker scheduled clone operation with the new clone pool as the source.

[“Scheduling a clone operation” on page 47](#) provides details on the scheduled clone option.

4. After the clone operation completes, verify the cloned data on the target devices. If required, test selected save sets to ensure they can be restored to the client hosts.

[Chapter 5, “Monitoring, Reporting, and Troubleshooting,”](#) provides details on the verification of NetWorker operations.

5. Once the cloned save sets have been verified, if desired, you may remove the original save sets. They may be deleted or expired by using NMC or the command line.

6. Remove old unused devices and pools to ensure that they are not mistakenly used or cause confusion. A pool may *not* be deleted until all volumes that belong to that pool are also deleted or relabelled.
7. 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.

This chapter includes the following sections:

- ◆ [Configuring Data Domain for NetWorker](#) 30
- ◆ [Configuring NetWorker for Data Domain](#) 31
- ◆ [Create a NetWorker Data Domain device with the wizard](#) 32
- ◆ [Configure Data Domain storage devices with the property windows](#) 33
- ◆ [Configuring clients to back up to Data Domain.....](#) 39

Configuring Data Domain for NetWorker

Configure the Data Domain system for the NetWorker backup environment as described in the following sections.

Configure the Data Domain system for NetWorker

The following steps use the Data Domain CLI. The Data Domain documentation provides information on using the Data Domain Enterprise Manager GUI instead.

To enable a Data Domain system for storage operations with a NetWorker server:

1. Ensure the required versions and licenses are available and ready to use. [“Versions and licensing requirements” on page 11](#) provides details.
2. On the Data Domain system, log in as an administrative user and open the Data Domain CLI.
3. Type the following command to verify that the file system is enabled:

```
# fileSYS status
```

4. Create the backup user and set the OST username:

```
# user add username
# ost set user-name username
```

Note: Use the same *username* in both of these commands. Only one OST user may have access to Data Domain at a time.

5. Add the DD Boost license key supplied by Data Domain:
6. (Optional) If clone-controlled replication (“optimized cloning”) will be used, add the Replicator license key supplied by Data Domain:

```
# license add license_key
```

7. Apply the username modification by disabling and re-enabling the OST:

```
# ost disable
# ost enable
```

8. 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.

9. Verify that distributed segment processing is enabled. This is required for deduplication operations on the NetWorker storage nodes.

```
# ost option show boost
```

If disabled, type the following command:

```
# ost option set boost enabled
```

Note: The distributed segment processing **boost** option must be enabled. The disabled setting is *not* supported for production use.

10. (Optional) Use of the Device Configuration Wizard is strongly recommended for the creation of storage units and device configuration details. This step is included for power users and for special configurations that require the manual creation of storage units.

Create storage folders (storage units) to be manually associated with NetWorker Data Domain Device resources:

```
# ost lsu create folder_name
```

All NetWorker Data Domain devices are located under the /backup/ost tree on the Data Domain system. This folder structure is used by all NetWorker datazones and should *not* be changed or modified. Any folder created at this level can be defined as a device and any sub-folder under this level should *not* be used as a device.

Configuring NetWorker for Data Domain

After a Data Domain system has been configured for the integrated environment, you can configure the NetWorker devices, media (target) pools, volume labels, and clients to be backed up on the Data Domain system:

- ◆ Each NetWorker Data Domain device is associated with a storage volume. Each device appears as a folder on the Data Domain system. Deletion of a NetWorker Data Domain device does not delete the data stored on its volume.
- ◆ Pools are used to sort and target different types of backups to specific devices for storage on their volumes.
- ◆ Storage volumes contain the stored backup data. A volume is mounted on a NetWorker Data Domain device and is identified by its volume label (Volume Name), which associates it with a pool.

Ensure the required versions and licenses are available and ready to use. [“Versions and licensing requirements” on page 11](#) provides details.

Methods

The NMC software provides the New Device Wizard, which is used to create and configure the NetWorker Data Domain devices, as well as the required volume labels and storage pools that are necessary to target and store client backups on NetWorker Data Domain devices.

After a device has been created with the wizard, its configuration may be modified, if required, by using the individual NMC property windows:

- ◆ [“Create a NetWorker Data Domain device with the wizard” on page 32](#)
- ◆ [“Configure Data Domain storage devices with the property windows” on page 33.](#)

Create a NetWorker Data Domain device with the wizard

The New Device Wizard is designed to reduce user errors when creating NetWorker Data Domain devices and is the preferred method.

To create a device with the wizard:

1. In the NMC **Enterprise** view, select the NetWorker server name, and double-click the **NetWorker** application to launch it.
2. In the NetWorker Administration application, click **Devices**.
3. In the left panel, right-click **Data Domain Systems** and select **New Device Wizard**.
4. On each wizard page that appears, specify the options and values required for the backup configuration and click **Next**. The configuration includes:
 - Select the Device Type
 - Check configuration prerequisites on Data Domain Configuration Checklist
 - Specify the Data Domain Configuration Options
 - Select or Create the Folders for NetWorker Devices
 - Select or Create the NetWorker Device Pool
 - Select or Create the Storage Node
 - Select the SNMP Monitoring Options
 - Review the Device Configuration Settings

[“Configure Data Domain storage devices with the property windows” on page 33](#) provides specific details on device and pool configurations.

Only one Data Domain OST username and password may be defined. All NetWorker storage nodes and servers that access the Data Domain system must use the same username and password. [“Configure the Data Domain system for NetWorker” on page 30](#) provides details on setting the OST username.

All NetWorker Data Domain devices are located under the `/backup/ost` tree on the Data Domain system. This folder structure is used by all NetWorker datazones and should *not* be changed or modified. Any folder created at this level can be defined as a device and any subfolder under this level should *not* be used as a device. The wizard provides an option to create new folders under `/backup/ost`.

[“Naming guidelines” on page 19](#) provides guidelines for creating names.

5. You may click a link in the wizard steps panel to go directly to the page you want to modify. The number of steps shown in the steps panel may vary according to the type of configuration chosen.
6. On the Review **the Device Configuration Settings** page, click **Configure** to create the configuration.
7. On the final **Device Configuration Results** page, click **Finish** to exit the wizard.
8. Verify that the device is labelled and mounted, ready for use. The NMC Devices view should list the device with its appropriate Volume Name. [Figure 4 on page 33](#) shows an example.

The *EMC NetWorker Administration Guide* provides details about the wizard.

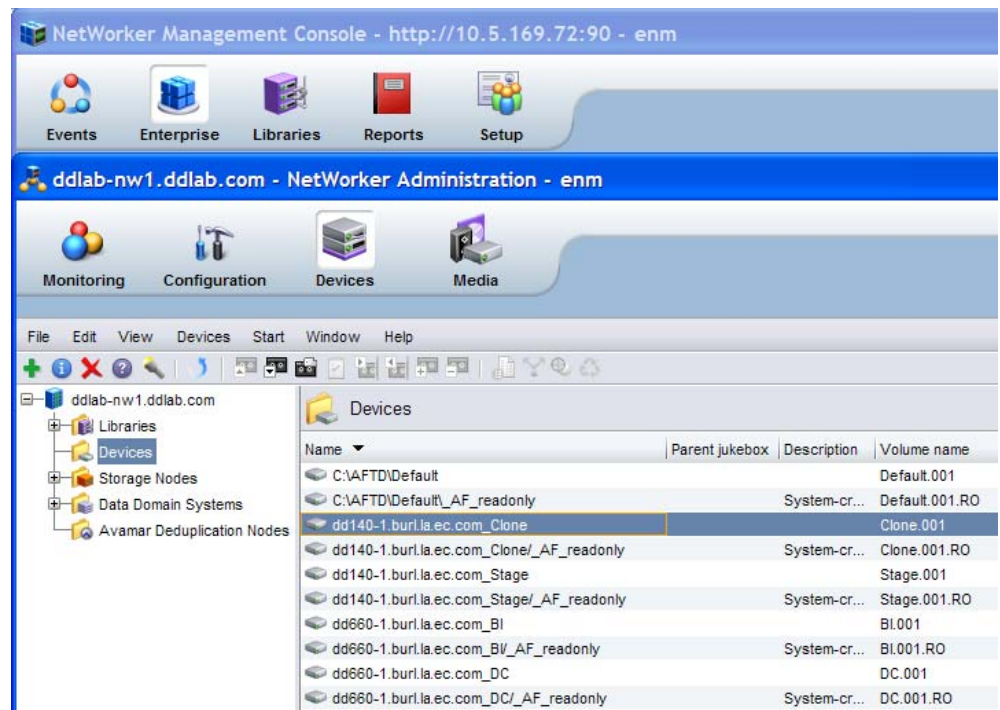


Figure 4 NetWorker Data Domain devices

Configure Data Domain storage devices with the property windows

The New Device Wizard is the recommended method to create NetWorker Data Domain devices. You may modify the devices and perform other tasks by following the procedures in this section.

