Module 11: Administering NetWorker

Upon completion of this module, you should be able to:

- Describe:
    - EMC NetWorker licenses and the licensing process
    - The software distribution process
    - How to configure NetWorker in a firewall environment
    - NetWorker multi-tenancy
- Configure the NetWorker Management Console and Server
- Create and View Reports
- Configure Server, Client, and Savegroup parallelism

This module focuses on administering the NetWorker server and the NetWorker Management Console. Additionally, we will look at NetWorker licensing, the software distribution process, and how to configure NetWorker in a firewall environment.

Module 11: Administering NetWorker

Lesson 1: NetWorker Management Console Administration

During this lesson the following topics are covered:
- Configuring applications for monitoring
- Configuring reporting and data collection

EMC²

This lesson covers NetWorker Management Console administration, including configuration of applications such as NetWorker for monitoring, as well as the configuration of reporting and data collection on these systems.

Managing Additional NetWorker Servers

Configure one or more NetWorker servers in NMC

Right-click to bring up context menu
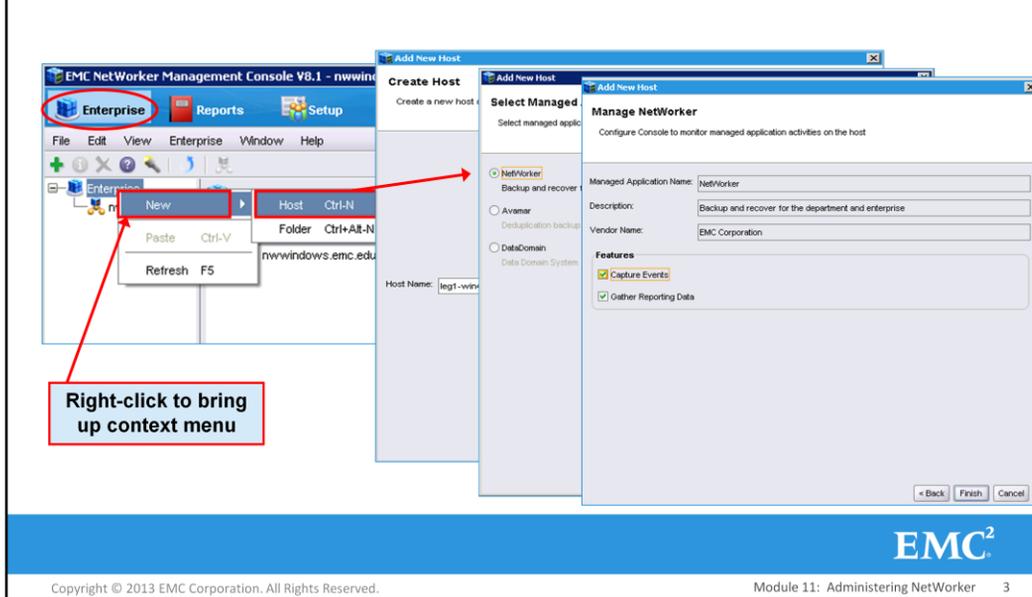
A NetWorker Management Console server can be configured to manage multiple NetWorker servers. To display a list of NetWorker servers managed by the Console server, click the **Enterprise** button in the task bar. In the left pane, a hierarchical list of managed NetWorker servers is displayed.

When setting up a new installation of NetWorker Management Console (NMC), you specify the NetWorker servers that will be managed by the Console server during execution of the **Console Configuration Wizard**. After this initial setup, new NetWorker servers can be added to the Console from the *Enterprise* window.

To specify a new NetWorker server to manage, select **Enterprise** from the NMC task bar and right-click **Enterprise** in the left pane. In the **Create Host** window, specify the name of the NetWorker server to manage. In the **Select Managed Application** window, select NetWorker to manage a NetWorker server. Next, in the **Manage NetWorker** window, choose whether to gather information from the NetWorker server.

Running the `gstmodconf` command-line utility is another way of configuring the Console server to manage an additional NetWorker server. The `gstmodconf` command is run on the Console server. See the *EMC NetWorker Command Reference Guide* for additional information concerning options and arguments.

Setting Information Gathering Features

Information gathering is configurable for each NetWorker server:

- When **Capture Events** is enabled:
  - Console receives event notifications from the NetWorker server
- When **Gather Reporting Data** is enabled:
  - Data from the NetWorker server is incorporated into Console reports
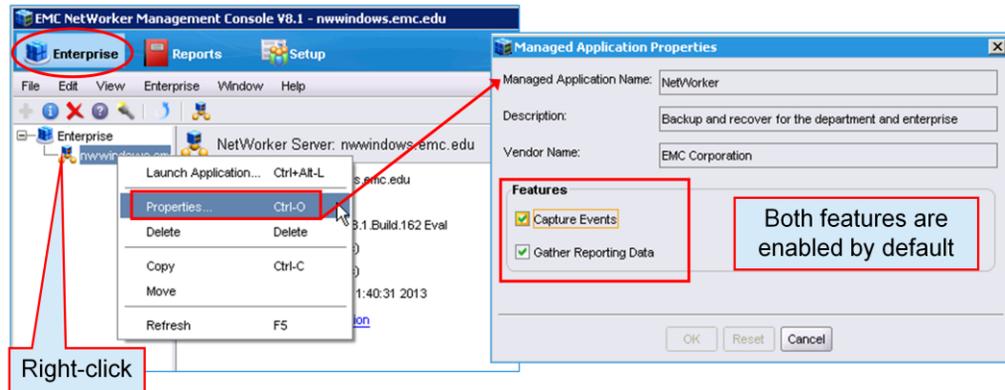
To change whether the Console server captures events and gathers reporting data from a managed NetWorker server, select the NetWorker server in the Console **Enterprise** window, right-click **NetWorker** (the managed application) in the right pane, and select **Properties** from the context menu.

Selecting **Capture Events** allows events such as disabled licenses and pending media requests to be displayed in the Console **Events** window. Selecting **Gather Reporting Data** allows the Console server to accumulate data retrieved from the NetWorker server jobs database to be used when creating reports.

NetWorker and Console Server Events

- Events are generated by managed servers and the Console server.
- **Capture Events** must be enabled for Console to display events from a particular server.
- Examples of events include:
  - ▸ Failed group backup
  - ▸ Waiting for a writable volume
  - ▸ Device automatically disabled
  - ▸ Managed server not responding

Events
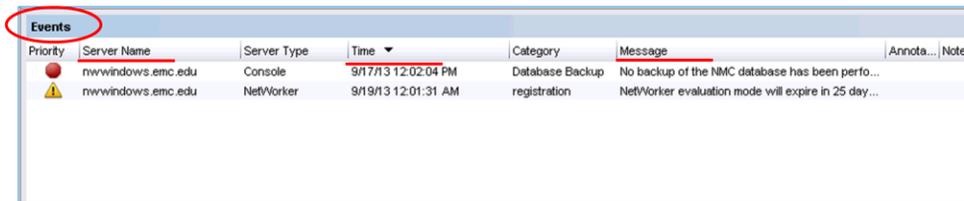
Priority	Server Name	Server Type	Time ▼	Category	Message	Annota...	Note
🔴	nwwindows.emc.edu	Console	9/17/13 12:02:04 PM	Database Backup	No backup of the NMC database has been perfo...		
⚠️	nwwindows.emc.edu	NetWorker	9/19/13 12:01:31 AM	registration	NetWorker evaluation mode will expire in 25 day...		

EMC²
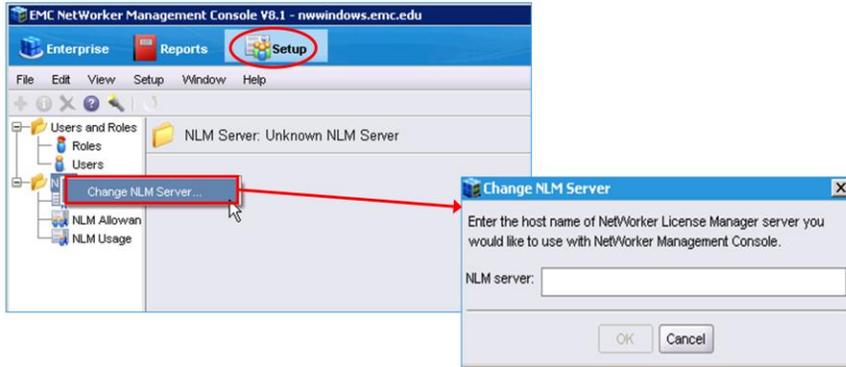
The **Events** window contains important notices generated by managed servers and the Console server. Types of NetWorker events include failed group backups, pending media requests, automatic disabling of devices due to too many consecutive write errors, and a NetWorker server's `nsrd` not responding to the Console server's polling.

If the **Capture Events** property for a particular server is not enabled, no events from that server are displayed.

Specifying a NetWorker License Manager (optional)

Set the NetWorker License Manager server that Console uses for managing NetWorker licenses for one or more NetWorker servers (optional).

EMC NetWorker Management Console V8.1 - nwwindows.emc.edu

Enterprise   Reports   Setup

File   Edit   View   Setup   Window   Help

Users and Roles
— Roles
— Users
    NLM Server: Unknown NLM Server

Change NLM Server...

NLM Allowan
NLM Usage

Change NLM Server

Enter the host name of NetWorker License Manager server you would like to use with NetWorker Management Console.

NLM server:

OK   Cancel

EMC²

If you are using a NetWorker License Manager (NLM) server to manage NetWorker licenses for one or more NetWorker servers, you can right-click **Licensing** in the **Setup** window to specify the NLM server to manage. You can then use the Console GUI to administer licenses on the NLM server.

Module 11: Administering NetWorker

Lesson 1 Summary

During this lesson the following topics were covered:
- Configuring applications for monitoring
- Configuring reporting and data collection

This lesson covered NetWorker Management Console administration, including configuration of applications such as NetWorker for monitoring, as well as the configuration of reporting and data collection on these systems.

Module 11: Administering NetWorker

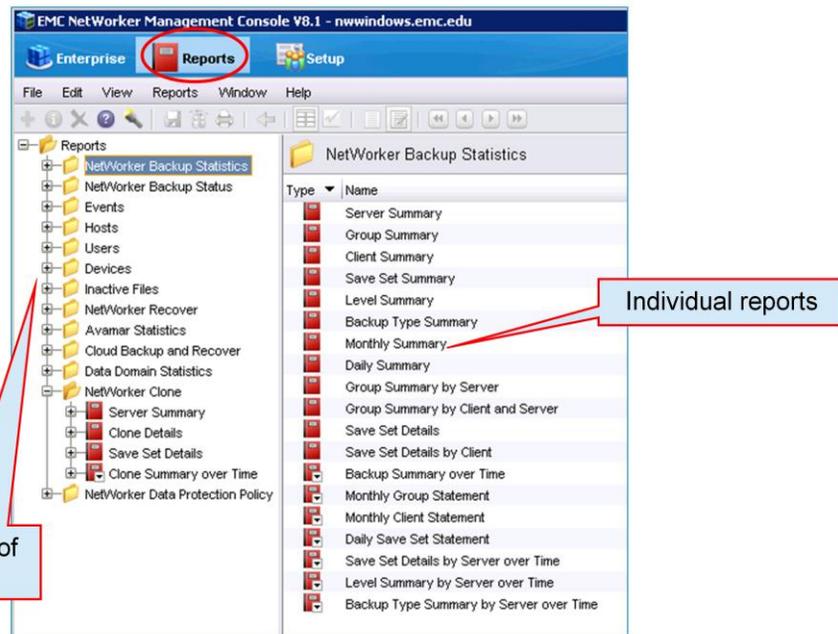Lesson 2: NetWorker Management Console Reporting

During this lesson the following topics are covered:
- Report types
- Methods for running reports
- Configuring report data retention
- EMC Report Home

This lesson covers the reporting capabilities of the NetWorker Management Console, including a discussion of the report types, methods for running reports, how to configure data retention times, and an overview of EMC Report Home.

NMC Reporting

EMC NetWorker Management Console V8.1 - nwwindows.emc.edu

Enterprise | Reports | Setup

File Edit View Reports Window Help

Reports
- NetWorker Backup Statistics
- NetWorker Backup Status
- Events
- Hosts
- Users
- Devices
- Inactive Files
- NetWorker Recover
- Avamar Statistics
- Cloud Backup and Recover
- Data Domain Statistics
- NetWorker Clone
  - Server Summary
  - Clone Details
  - Save Set Details
  - Clone Summary over Time
- NetWorker Data Protection Policy

NetWorker Backup Statistics

Type ▼ Name
- Server Summary
- Group Summary
- Client Summary
- Save Set Summary
- Level Summary
- Backup Type Summary
- Monthly Summary
- Daily Summary
- Group Summary by Server
- Group Summary by Client and Server
- Save Set Details
- Save Set Details by Client
- Backup Summary over Time
- Monthly Group Statement
- Monthly Client Statement
- Daily Save Set Statement
- Save Set Details by Server over Time
- Level Summary by Server over Time
- Backup Type Summary by Server over Time

Individual reports

Categories of reports

The Console server's **Reports** window is used to generate reports. There are dozens of preconfigured reports that can be generated.