The following topics provide details:

- ◆ [“Add a host Data Domain system to NMC Enterprise view” on page 33](#)
- ◆ [“Configure a NetWorker Data Domain device” on page 34](#)
- ◆ [“Create a volume label template for NetWorker Data Domain devices” on page 36](#)
- ◆ [“Create pools to target NetWorker Data Domain devices” on page 37](#)
- ◆ [“Label and mount devices on the storage node” on page 39](#)

Add a host Data Domain system to NMC Enterprise view

Normally, a Data Domain host is added to the NMC Enterprise view by the Device Configuration Wizard, but it may alternatively be added by the Add New Host Wizard.

Data Domain systems that are used for storage with NetWorker software should be listed as hosts in the NMC Enterprise view. This allows NMC to display the Data Domain system status and monitor events during backup and recovery operations. It also provides you with a live link that launches the Data Domain GUI.

To add a host Data Domain system to the NMC Enterprise view.

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

2. Follow the wizard screens:
 - Type the Data Domain Host Name
 - Select **Data Domain**
 - Select **Capture Events**
 - Type the SNMP community string, where NMC will retrieve Data Domain status information. The default is the value set on the Data Domain system with the **snmp add ro-community** *community_name* command. [“Configure the Data Domain system for NetWorker” on page 30](#) provides details.
 - Type a value for the SNMP Process Port. The default is the value set on the Data Domain system with the **snmp add trap-host** *hostname[:port]* command. [“Configure the Data Domain system for NetWorker” on page 30](#) provides details. This setting should agree with the firewall setting on the Data Domain system. [“Firewall requirements” on page 20](#) provides details.
 - Select the **SNMP Traps** you want to monitor.
[“Configure Data Domain monitoring and alerts” on page 52](#) provides details on monitoring and alerts.

Configure a NetWorker Data Domain device

Normally, NetWorker Data Domain devices are created by the New Device Wizard. The devices appear as folders on the Data Domain system. You may use this procedure to *modify* an existing device.

Note: If you manually try to create a device with this procedure, NMC will list the device but no corresponding storage unit will be created on the Data Domain system. If you try to label such a device, an error results. [“Configure the Data Domain system for NetWorker” on page 30](#) provides an optional step to a create storage unit on the Data Domain system.

To modify a NetWorker Data Domain device:

1. In the NetWorker **Administration** window, click the **Devices** view.
2. In the left panel, click **Data Domain Systems** and select a host Data Domain system on which to store your save sets.
[“Add a host Data Domain system to NMC Enterprise view” on page 33](#) provides details if you need to add a host Data Domain system.
3. In the right panel, right-click the name of the device to modify and select **Properties**. [Figure 6 on page 36](#) shows an example.
4. In the **Identify** section, configure the NetWorker Data Domain device (storage unit) pathname and the Data Domain hostname. The device may be configured on a remote storage node. For example:

```
Device path = /backup/ost/aftd1
DD_hostname = DD_600
The device is configured on storage node: SN1
```

Note: The *device_name* value should *not* include /backup/ost. All NetWorker Data Domain devices are located under the /backup/ost tree on the Data Domain system. This folder structure is used by all NetWorker datazones and should *not* be changed or modified.

- a. In the **Name** attribute, identify the Data Domain device.

Although this name is informational only and is not validated against the Data Domain system, it is recommended to use the same format that is used in the following **Device access information** attribute. For example:

aftd1

However, if the device is configured on a storage node, it is a “remote device” and this **Name** attribute is required to begin with **rd=storagenode_hostname:**, for example:

rd=SN1:aftd1

- b. In the **Device access information** attribute, type the Data Domain hostname and the device pathname, separated by a colon (:) in the format, *DD_hostname:device_name*. For example:

DD_600:aftd1

“[Naming guidelines](#)” on page 19 provides guidelines for creating names.

- c. In the **Media type** attribute, select **Data Domain** from the list.

Note: Each Data Domain system NIC that is used as device with the **Media type** attribute set to **Data Domain** will require a Data Domain Storage System Enabler. “[Licensing requirements](#)” on page 11 provides details.

5. Do *not* select **Auto media management**. Only one volume is used and this attribute, which pertains to tape volumes, does *not* apply to NetWorker Data Domain devices.
6. In the **Remote user** and **Password** attributes, type the Data Domain OST username and password, respectively. This allows NetWorker interfaces to connect to the Data Domain interface.

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

7. On the **Configuration** tab, set the number of concurrent save set or clone operations (sessions or save streams) the device may handle:
- **Target sessions** are the number of sessions that the NetWorker storage node may send to this device before the storage node looks for another available device. It is your preferred setting and is not a limit. This should be set to a low value for best performance. The default setting is 1.
 - **Max sessions** may be set to a maximum value of 10. The default setting is 4.
8. On the **Advanced** tab, ensure that common device interface (**CDI**) is set to **Not used** with **No reserver release**. This setting pertains to tape volumes and does not apply to NetWorker Data Domain devices.
9. Click **OK** to save the device settings.

The NetWorker **Administration** window displays the Data Domain system and details of the device. Each device is accompanied by a corresponding read-only mirror device. [Figure 5 on page 36](#) lists devices on the selected Data Domain system.

10. Ensure that the device is labeled and mounted before attempting to use it, otherwise an error results. “[Label and mount devices on the storage node](#)” on [page 39](#) provides details.

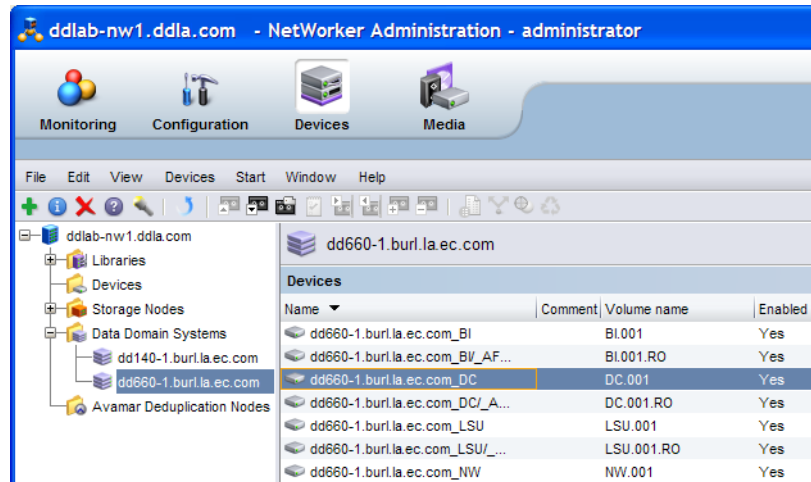


Figure 5 Devices on a Data Domain system

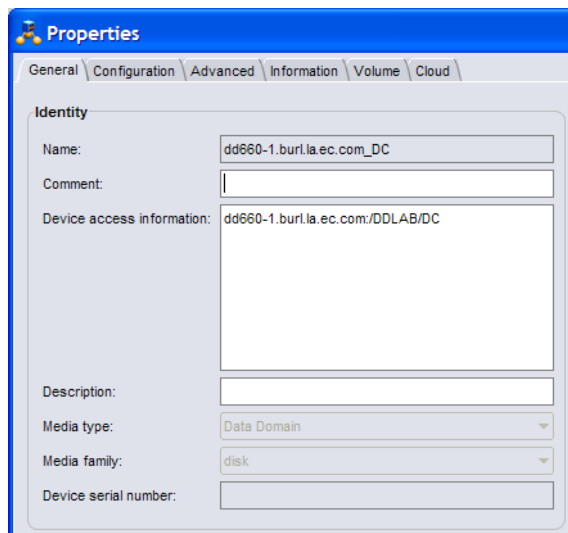


Figure 6 Configure a NetWorker Data Domain device

Create a volume label template for NetWorker Data Domain devices

Each NetWorker Data Domain device must be mounted with a storage volume, which associates it 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_zmedia") 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_zmedia.001
- DD_zmedia.002
- DD_zmedia.003

To create a volume label:

1. From 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** attributes, type a name and description for the label template. The label will associate a storage pool to a device.
4. In the **Fields** attribute, 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 NetWorker Data Domain devices in a Data Domain system.