The reports are separated into several categories including the following:

- NetWorker Backup Statistics
- NetWorker Backup Status
- NetWorker Recover
- Cloud Backup and Recover
- Data Domain Statistics
- Avamar Statistics
- Devices
- Inactive Files
- Users
- Hosts
- Events
- NetWorker Clone
- Networker Data Protection Policy

Console Database – Data Retention

- Data maintained in the Console database is used for generating reports.
- The amount of data retained is managed by configuring retention periods for different types of data.

The information contained in the Console database (lgto_gstdb) is used when generating reports. To manage the size of the database, there are four configurable parameters that allow you to retain various types of data for differing lengths of time.

Audit Data is kept in the Console database for one year, by default. This information consists of a complete record of all activities performed by all NMC users.

Backup Statistics consists of all save set data, retrieved from a NetWorker server's media database, for use in generating backup statistics reports. Once retrieved from a NetWorker server into the Console database, the save set data is retained, by default, for a period of one year.

Completion Data is kept for one month, by default. Completion data includes information about all backed up save sets.

Completion Messages include the success/failure status of each backup. By default, this information is retained for two weeks.

Recover Statistics consists of all recovery operations performed by NetWorker servers. This information is kept in the console database for three months, by default.

Running Console Reports (1 of 2)

All items are selected by default

>, <   Move selected item
>>, <<   Move all items

Report on backups from any date

For each report, there are a number of parameters that can be specified. By default, all possible values of each parameter are selected. For example, the **Server Summary** report automatically displays information about all NetWorker servers viewable by the user running the report, all types of backup data created on those servers (file system save sets, CFI save sets, bootstrap save sets, save sets created by NetWorker Modules, etc.) and all backup levels. All Console database information matching this query, regardless of the save set timestamp, is included in the report.

To customize the report, deselect one or more values from one or more of the parameters, or restrict the time period for which the report is generated. A customized report can be saved for later use.

The '**<**' button deselects an individual value while '**<<**' deselects all selected values. The '**>**' button selects an unselected value while '**>>**' selects all unselected values.

- Change to the **View Report** tab to perform the query and display the results.
- You can perform only one query at a time.
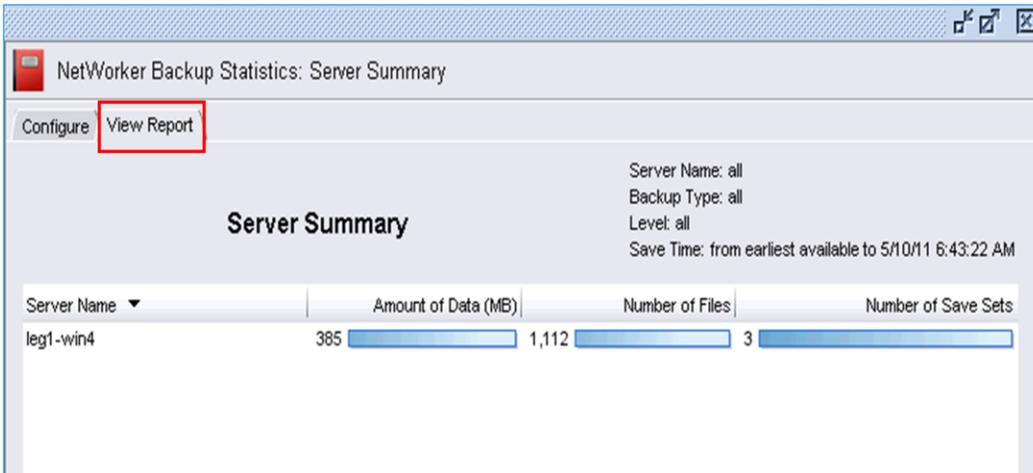
NetWorker Backup Statistics: Server Summary

Configure | View Report

Server Summary

Server Name: all
Backup Type: all
Level: all
Save Time: from earliest available to 5/10/11 6:43:22 AM

Server Name ▼	Amount of Data (MB)	Number of Files	Number of Save Sets
leg1-win4	385	1,112	3

After specifying the parameters on which to query, change to the *View Report* tab to perform the query and display the results. The parameters used for the query are displayed in the upper right corner and the actual report is displayed below them.

Clicking the heading of a field causes the report to be sorted on that field. Clicking the same heading again reverses the sort.

Report Types – Table

A report can be displayed in a number of different formats, including a table, a document, and a chart.

Right-clicking anywhere in a report pops up the context menu shown in the slide from which you can choose the report format.

By default, reports are displayed in a tabular format in portrait orientation. You can use the context menu to change the orientation to landscape.

The default tabular display can be modified by selecting **Document** from the context menu, as shown on the slide. Displaying a report in document format is useful if you want to print the report.

To return to the default tabular view, select **Interactive** from the context menu.

Report Types – Chart (Stacking Bar)
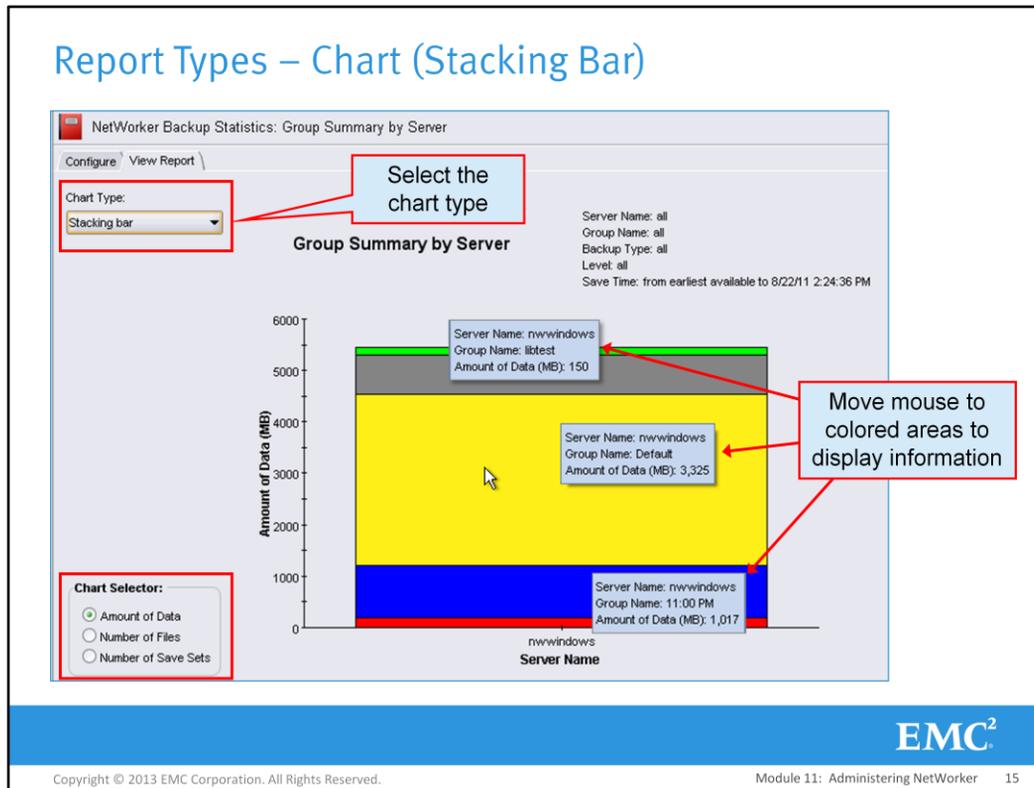
There are several types of chart formats including bar chart, pie chart, plot chart, and stacking bar chart. Each type of chart displays the same information but in a different format. To display a report in chart format, select **Chart** from the context menu. Then, select the type of chart from the choices in the **Chart Type** drop-down menu. Select the type(s) of data to display with the **Chart Selection** field.