For example:

```
DD_zmedia
001-999
```

[“Naming guidelines” on page 19](#) provides guidelines for creating names.

5. Select a **Separator** and click **OK**.
6. In the **Next** attribute, specify the next Volume Label in the sequence to be applied during the next label and mount operation. For example, DD_Media.001.
7. Click **OK**.

Create pools to target NetWorker Data Domain devices

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

Each NetWorker Data Domain device is associated with a storage volume (**Volume Name**). Each volume is named by a label template when the volume is mounted on the device. The **Volume Name** implicitly associates the volume and the device with the specified pool.

Note: Dynamic Drive sharing (DDS) is *not* supported for NetWorker Data Domain devices.

To create a pool for Data Domain backups:

1. Ensure the devices that will use the pool have been created. If you do *not* use the New Device Wizard for this, [“Configure the Data Domain system for NetWorker” on page 30](#) provides details.
2. Ensure a label template has been created for the pool. [“Create a volume label template for NetWorker Data Domain devices” on page 36](#).
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** attribute, type a name for each pool. Create names that clearly indicate whether the pool is for Data Domain backup or 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.

[“Naming guidelines” on page 19](#) provides guidelines for creating names.

6. In the optional **Comment** attribute, 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 of backups, select **Backup Clone**. [Chapter 4, “Cloning and Replicating Data,”](#) provides details on clones.

Note: **Pool type** cannot be modified after it is created.

9. In the **Label Template** attribute, select a label template, created earlier, to associate with the pool.

The pool will later be applied to NetWorker Data Domain devices. [“Label and mount devices on the storage node” on page 39](#) provides details.

10. In the **Data Source** attribute, select the groups that the clients in this pool can belong to, bearing in mind that a client may belong to multiple groups through multiple client definitions.
11. Click the **Selection Criteria** tab.
12. Under **Target Devices**, select all of the NetWorker Data Domain storage devices that this pool may use. The pool may store data on any of these devices.

You must select *both* the storage device *and* its corresponding read-only device, which is appended with the “/_AF_readonly” suffix.

- Select *only* NetWorker Data Domain storage devices for the pool. Do *not* mix with other types of storage devices.

If you modify an existing pool for this step, ensure that the pool excludes all devices that are *not* NetWorker Data Domain devices. The pool **Selection Criteria** may also include client attributes that need to be removed or updated.

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

If devices from more than one Data Domain system are associated with the same pool, the backups from a single NetWorker client may be targeted to any of these Data Domain system. This will impair the backup window and deduplication ratio.

13. Under **Media type required**, if the pool is intended for Data Domain backup, set this attribute to **Data Domain**.

This attribute ensures that only media of the selected type can be labeled into this pool.

14. Click **OK**.

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

Label and mount devices on the storage node

A NetWorker Data Domain device must be identified with a volume label (Volume Name) and its associated pool, and must be mounted for use by the NetWorker storage node.

To label and mount a device:

1. From 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 to be labeled and select **Label**.
4. In the **Label** window, **Pools** list box list, select a pool to associate with the device.

A label for the selected pool appears in the **Volume Label** attribute. This will become the **Volume name** that is applied to the device.

5. Select **Mount After Labeling** and click **OK**.

The NMC list shows the device with its associated **Volume name**.

[Figure 5 on page 36](#) shows devices on a Data Domain system.

The *EMC NetWorker Administration Guide* provides details.

Configuring clients to back up to Data Domain

The NMC software provides different methods to create NetWorker clients and their schedules. You may use either the wizard method or the individual property windows, as described in the following sections.

Configure backup clients with the client wizard

The NetWorker Client Configuration Wizard is designed to reduce user errors when creating and configuring NetWorker backup clients and their backup schedules and is the preferred method over the individual property windows method.

To create or modify a client and its scheduled backup with the wizard:

1. In the NMC **Enterprise** view, select the NetWorker server name, and double-click the **NetWorker** managed application to launch it.
2. In the **Configuration** view, under the NetWorker server name, right-click **Clients** and select **Client Backup Configuration > New**.
3. Follow the instructions on the wizard pages:
 - Show the Client Name
 - Specify the Backup Configuration Type
 - Specify the Backup Options
 - In the **Deduplication** settings, select **Data Domain Backup**.
 - Set **Target Pool** to a media pool associated with Data Domain devices. This setting ensures that the client data will be backed up to NetWorker Data Domain devices.
 - Select Files to Back Up
 - Select the Client Properties

- Select the Backup Group
- Specify the Storage Node Options

“Configure backup clients with the property windows” on page 40 provides details on settings for backups to NetWorker Data Domain devices.

The *EMC NetWorker Administration Guide* provides wizard details.

Configure backup clients with the property windows

As an alternative to the client wizard method, new or existing NetWorker backup clients may be configured for the NetWorker for Data Domain backup environment by using the individual NMC client configuration windows.

To configure a NetWorker client for scheduled backups to a NetWorker Data Domain device:

1. In the NMC **Enterprise** view, select the NetWorker server name and double-click the NetWorker application to launch it.
2. In the **NetWorker Administration** window, click **Configuration**.
3. In the browser tree, select **Clients**:
 - To create a new Client resource, select the **Clients** icon and from the **File** menu, click **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**.
4. Skip this step unless you are creating a new Client resource. The following attributes do *not* need to be modified for Clients whose backups have been redirected to NetWorker Data Domain devices:
 - a. In the **Name** attribute, type the hostname for the client and, optionally, type a comment in the **Comment** attribute.
 - b. Select values for **Browse Policy** and **Retention Policy**:
 - The browse policy determines how long the details of individual backed-up files are maintained in a browsable index for quick recovery through the GUI or command line.
 - The retention policy determines how long backed-up data is protected and available for recovery even though the browse policy has lapsed. Recovery might require rebuilding an index.
 - c. Select the **Scheduled Backups** checkbox.
 - d. In the **Save Sets** attribute, click the **Browse** button to open the **Choose Directory** window. Browse to and select all the directories or individual files to be backed up. When finished selecting, click **OK**.

Each item should appear on a separate line. For example:

```
accounting
sales
```

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

Note: For Microsoft Windows systems, the SYSTEM or Volume Shadow Copy Service (VSS) SYSTEM save sets should be backed up on a regular basis for disaster recovery of the client system.

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

5. In the **Group** attribute, select a backup group. A backup group consists of clients that are backed up according to the schedule for the group.

You may want to create a separate Group resource for deduplication backups to help you monitor deduplication operations and to configure backup schedules for either deduplication or traditional storage.

6. In the **Pool** attribute, select a pool that targets the NetWorker Data Domain devices you want to use.

Note: The pool selected in this attribute overrides any other pool that might be configured for the client or its save sets.

Normally, The NetWorker server's bootstrap and index files are backed up to a traditional disk or tape device that is locally attached to the NetWorker server. To back up these files to a target pool, create a Pool resource specifically for them. Specify the following in the **Save Sets** attribute of this Pool resource:

```
bootstrap*
index*
```

7. In the **Schedule** attribute, select a backup schedule.

The schedule selected in this attribute overrides any other schedules that might be configured for the client or its save sets.

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

9. In the **Deduplication** attributes group, select **Data Domain backup**. This ensures that the client data will be backed up *only* to NetWorker Data Domain devices.

The Client resource settings for **Data Domain backup** apply only to the save sets (the data portion of backups), and selecting this option does not back up bootstrap and index files to a Data Domain device. The previous [step 6](#) describes how to specify a target pool for these files.

Note: If this attribute is *not* selected, then backups may be made to other types of devices.

10. Click the **Globals (2 of 2)** tab.
11. In the **Storage nodes** attribute, specify storage nodes the client will back up to, especially if this client backs up to a remote storage node.
12. In the **Clone storage nodes** attribute, if this client is a source storage node for clone operations, specify the target storage node where the clones will be stored.
13. When you have completed the client configuration, click **OK**.

In the **NetWorker Administration** window, the configured client shows a checkmark in the **Scheduled backup** column to indicate that scheduled backup is enabled.

The *EMC NetWorker Administration Guide* provides complete details on NetWorker Client resource configurations.

This chapter includes the following sections:

◆ About cloning and replicating with Data Domain.....	44
◆ Clone formats.....	44
◆ Cloning methods	45
◆ Cloning requirements	46
◆ Scheduling a clone operation	47
◆ Cloning by pools	49
◆ Starting a scheduled clone job manually on demand.....	50

About cloning and replicating with Data Domain

For added data protection, save sets that have been successfully written to a NetWorker Data Domain device can be copied to a different location with the NetWorker clone feature. A clone is a complete and independent copy of the data, which can be used for data recovery or to create further clones. Single save sets or the entire volume of a NetWorker Data Domain device may be cloned. A NetWorker clone retains the original NetWorker browse and retention policies.

Datazone requirement

A NetWorker clone of stored data may *not* be created in a different NetWorker datazone. In order for the NetWorker server to manage and monitor clone operations, the NetWorker storage nodes at both the source and target locations must be clients of the same NetWorker server. The NetWorker server manages browse and retention policies for all cloned copies and can monitor and report on their storage operations.

Clone pool

In order for the NetWorker software to copy save sets from one device to another, a special pool must be created and assigned in clone operations. This pool, known as a “clone pool,” is assigned to devices on the target system. It must be properly configured and available for use. [“Create pools to target NetWorker Data Domain devices” on page 37](#) and [“Cloning by pools” on page 49](#) provides details.

Data Domain replication support

Data Domain replication procedures are used to copy deduplicated data stored in CIFS, NFS, or VTL formats from one Data Domain system to another, typically for disaster recovery purposes. NetWorker clone-controlled replication provides similar operations plus monitoring and reporting features for data stored on NetWorker Data Domain devices.

NetWorker provides limited support for Data Domain replication:

- ◆ Data Domain directory replication at the storage unit level or at the directory level is *not* supported on NetWorker Data Domain devices.
- ◆ Data Domain collection replication (the replication of the entire stored contents of a Data Domain system) is supported by NetWorker Data Domain devices. However, during this procedure, NetWorker *cannot* perform any backups or clone-controlled replication procedures to the destination Data Domain system. Additionally, NMC monitoring and reports covers *only* the data that will be stored on NetWorker Data Domain devices.
- ◆ Data Domain replication, independent of NMC and NetWorker, is supported only for Data Domain directories that do *not* use NetWorker Data Domain devices.

Clone formats

Data stored on a NetWorker Data Domain device may be cloned by the NetWorker software in one of two formats, depending on the type of media on which the clone will be stored.

Clone-controlled replication format

Data that is cloned to a target NetWorker Data Domain device, typically at a remote location, retains its deduplication format. This is called “clone-controlled replication,” “optimized clone,” or “DD format.”

NetWorker control ensures that clone-controlled replication will *not* begin until after the related backup group at the source has finished its backup.

The storage node for the target device reviews the incoming clone for data that is already stored on the target device and transfers only unique data and reference pointers to be stored on the device.

Clone replication uses a special NetWorker Data Domain API command and should not be confused with standard directory level replication, which is also supported. The clone is created quickly and uses low bandwidth and low storage capacity.

A clone created in this format may be used for data recovery or to create further copies, for example, to traditional disk or tape storage, with minimal impact on production or primary backup and recovery operations.

Clone to native format

When data on the NetWorker Data Domain device is cloned to a traditional disk or tape, it is reverted to its native non-deduplicated format, also known as “regular clone” format. Native format is necessary for the data on traditional disk or tape storage to be completely recoverable, for example for disaster recovery, without the need of a Data Domain system.

Cloning methods

NetWorker clone operations may be configured by several methods, which are suitable to different environment and storage needs. In some cases it may be necessary to use multiple or mixed approaches in order to achieve the desired control and flexibility.

As choices, you can configure clone jobs to be run by automatic start, by a schedule, or by a customized script.

Auto-clone

Save sets can be automatically cloned when the backup group that contains them is completed. This clone method is suitable for smaller environments, or a small number of clients, where the clone operations need to be completed quickly and automatically as part of the backup window:

1. In the NetWorker **Administration** window, select **Configuration**.
2. Create a **Group** resource and specify the **Clones** option and **Clone pool**.

“[Create pools to target NetWorker Data Domain devices](#)” on page 37 provides details on creating a clone pool.

Scheduled clone

NetWorker clone jobs can be run according to a schedule. This method is suitable for environments where copies of save sets need to be regularly provided, typically as

part of a well-defined maintenance cloning window, which runs independently of the main backup operation.

[“Scheduling a clone operation” on page 47](#) provides details.

nsrclone command

A NetWorker **nsrclone** script can be set to run clone jobs and be launched either manually or as a scheduled task. This method is typically used in larger environments where flexibility and conditional controls are required.

One example would be to start Clone Job B, which clones to tape storage, if and only if Clone Job A successfully completes. Another example would be to select multiple specific save sets to be cloned to specific devices or storage nodes.

Scripted solutions require additional knowledge and have external dependencies, such as operating system, scripting tool, and so forth.

The *EMC NetWorker Administration Guide* and the *EMC NetWorker Command Reference Guide* provides details. EMC Professional Services are also available.

Cloning requirements

To clone data from one Data Domain device to another by NetWorker clone-controlled replication (optimized cloning), ensure that the following requirements are met. These requirements assume the previous creation of a clone target pool, for example, named *newclonepool*:

1. Ensure that both the source and target storage nodes are clients of the same NetWorker server.
2. Ensure that the Data Domain systems are properly licensed, including a Replication license, which is required to create optimized clones.

[“Configure the Data Domain system for NetWorker” on page 30](#) provides details.

3. Ensure that the Client resource for the NetWorker server and both storage nodes specify, in their **Aliases** attribute (Globals 1 of 2 tab), all of their names in use (fully qualified name, short name, aliases, and IP address).

Note: If a **nsrclone** command or script is used to perform an optimized clone from a host that is *not* the NetWorker server, then this command must specify the NetWorker server by its primary hostname (as listed in the NMC Enterprise view). Otherwise, a regular clone might be produced instead of an optimized clone.

4. Ensure that a target pool (for example, *newclonepool*) has been created for **Backup Clone** type with the **Media type required** attribute set to **Data Domain**.

With this setting, if a Data Domain device is not available for a clone operation in the specified target pool, then NMC displays a “Media waiting” message.

Note: The Default Clone pool does not allow any modification and **Media type required** *cannot* be set in that pool.

[“Create pools to target NetWorker Data Domain devices” on page 37](#) provides details on creating pools.

5. Ensure that the Client resource for the source storage node specifies, in its **Clone storage node** attribute, the target storage node hostname. This setting is not required if the target storage node is on the NetWorker server.

If the **Clone storage node** attribute is *not* specified, then the NetWorker server becomes the storage node for the clone operation.

If the **Clone storage node** attribute lists a storage node for a non-Data Domain volume, and **Media type required** is *not* set to **Data Domain** in the target clone pool, then only regular clones may be stored on those volumes.

6. Ensure that the source NetWorker Data Domain device is mounted and available on the source storage node.

If the source device is *not* mounted, then a regular, non-deduplicated clone will be performed, except if the specified target pool is of **Backup Clone** type with the **Media type required** attribute set to **Data Domain**.

7. Ensure that the target NetWorker Data Domain device is labeled and mounted on the target storage node. The pool selected for the device label operation (for example, *newclonepool*) must be of **Backup Clone** pool type.

8. Verify that the target clone pool (for example, *newclonepool*) is properly specified or selected:

- For CLI clone operations, use the **nsrclone -b newclonepool** command.
- For scheduled clone operations, in the **Write clone data to pool** attribute of the Clone resource, select *newclonepool*.
- For auto-clone operations for a group, in the **Clone pool** attribute of the Group resource, select *newclonepool*.
- For clones of entire volumes, “Cloning by pools” on page 49 provides details.

Scheduling a clone operation

To configure NMC for a clone operation to be performed at a scheduled time, for either an optimized clone or a regular (non-deduplicated) clone:

1. From the **NetWorker Administration** window, click **Configuration**.
2. In the browser tree, click **Clones**, and from the **File** menu, select **New** to open the **Create Clone** window. [Figure 7 on page 49](#) shows the General settings for a Clone resource.
3. In the **Name** attribute, create a unique name to identify your scheduled Clone resource. Type any additional information in the **Comment** attribute.
4. Set the **Browse Policy** and **Retention Policy** attributes if you want the clones to use different policies than the original backup.
5. In the **Write clone data to pool** attribute, specify the clone pool that targets the devices on which the clones will be stored.
6. To skip invalid save sets, select **Continue on save set error**. If *not* selected (default setting), an invalid save set will stop the clone operation and generate an error message.
7. The **Limit number of save set clones** attribute has a default value of 1. This allows only *one* clone to be made to the target pool for each save set.

This setting of 1 is useful, for example, if you need to manually restart an interrupted clone operation, and you want to produce only the missed clones but do *not* want to reproduce clones that were already successful.