In a stacking bar chart, multiple pieces of information are displayed in each bar. In the stacking bar chart shown on the slide, there are several groups on the NetWorker server, nwwindows, that have backed up. Moving the mouse to the yellow portion of the bar displays the amount of data backed up for the Default group. Moving the mouse to the green portion of the bar displays information about the libtest group. Moving the mouse to the blue portion of the bar displays information about the 11:00 PM group. Information to be displayed includes amount of data, number of files or number of save sets.

In most report types, you can select **Zoom** from the context menu to change the size of what is displayed. In the above slide, it might be helpful to zoom the graphic to 150% of normal to view the details on the chart.

Choose **Print** from the context menu to send the report to a printer.

The context menu also has an **Export** selection which allows you to export the displayed information to a file in PDF, HTML, or Postscript format. Reports displayed in a tabular format also allow exporting to be performed in CSV format.

Drill-down Reports
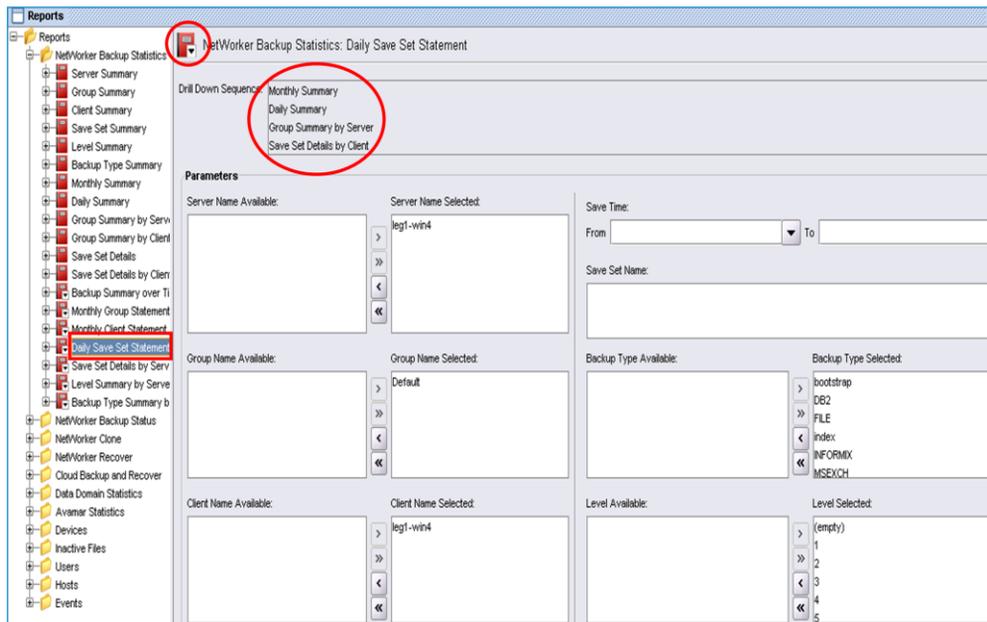
Drill-down reports are designated by a small white box containing a triangle in the report's icon in the left pane of the *Reports* window.

In a drill-down report, you can double-click items within the report to view more detailed information. The types of information displayed when drilling down and the order in which they appear are listed at the top of the report above the query parameters.

<u>Note</u>: You can reverse the drill-down sequence by right-clicking in a report and selecting **Back** from the context menu.

Creating a Custom Report
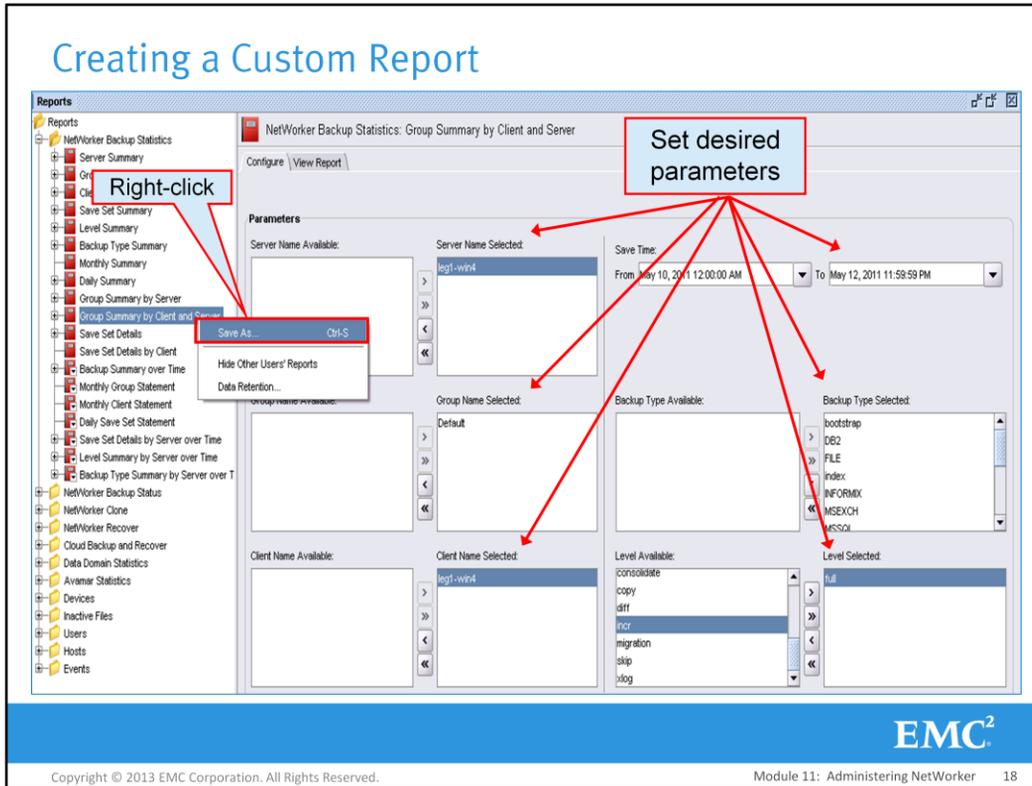
You can customize a report by deselecting any of the selected parameters or by changing the time period used for the query.

To save the customized query parameters, right click the report that you customized in the left pane and select **Save A**s from the context menu.

After you specify a name for the report, the customized report will be filed in the left pane below the preconfigured report.

By default, a customized report is stored as private for the user who created it and only appears in that user's list of reports. The owner, or the NetWorker administrator, may choose to share the report with others by right-clicking the report name in the left pane and choosing **Share** from the context menu. Once enabled for sharing, the report appears in the list of reports for all users.

Command Line Reporting

- Use the **gstclreport** command to run reports from the command-line.

```
C:\Program Files\EMC NetWorker\Management\GST\bin>gstclreport
Java version "1.6.0_33"
Java(TM) SE Runtime Environment (build 1.6.0_33-b05)
Java HotSpot(TM) Client VM (build 20.8-b03, mixed mode)

usage: gstclreport [-h] -r reportname -u username
       [-C parameters] [-P password] [-a chartselector]
       [-c charttype] [-f filename] [-n fontfamily]
       [-o orientation] [-v viewtype] [-x exporttype]
where:
     -h                      Print this help message
     -r  reportname          The name of the report to run, or full path name like "/Reports/Users/User L
ist"
     -u  username            Log into GST server with given name
     -C  parameters          The parameters will vary based on reportname.
     -P  password            Log into GST server with given password
     -a  chartselector       The set of Y axis to display in a chart
     -c  charttype           The chart type [bar | pie | plot | "stacking bar"]
     -f  filename            The name of the export file
     -n  fontfamily          A font family to override the default
     -o  orientation         The orientation [portrait | landscape]
     -v  viewtype            The view type [table | chart]
     -x  exporttype          The type of export [ pdf | postscript | html | csv | print]
```

To perform a query and generate a report from the command-line, use the gstclreport command. There are a large number of options used to specify items such as the Console user to perform the query as, the query parameters, and the format of the report.

Command line reports may only be printed or run to generate exported output. They cannot be saved or shared. Drill-down reports cannot be run from the command line.

Note: Support of command line reporting requires JRE version 1.6 or later. Uncomment and change the SET JAVA_HOME statement in the gstclreport.bat file to the Java location prior to running the command. For example, on this Windows host:

```
REM Java Runtime Environment 1.6 is required to run this script.
REM Uncomment the line below and set JAVA_HOME to a valid JRE location.

SET JAVA_HOME=C:\Program Files (x86)\Java\jre6
```

EMC Report Home

- Report Home introduced with NetWorker 8.0
  - Not related to previously used ConnectEMC
- Enabled by default
  - Runs every Monday at 8AM local time.
  - Can be rescheduled or disabled using nsradmin
  - May need to modify mail configuration on host to allow reports to be sent
- Collects NW configuration data and sends to EMC via email
  - By default, reporting excludes hostnames to avoid security concerns
  - Can be configured to exclude other resource or attribute types
  - Collect command can be run manually for inspection: "nsrdump"

```
nsradmin> print type: NSR Task
  name: DefaultReportHomeTask;
  comment: Single Instance of Report Home Task;
  action: "NSR Report Home:DefaultReportHome";
  autostart: Enabled;
  start time: "8:00";
  period: Week;
  last start: "Mon May 28 08:00:00 2012";
  last message: Successful;
```

```
nsradmin> print type: NSR Report Home
  name: DefaultReportHome;
  command: nsrdump;
  mail program: smtpmail -h mailhost;
  email address: NetWorkerProfile@emc.com;
  exclude resources: ;
  exclude attributes: hostname;
```

EMC Report Home provides an email-based report mechanism for NetWorker environments. It is enabled by default.

Benefits include:

- Better understanding of versions being used in the field so that Support can be more proactive in helping to identify known issues
- Improved support as information is already available when problems arise

Module 11: Administering NetWorker

Lesson 2 Summary

During this lesson the following topics were covered:
- Report types
- Methods for running reports
- Configuring report data retention
- Report home

This lesson covered the reporting capabilities of the NetWorker Management Console, including a discussion of the report types, methods for running reports, how to configure data retention times, and an overview of EMC Report Home.

This lesson covers the procedures for protecting the NetWorker Console database. Specifically the procedures for backing up and recovering the database are discussed.

Backing Up the Console Database (1 of 2)

Until a backup of the Console database is performed, an event notification is posted.

Events

Priority	Server Name	Server Type	Time ▼	Category	Message
●	nwwindows.emc.edu	Console	9/17/13 12:02:04 PM	Database Backup	No backup of the NMC database has been perfo...

EMC NetWorker Management Console V8.1 - nwwindows.e

Enterprise   Reports   Setup

File   Edit   View   Setup   Window   Help

System Options...
Set Database Backup Server...
Configure Login Authentication...
Console Configuration Wizard...
Change NLM Server...

Users and Rol
  Roles
  Users
NLM
  NLM Licen
  NLM Allow
  NLM Usage

Set Database Backup Server

Enter the name of the NetWorker server that will backup the NetWorker Management Console database.

NetWorker server: nwwindows.emc.edu

Create client resource on this server: ☑

Client name: nwwindows.emc.edu

[OK]   [Cancel]

This is the Console server

The Console database, `lgto_gstdb`, is used to generate reports. To avoid loss of data needed for accurate reporting of past backups, it is important to back up the Console database. To configure automatic backups of the Console database, a NetWorker client resource must be configured for the Console server with the appropriate save set name.

When setting up a new installation of NetWorker Management Console (NMC), you specify the Console database backup server and Console client name during execution of the **Console Configuration Wizard**. This creates a client resource on the specified NetWorker server to back up the Console database.

If, at a later time, you need to create a client resource to backup the Console database, you can do this using the **Setup** menu in the Console **Setup** window. Selecting **Set Database Backup Server** from the menu pops up a window in which you can specify the NetWorker server that performs the backup. Enter the name of the Console server in the **Client name** field.
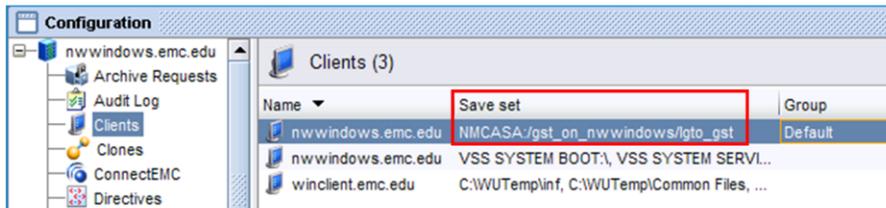
- The special save set name uses the same syntax whether the Console server is a UNIX host or a Windows host.
- The client resource is automatically configured with **Backup command** set to **savepsm**. Because of this, a separate client instance is needed to back up the Console server.