This attribute limits the number of clones of each save set that may be produced in the clone pool for a scheduled clone operation. A zero (0) setting allows an unlimited number of duplicate clones.

Note: The NetWorker software allows only one unique save set clone to be stored on a single volume. If multiple clones of the same save set are created, each will be stored on a different volume in the pool.

8. Configure the schedule for the clone job. [Figure 7 on page 49](#) shows the settings for a schedule.

Typically, to reduce the use of resources, you would schedule clone operations to be performed after the backup window has completed:

- a. Select **Enable** to enable the clone job to run at its scheduled times.
- b. In the **Start Time** attribute, click the spin arrows, or type values, to set the start time.
- 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 job to run.
- d. To repeat the clone job within a day, specify an **Interval** time in hours. For example, if the start time is 6 a.m., and the interval is 6 hours, then the clone job will run at 6 a.m., 12 p.m., and 6 p.m.

If the **Limit the number of save set clones** value is set, then the repeat clone job will fail after the limit is reached.

9. Select the **Save Set Filters** tab and specify the source save sets to include in your scheduled clone job.

There are two main options as follows:

- Select **Clone save sets that match selections** and limit the save sets to be cloned by specifying the following details:
 - 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 to be cloned, 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 your search. Alternatively, you may use the NetWorker **mminfo** command. The *EMC NetWorker Administration Guide* provides details.

10. Click **Preview Save Set Selection** to review save set filter settings.
11. Select **OK** to save the scheduled clone job.

- After the clone operation completes, verify the cloned data on the target devices. If required, test selected save sets to ensure they can be restored to the client hosts.

Chapter 5, “Monitoring, Reporting, and Troubleshooting,” provides details on the verification of NetWorker operations and the monitoring of clone jobs, in the NMC Clones window, similar to a group.

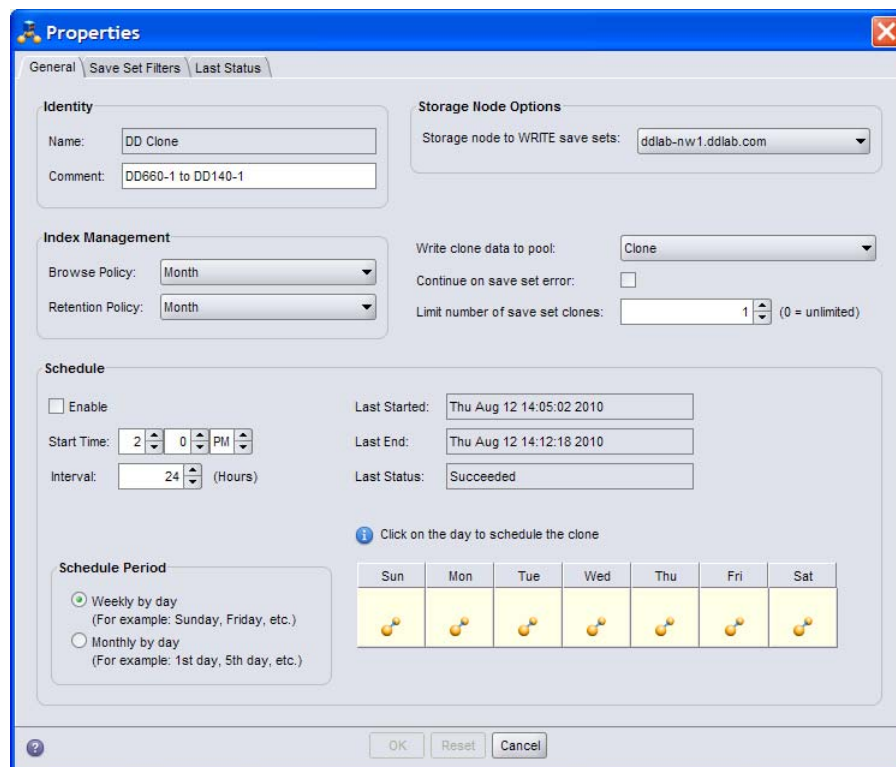


Figure 7 Clone properties, general settings

Cloning by pools

In order to copy save sets from Data Domain storage to a device, a special pool must be specified. This pool is known as a “clone pool.” A clone pool must be assigned to a device on the target Data Domain system, where it will be available for use. There are two main purposes for a clone pool:

- ◆ To copy existing deduplicated VTL or CIFS/NFS AFTD save sets to a NetWorker Data Domain device.
- ◆ To copy the existing save sets from one NetWorker Data Domain device to another NetWorker Data Domain device, typically at a remote location for disaster recovery purposes.

To specify a clone pool for the source volumes:

- Ensure that cloning requirements are met. “Cloning requirements” on page 46 provides details.
- Create a clone pool.

“Create pools to target NetWorker Data Domain devices” on page 37 provides details.

- In NetWorker Administration window, click the **Media** view.

4. Click **Disk Volumes** and select volumes to clone.
5. Right-click and select **Clone**.
6. In the **Source volumes to clone** window, in the **Target clone media pool** list box, select the name of the clone pool, for example, *newclonepool*.
7. Once the pool is defined, the clone copies may be configured and run as a scheduled clone job. "[Scheduling a clone operation](#)" on page 47 provides details.

Starting a scheduled clone job manually on demand

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

Manually start a clone job from the Configuration window

To manually start a scheduled clone job:

1. From the Administration window, click **Configuration**.
2. In the browser tree, select **Clones**.
3. Right-click on a Clone resource in the right panel listings and select **Start**.

Manually start a clone job from the Monitoring window

To manually start a scheduled clone job:

1. From the Administration window, click **Monitoring**.
2. Select the **Clones** tab.
3. Right-click on a Clone resource and select **Start**.

This chapter includes the following sections:

- ◆ [Monitoring NetWorker Data Domain devices](#) 52
- ◆ [Backup reports](#)..... 55
- ◆ [Troubleshooting](#)..... 60

Monitoring NetWorker Data Domain devices

NMC provides the ability to monitor details of current Data Domain backup operations as well as display events that require user intervention. NMC also monitors clone operations, except replication clones from Data Domain to Data Domain systems.

Configure Data Domain monitoring and alerts

The status and events for a Data Domain host can be monitored from the NMC Enterprise view and Events view.

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

To configure NMC to monitor Data Domain backup status and events (SNMP traps):

1. Provided you have viewing privileges, the NMC **Enterprise** view should list the Data Domain systems as network hosts. “[Add a host Data Domain system to NMC Enterprise view](#)” on page 33 provides details.
2. Ensure that SNMP is enabled on the Data Domain system and Data Domain system is configured to send traps to NMC server. “[Configure the Data Domain system for NetWorker](#)” on page 30 provides details.
3. In the NMC **Enterprise** view left panel, right-click the Data Domain system to be monitored and select **Properties**. The **Properties** window opens.
4. On the **Manage Data Domain** tab, select **Capture Events**.
If the box is *not* checked, NMC will monitor the status of the NetWorker Data Domain devices, but will *not* monitor Data Domain SNMP traps, required to monitor event.
5. 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. [Figure 8 on page 53](#) shows an example.
6. Type a value for the **SNMP Process Port**. The default value is 162. This setting should agree with the firewall setting on the Data Domain system. “[Firewall requirements](#)” on page 20 provides details.
7. Select the appropriate **SNMP Traps** that you want to monitor. Some traps are pre-selected. [Figure 8 on page 53](#) shows an example for Data Domain 4.8 alerts. Other versions may differ.
8. Click **OK**.