Even if a client resource already exists for the Console server, it is necessary to create a separate client resource to back up the Console database. This is because the `savepsm` command is required to back up the Console database properly. This command must be entered in the **Backup command** attribute of the client resource.

Additionally, the **Save set** list of the client resource must contain only:

```
NMCASA:/gst_on_console_server/lgto_gst
```

`console_server` should be replaced by the name of the Console server. This save set name is used regardless of whether the Console server is a UNIX or Windows host. `savepsm` backs up the Console server database and the Console server credential file, `gstd_db.conf`. Verify that both files are being backed up.

Important: It is not necessary for you to manually create the client resource used to back up the Console database. The **Set Database Backup Server** feature described on the previous page automatically configures the client resource.

Note: An alert is posted to the **Events** window in the Console GUI until the Console database is backed up for the first time.

Recovering the Console Database
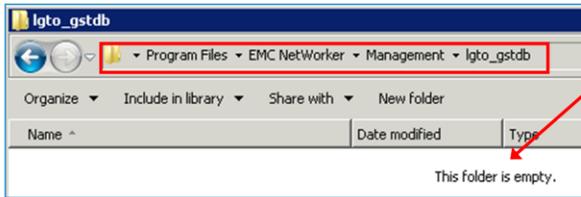
The Console database is gone

1. Stop `gstd` (not shown)

2. Run `recoverpsm`

```
C:\Program Files\EMC NetWorker\Management\GST\bin>recoverpsm -c nwwindows.emc.edu -s nwwindows.emc.edu
19221:recoverpsm: Restoring database lgto_gst
24042:recoverpsm: Restore of database completed successfully
42137:recoverpsm: Restoring database credential file
Recovering 1 file from C:\Program Files\EMC NetWorker\Management\lgto_gstdb\ into C:\Program Files\EMC NetWorker\Management\lgto_gstdb
Requesting 1 file(s), this may take a while...
Requesting 1 recover session(s) from server.
91651:recoverpsm: Successfully established AFTD DFA session for recovering save-set ID '4237034749'.
C:\Program Files\EMC NetWorker\Management\lgto_gstdb\gstd_db.conf
Received 1 file(s) from NSR server 'nwwindows.emc.edu'
Recover completion time: 10/27/2012 9:16:08 AM
```
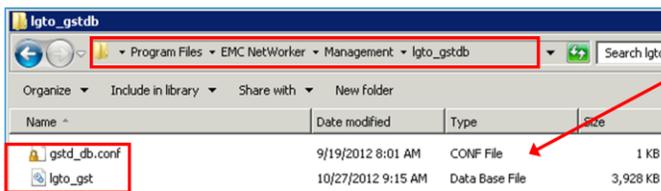
Console database and the conf file are recovered

3. Start `gstd` (not shown)

To recover the Console server database:

1. Stop the GST service (`gstd`) if it is currently running.

2. At a command prompt, enter the `recoverpsm` command:

    recoverpsm [-f][-c *client*][-s *server*][-d *dir*][-t *time*][-S *cons_serv*]

    - **-f** Overwrite the existing database file if it exists.

    - **-c** Specify the name of the NetWorker *client* (Console server).

    - **-s** Specify the name of the NetWorker *server*.

    - **-d** Recover the database to *dir* instead of to the current Console server database directory.

    - **-t** Recover the database as it existed at *time*, specified in nsr_getdate format.

    - **-S** If the Console server has been moved to a different location since the last backup, use this option to specify the name of the previous Console server host. The format of the database server name is gst_on_*cons_serv*. *cons_serv* should be the hosts short name. For example, if the Console server was formerly **flute**, the option would be -S gst_on_flute.

3. Restart the Console server.

<u>Important</u>:

On some UNIX systems, the directory containing `recoverpsm` is not automatically added to root's **PATH**. It is therefore necessary to manually add it using root's shell initialization file (`.profile`, `.cshrc`, etc.) to avoid having to specify the full pathname when executing the command.

As an example, if the Console server was running Solaris, the Console server software was installed in the default location, and the root user was using the Korn shell, the following line would be added to `/.profile`:

`PATH=$PATH:/opt/LGTOnmc/bin`

Additionally, `recoverpsm` requires a shared library which may not be located in a directory where the UNIX shell will find it. It is therefore necessary to update the value of root's **LD_LIBRARY_PATH** variable. The directory that must be included is the **`sybasa/lib`** directory under the location where the Console server software was installed.

Using the same example as above, where the Console server software was installed in `/opt/LGTOnmc` on a system running Solaris, the line to add to root's `/.profile` would look like the following:

`LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/opt/LGTOnmc/sybasa/lib`

Module 11: Administering NetWorker

Lesson 3: Summary

During this lesson the following topics were covered:
- Backing up the Console database
- Recovering the Console database

EMC²

This lesson covered the procedures for backing up and recovering the NetWorker Console database.

Lab 11: Administering NetWorker

In this lab, you will perform several tasks relating to the management of the Console server.

- Lab Exercise 11-1: Manage the Console Server

In this lab, you will:

- Create a new Console user
- Generate reports and create custom reports
- Back up the Console database

Module 11 : Administering NetWorker

Lesson 4 : Managing NetWorker Parallelism

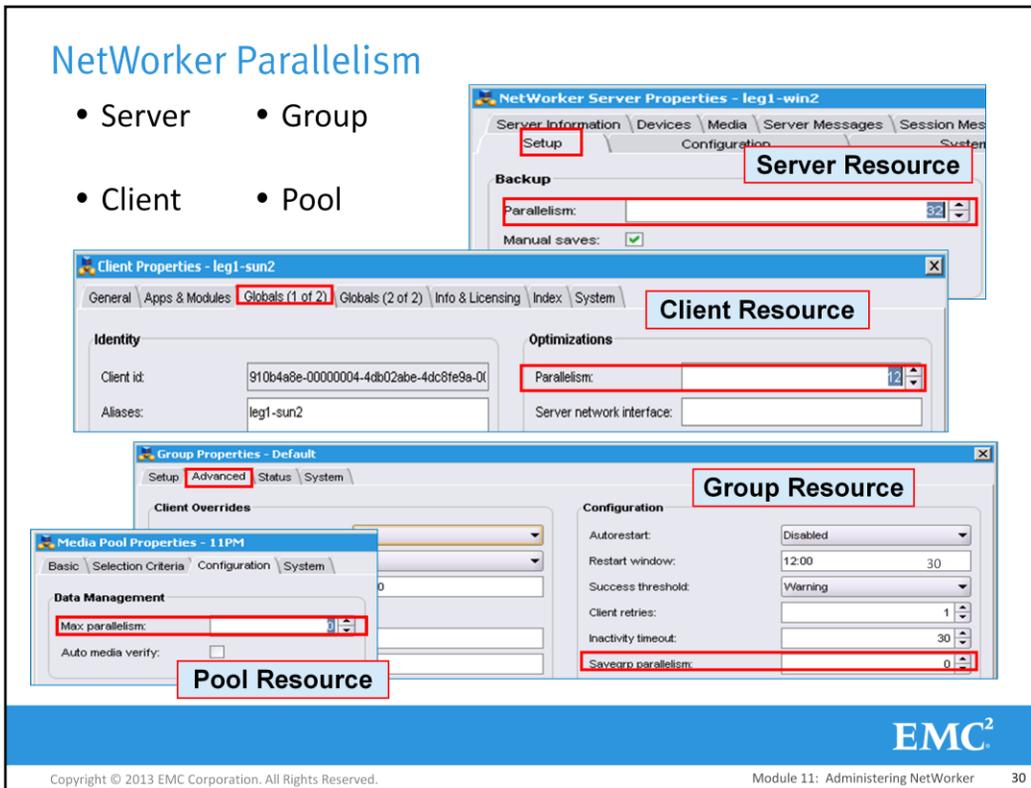During this lesson the following topics are covered:
- NetWorker Parallelism Specifically in Relation to:
  - Servers
  - Groups
  - Clients
  - Pools

This lesson discusses NetWorker parallelism, including server, group, client, and pool parallelism settings.

NetWorker Parallelism
- Server
- Group
- Client
- Pool

Server Resource

Client Resource

Group Resource

Pool Resource

Parallelism on different types of resources allows for a granular level of control over the maximum number of save sets that may be backed up simultaneously within a data zone, and the maximum number of save sets simultaneously backed up by a particular group, client or pool.

Server parallelism – The maximum number of save sets that may be backed up simultaneously within a data zone. Save streams may be from both server-initiated and client-initiated backups.

Client parallelism – The maximum number of save sets that may be backed up simultaneously from a single client. If multiple (logical) client resources exist for a host and are backed up at the same time, the maximum number of save sets backed up simultaneously from the physical host is the sum of the **Parallelism** value for each client backing up.

Savegroup Parallelism – The maximum number of save sets that may be backed up simultaneously by a particular NetWorker group. If multiple groups are running concurrently, this value can be used to avoid one of the groups consuming all of the allowed sessions as specified by the server parallelism value.

Pool Parallelism – The maximum number of simultaneous sessions that can be sent to a particular NetWorker pool.

Example: Server Parallelism = 1

NetWorker Server

Target sessions = 1

Volume

flute
/home
1

/usr
3

oboe
/mail
2
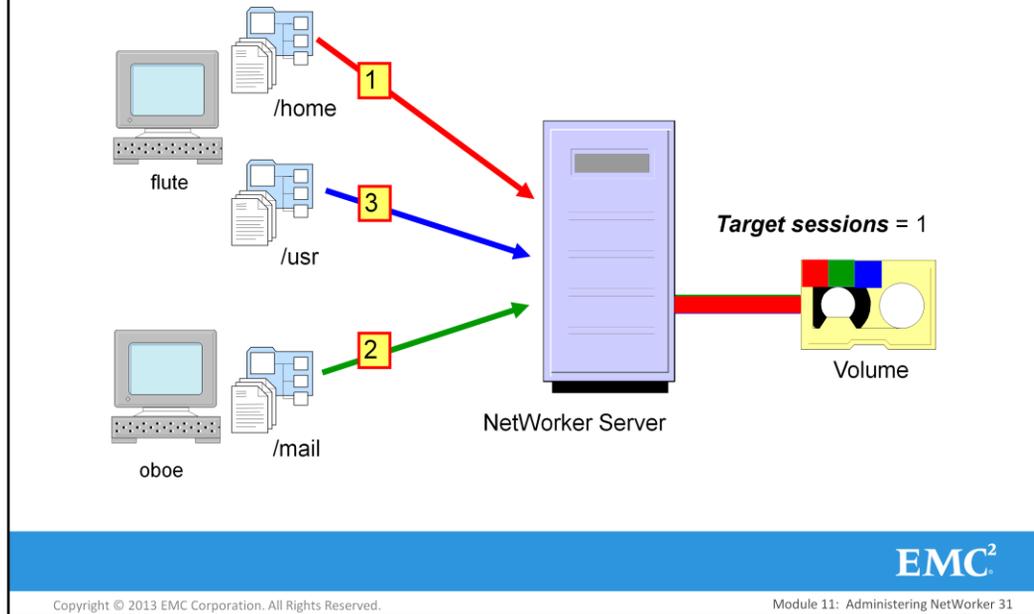
Server Parallelism = 1

Save streams cannot be multiplexed when server parallelism is set to **1** because the NetWorker server only allows one save set at a time to be backed up. Save sets are backed up on a first-come, first-served basis until the **Parallelism** value is reached.

The steps in the slide explain how the backup occurs.

Parallelism is one of NetWorker's key performance tuning parameters. It helps determine the amount of multiplexing that occurs when writing to a device. If parallelism is set too high, it might overload the network, clients, storage nodes, or the NetWorker server. If parallelism is set too low, there may be an insufficient number of save streams directed to a device for it to achieve its maximum throughput.

Example: Server Parallelism = 2

flute — /home [1], /usr [3], /opt [6]

oboe — /opt [2], /var [4]

clarinet — /usr [5]