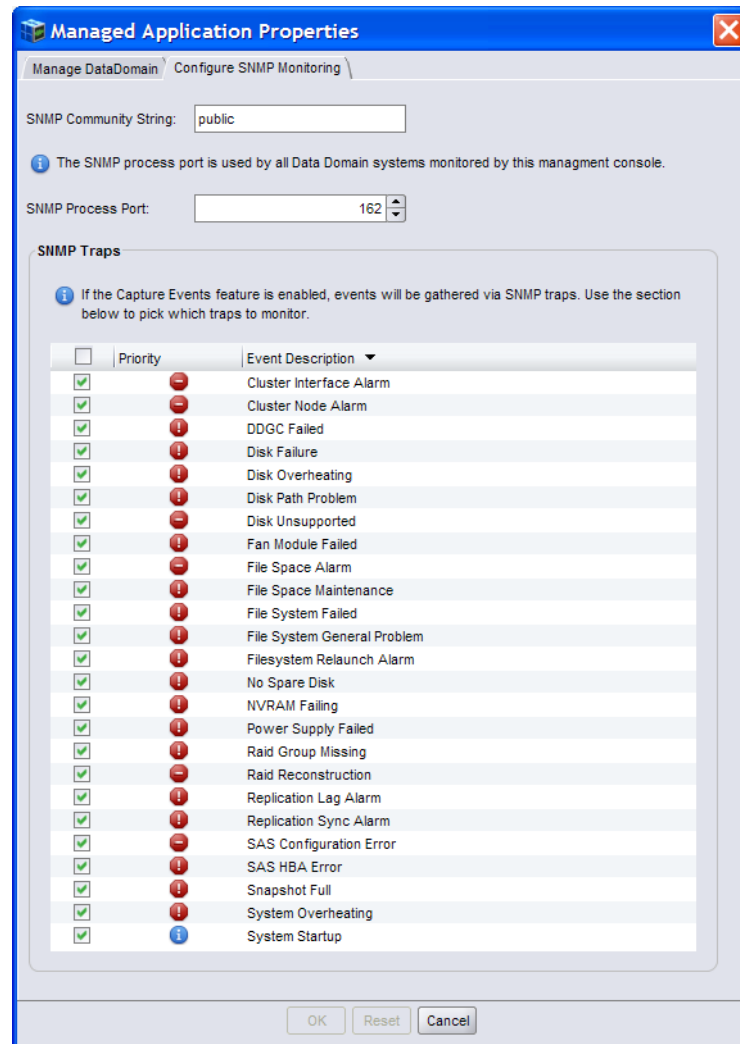


Figure 8 Data Domain alerts to monitor

Monitor Data Domain operations in the Devices view

Figure 9 on page 54 shows the NetWorker Administration Devices view. Some of the features shown in this view are as follows:

- ◆ Each device in the list has a corresponding mirror, read-only device, appended with the “/_AF_readonly” suffix. The read-only device enables concurrent read/write operations.
- ◆ Each device is associated with a single storage unit and NetWorker volume.
- ◆ Device status information and events are available only if SNMP is configured:
 - Pre-Compression (/backup: pre-comp) indicates the amount of space that would have been used for backup if the data had *not* been deduplicated and compressed. The NetWorker software tracks this value as the size of backups.
 - /backup: post-comp indicates three values, the total capacity of the Data Domain system, the amount of disk space actually used, and the amount of space available.

- /ddvar indicates log file space used on the Data Domain file system.
- Compression (Reduction), which is represented by two values:
 - Pre-Compression ÷ Post-comp Used
 - (1 - Post-comp Used) ÷ Pre-Compression) x 100%

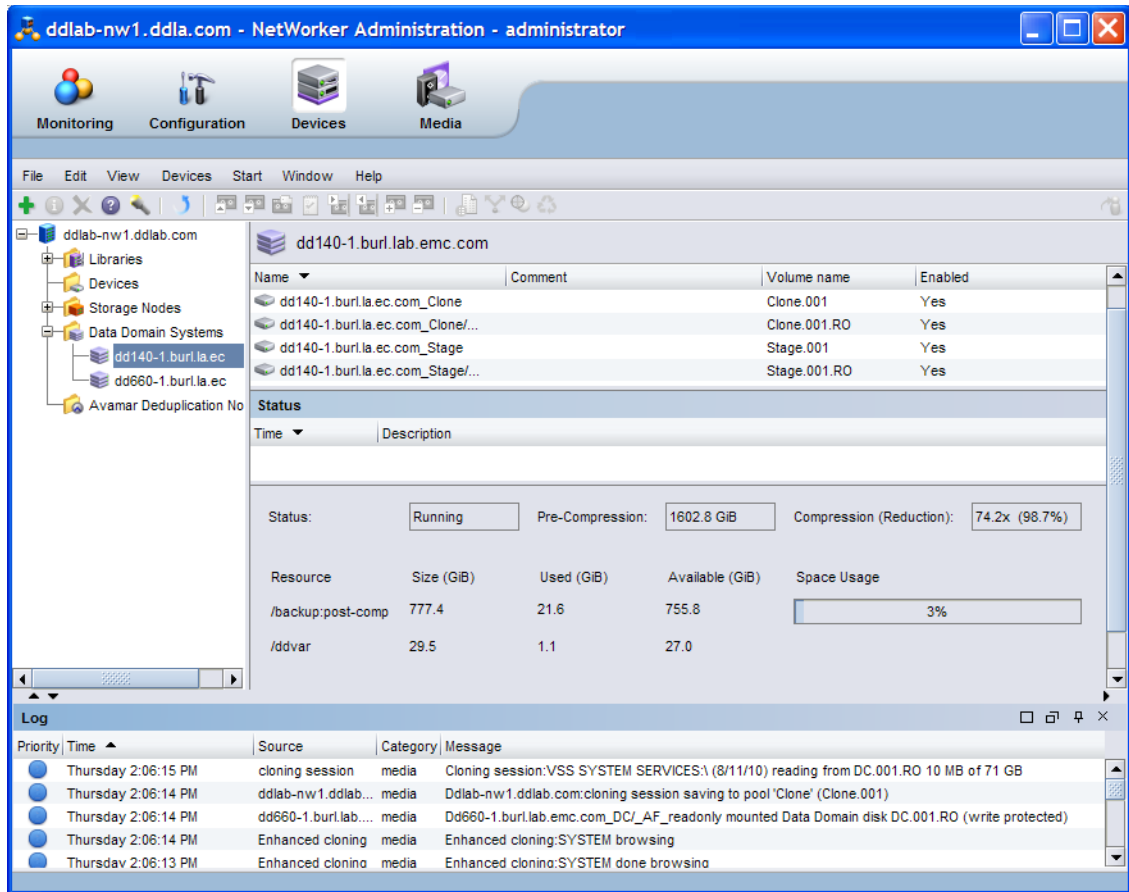


Figure 9 NetWorker Administration showing NetWorker Data Domain devices

Monitor Data Domain backup statistics, log, and events

To monitor Data Domain backup statistics and log:

- ◆ In the NMC **Enterprise** window, select a Data Domain host. The right-hand panel shows the statistics for space on the selected system.
- ◆ In the NetWorker **Administration** window **Devices** view, select **Data Domain Systems** and then a Data Domain system in the browser tree. The panels show the statistics and the backup log of the selected system.

To view Data Domain events (SNMP traps):

- ◆ In the NMC window, select the **Events** view.
- ◆ In the NetWorker Administration window, select the **Monitoring** view.

Backup reports

Statistical reports of NetWorker Data Domain backup activities are available from the NMC Reports view.

Configure a report

To configure and display a Data Domain backup report:

1. From the **NetWorker Management Console** window, click **Reports**.
2. Expand the **Reports** folder, expand the **Data Domain Statistics** folder, and then select a summary or statement report type 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 by selecting the item parameters and clicking the **Remove** (◀), **Add** (▶), **Remove All** (◀◀), or **Add All** (▶▶) buttons as required.

If **Save Time** values are not specified, the report will display all the available data.

[Table 1 on page 55](#) lists details of report configuration parameters. The specific parameters available depend on the type of report selected.

[Figure 10 on page 56](#) shows an example report configuration.

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

Table 1 Data Domain report configuration parameters

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

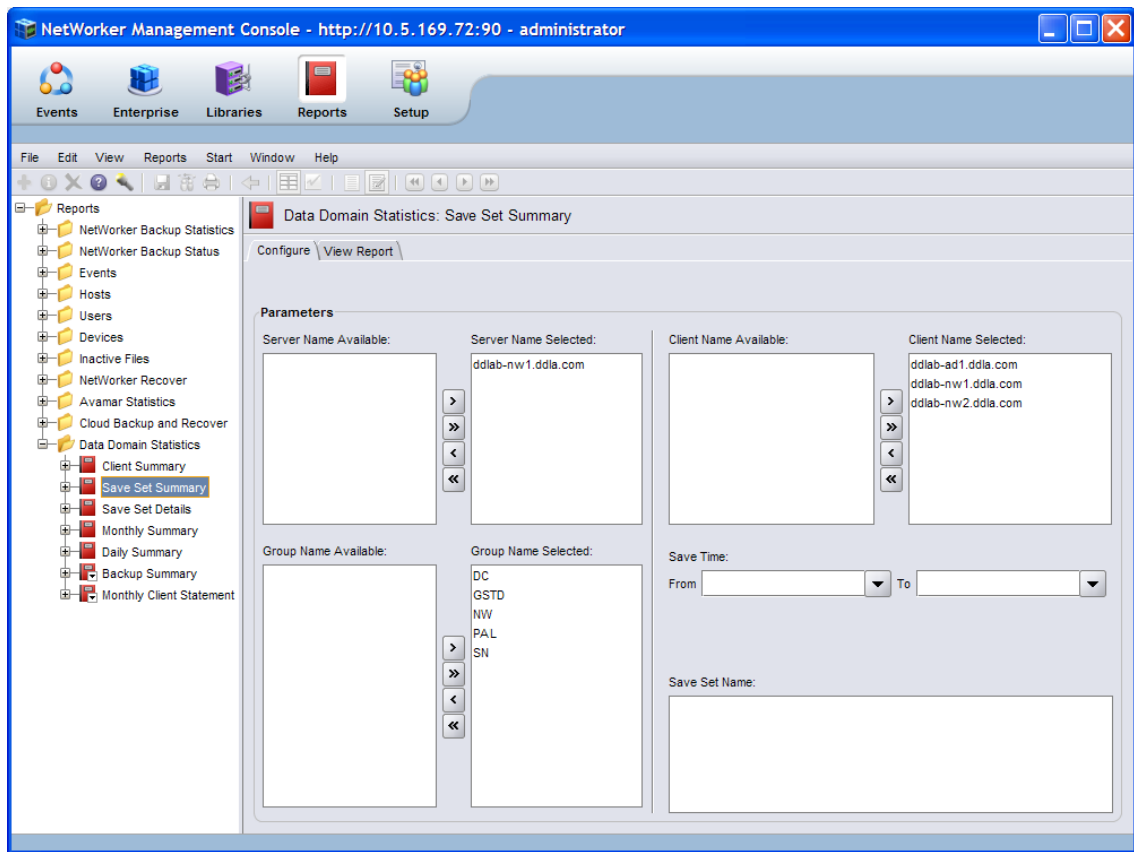


Figure 10 Report configuration

View a report

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

- ◆ [Figure 11 on page 57](#) shows an example save set summary report.
- ◆ [Figure 12 on page 58](#) shows an example save set details report.
- ◆ “Basic reports” on page 58 describes details of basic reports.
- ◆ “Drill-down reports” on page 59 describes details of drill-down reports.
- ◆ “Advanced Reporting” on page 59 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**.

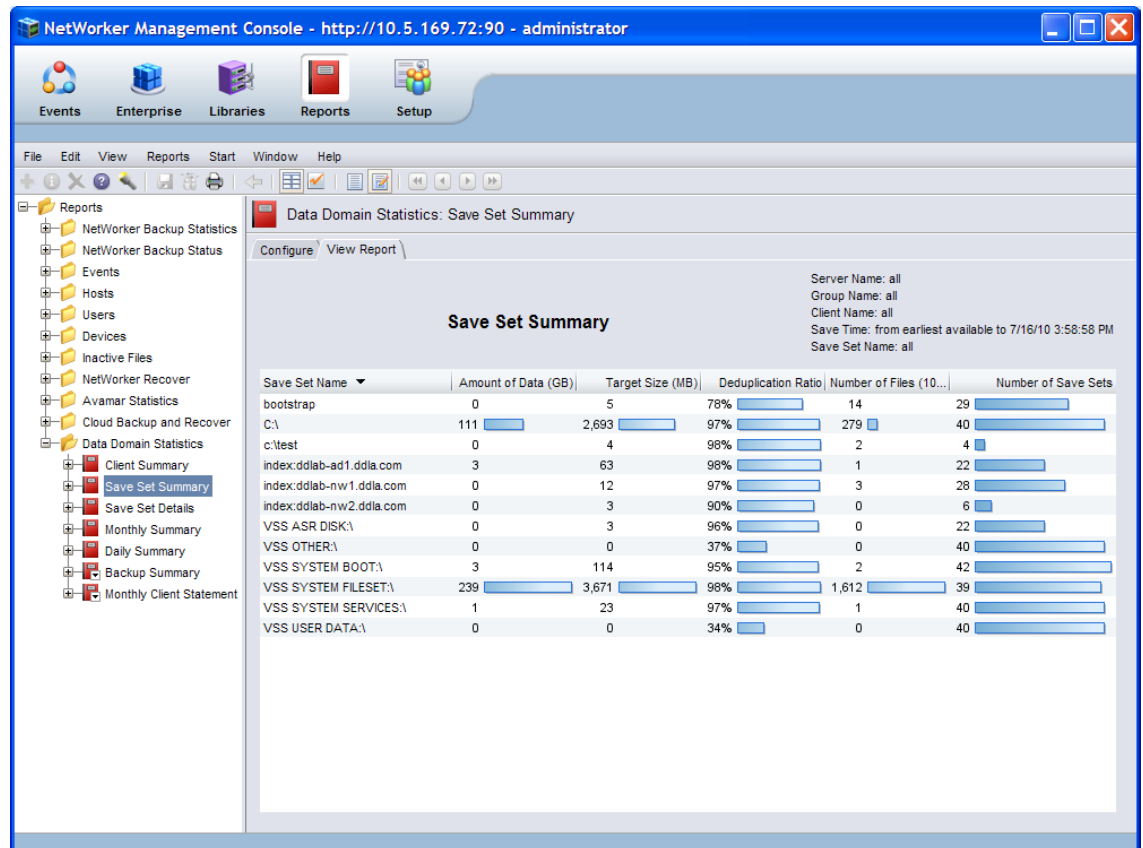


Figure 11 Data Domain save set summary report

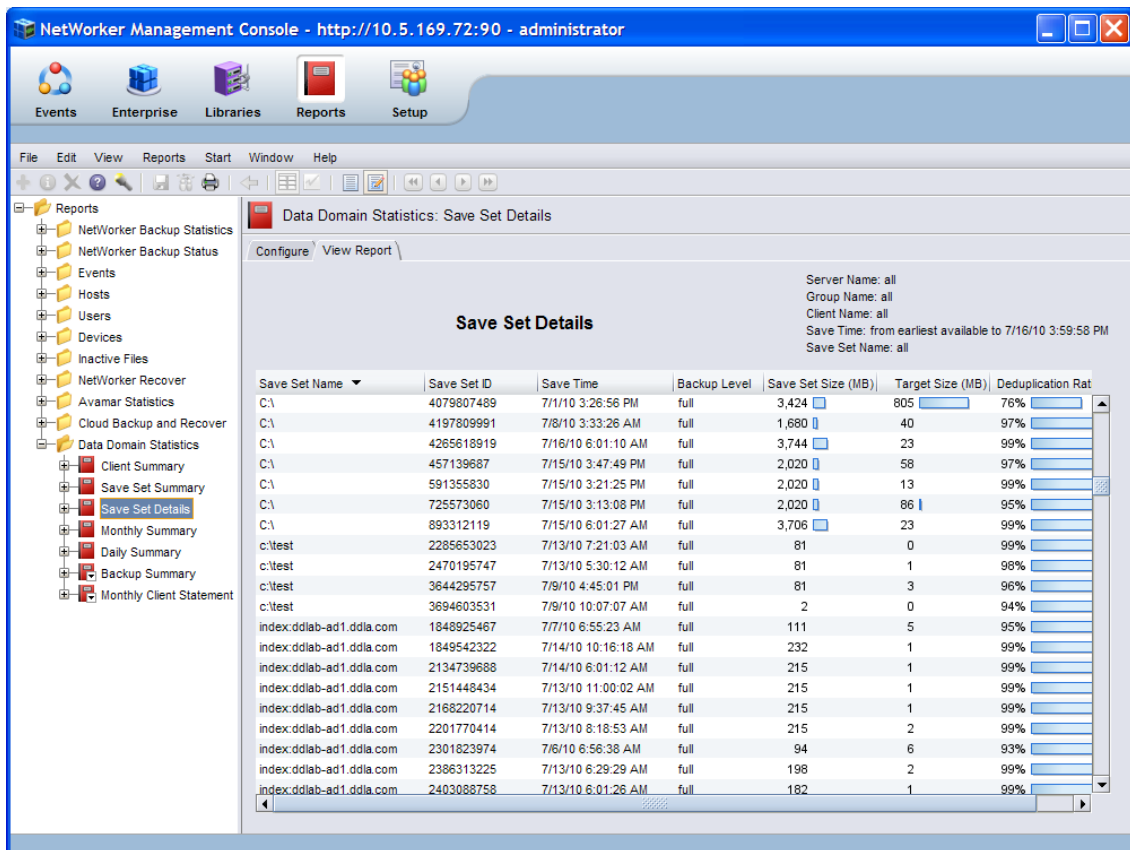


Figure 12 Data Domain save set details report

Basic reports

A basic report collects statistics for a specific datazone component, time span, or attribute. You can modify the scope of a report by adjusting the parameters on the **Configure** tab.

Table 2 on page 58 describes the basic reports available for Data Domain.

Table 2 Data Domain basic reports (page 1 of 2)

Report name	Purpose
Client Summary	<p>For all or specified clients, provides the following statistics:</p> <ul style="list-style-type: none"> Amount of data: The amount of the data that would have been moved using traditional NetWorker backup (protected data). Target size: Size of the data after deduplication has taken place on the Data Domain System (stored data). Deduplication ratio: Percentage of savings by using Data Domain deduplication. Number of Save Sets: The number of save sets included in the backup. Number of Files: The number of files included in the backup.

Table 2 Data Domain basic reports (page 2 of 2)

Report name	Purpose
Save Set Summary	For all or specified save sets, provides deduplication statistics on the following: <ul style="list-style-type: none"> • Amount of data: The amount of the data that would have been moved using traditional NetWorker backup. • Target size: Size of the data after deduplication has taken place on the Data Domain System. • Deduplication ratio: Percentage of savings by using deduplication. • Number of Save Sets: The number of save sets included in the backup. • Number of Files: The number of files included in the save set.
Save Set Details	Displays details about each save set, including backup duration. The Save Set Details report provides statistics on the following: <ul style="list-style-type: none"> • Save Set ID • Save time • Backup level • Save set size (protected data size) • Target size: Size of the data after deduplication has taken place on the Data Domain System (stored data size). • Deduplication ratio: Percentage of savings by using deduplication. • Number of Files: The number of files included in the save set.
Monthly Summary	Displays statistics on a month-to-month basis.
Daily Summary	Displays statistics on a day-to-day basis.

Drill-down reports

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

Reports can be run for groups, clients, or save sets. You can modify the scope of a report by adjusting the parameters on the **Configure** tab.

[Table 3 on page 59](#) lists the drill-down reports available for Data Domain Statistics.

Table 3 Data Domain Statistics drill-down report

Report name	Purpose	Sequence
Backup Summary	Reports backup statistics over a period of time, starting from client summary down to individual save sets level.	<ol style="list-style-type: none"> 1. Client Summary 2. Save Set Summary 3. Save Set Details
Monthly Client Statement	Reports backup statistics of individual clients on a month-to-month and day-to-day bases, down to individual save sets details.	<ol style="list-style-type: none"> 1. Client Summary 2. Monthly Summary 3. Daily Summary 4. Save Set Details

Advanced Reporting

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

Troubleshooting

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

Network issues

The Data Domain system is likely to have more than one network connection, and understanding these connections can be the key to quick diagnosis and problem resolution.

Number of connections

A typical Data Domain network configuration should provide a minimum of two network connections, one of which is dedicated to administration and the other to backup data only. Although there is no firm requirement for this, it is strongly advised as a best practice, especially for 10 Gb connectivity or for multiple backup connections that are aggregated or “teamed.”

Use of IP addresses

The use of IP addresses is generally *not* advised because numbers are more difficult to track and troubleshoot than descriptive names. [“Naming guidelines” on page 19](#) provides details.

However, there is an exception. The Data Domain system requires IP addresses to be used to interface with the “ifgroup” for Advanced Load Balancing and Link Failover features. The Data Domain documentation provides additional details.

Connectivity 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. Diagram and verify all relevant network connections. Use the **nslookup** command to verify that network names resolve to the appropriate IP address on storage nodes and servers. On the Data Domain system, you may use the **net hosts** command.

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

The Data Domain system can also be tested by using the **net lookup** command through an SSH Tenet session, which requires sysadmin or administrator permissions. The Data Domain system can also show the current network configuration by using the **net show** and other network related commands, available through the Data Domain interface (http://DDR_IP_ADDRESS). Log in and go to the specific Data Domain system. Then select the Hardware > Network tabs to access the commands.

This glossary provides 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.

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

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.

backup group [See "group."](#)

backup volume [See "volume."](#)

Boost An optimized library and communication layer with a special Data Domain API that allows NetWorker to interact with the Data Domain system

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

browse policy NetWorker policy that specifies the period of time during which backup entries are retained in the client file index. The index makes the associated backed-up data readily accessible for recovery by desktop users. [See "retention policy."](#)

C

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

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 single index file for each

client computer. The tracking information is purged from the index after the browse time of each backup expires.

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

clone Duplicate copy of backed-up data, which is indexed and tracked by the NetWorker server. Single save sets or entire volumes can be cloned.

clone-controlled replication Creation of a replica of deduplicated data copied from one NetWorker Data Domain device to another, which is scheduled by the NMC clone feature and is indexed and tracked by the NetWorker server.

clone volume Exact duplicate of a backup or archive volume. NetWorker software can track four types of volumes (backup, archive, backup clone, and archive clone). Save sets of these different types may not be intermixed on one volume. Clone volumes may be used in exactly the same way as the original backup or archive volume.

Console server [See “NMC \(NetWorker Management Console\).”](#)

D

database 1. A collection of data arranged for ease and speed of update, search, and retrieval by computer software. 2. An instance of a database management system (DBMS), which in a simple case might be a single file containing many records, each of which contains the same set of fields.

DD OS Data Domain Operating System

datazone Group of computers administered by a NetWorker server.

deduplication Process of detecting and identifying the redundant variable-length blocks (data segments) within a given set of data to eliminate redundancy.

deduplication backup Type of backup in which redundant data blocks replaced by metadata pointers and only unique blocks of data are stored. 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 storage unit can be a tape device, optical drive, autochanger, or disk connected to the server or storage node. 2. Access path to the physical drive, when dynamic drive sharing (DDS) is enabled. 3. General term that refers to storage hardware.

disaster recovery Recovery from any disruptive situation, such as hardware failure or software corruption, in which ordinary data recovery procedures are not sufficient to restore a system and its data to normal day-to-day operations.

distributed segment processing Part of the Data Domain interface, which enables data deduplication to be performed on a host before the data is sent to the Data Domain system for storage.

E

enabler code Special code that activates the software. The enabler code that unlocks the base features for software is called a base enabler. Enabler codes for additional features or products (for example, library support) are called add-on enablers.

G

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

H

host Computer on a network.

L

label Electronic header on a volume used for identification by NetWorker or other data mover application.

license enabler [See "enabler code."](#)

M

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

media Physical storage, such as magnetic tape, optical disk, or file system, 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.

media pool [See "pool."](#)

N

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.

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

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 cloning [See "clone-controlled replication."](#)

P

pathname Set of instructions to the operating system for accessing a file. An absolute pathname indicates how to find a file starting from the root directory and working down the directory tree. A relative pathname indicates how to find a file starting from the current location.

policy Set of constraints that specify how long the save sets for a client are available for recovery. Each NetWorker client has a browse policy and a retention policy. When the browse policy expires, the save sets associated with that policy are no longer readily available for browsing in an index. When the retention policy expires, the save sets associated with that policy are marked recyclable.

pool 1. NetWorker 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 a backup volume to a client disk and apply transactional (redo) logs to the data to make it consistent with a given point in time.

remote device 1. Storage device that is attached to a storage node that is separate from the NetWorker server. 2. Storage device located at an offsite location that stores a copy of data from a primary storage device for disaster recovery.

remote replication When backup data residing on a Data Domain storage system is copied over a LAN or WAN to another Data Domain storage system for disaster recovery protection.

replication Process of creating a network-efficient, automated exact copy of deduplicated data is created, for example, from a local Data Domain server source to a remote Data Domain server target, for disaster recovery.

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

resource database NetWorker database of information about each configured resource.

restore To retrieve individual data files from backup media and copy the files to disk, 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 volume available for recovery. Once 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 Group of files or a file system that has been backed up on storage media.

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.
ssid	See “save set ID (ssid).”
storage device	See “device.”
storage node	Computer with NetWorker software installed whose primary purpose is to receive a backup stream from one or more backup clients and then write to save sets on storage media.
T	
trap	Unsolicited notification sent from the SNMP agent to the network manager’s SNMP event manager.
V	
volume	1. Unit of physical storage medium, such as a magnetic tape, optical disk, or file system used to store data. Backup data must be stored on a backup volume and cannot be stored on an archive volume or a clone volume. 2. Identifiable unit of data storage that may reside on one or more computer disks.
volume ID (volid)	Internal identification that NetWorker software assigns to a backup volume.
volume name	Name that you assign to a backup volume when it is labeled. See also “label.”
VTL	Virtual tape library. Software emulation of a physical tape library storage system.