NetWorker Server and Storage Node

Target Sessions = 2

Volume

EMC²
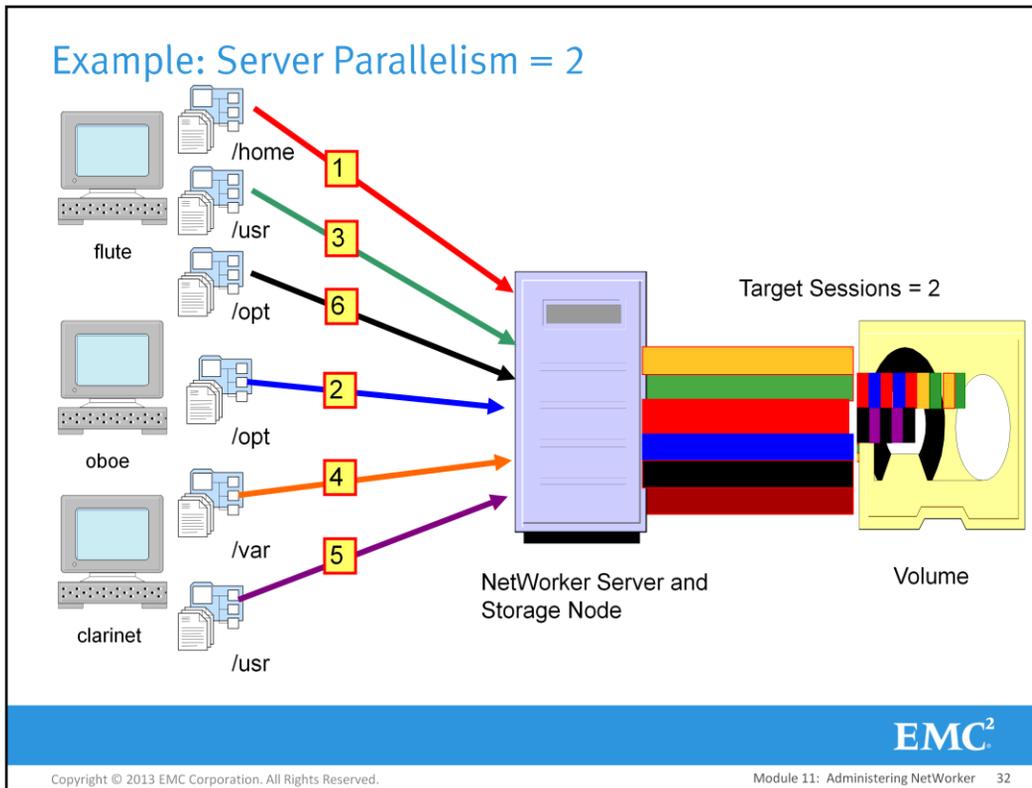
Server Parallelism = 2

The number of save streams assigned to a device is determined by the value of the device resource's **Target sessions** attribute. When a device is receiving the number of save streams specified by its **Target sessions** value, the NetWorker server attempts to direct additional save sets to other available devices. If there are no other devices available to receive additional save streams, the NetWorker server can direct the save streams to the device already receiving its target number of save streams. Thus, **Target sessions** is not a hard limit; the NetWorker server can override the value if necessary.

Each device resource also has an attribute called **Max sessions**. This attribute is a hard limit on the number of save streams that may be directed to the device.
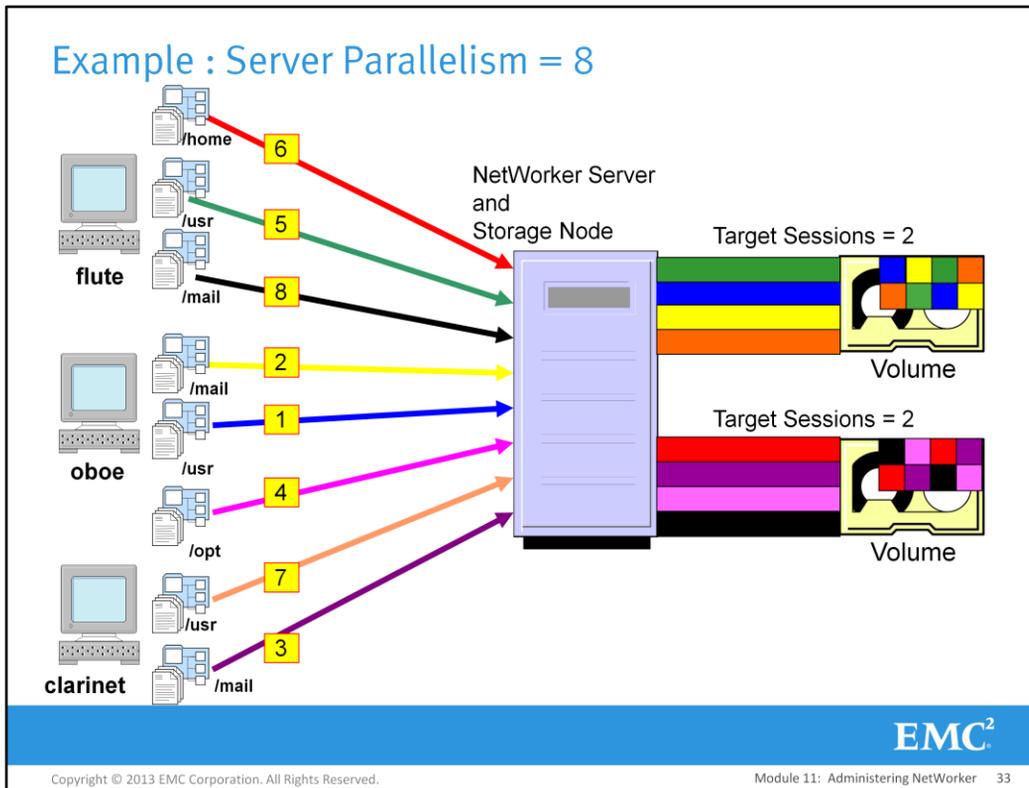
Server Parallelism = 8

The following steps explain how the backup illustrated in the slide occurs.

1. Client oboe backs up its `/usr` and `/mail` save sets. The save streams are directed to the first device because its **Target sessions** value is set to **2**.

2. Client clarinet's `/mail` and `/tmp` save sets are directed to the second device because the first device is already receiving the number of savestreams specified by its **Targets sessions** value. At this point, both devices are now receiving their desired number of save streams.

3. Since server parallelism is **8**, the NetWorker server will start four additional save sessions. Since a device's **Target sessions** is a soft limit, the server overrides the value and directs the streams to the two devices.

   Although the slide depicts the save streams being directed to the devices in a round-robin fashion, each additional save stream is directed to the least utilized device as determined by the device resource's **Accesses** attribute.

Note: The slide assumes that both devices contain a volume from the same pool and that all save sets can be written to that pool. If multiple pools are used for the save sets, the behavior of the backups may be considerably different.

Parallel Save Streams Overview

- Introduced with NetWorker 8.1
- Allows NetWorker to automatically break up large single save sets into multiple smaller save sets that can run in parallel
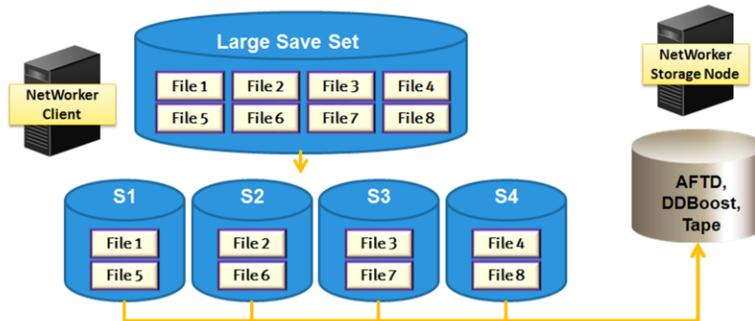
Prior to NetWorker 8.1 backing up a large file system could take a very long time. NetWorker 8.1 provides parallel save stream support for Unix and Linux systems. Parallel save streams are used to break up a large save set into multiple smaller save sets to be backed up at the same time. This results in a backup that completes faster for file systems on disks that support the increased read parallelism. Each PSS client resources save set entry (mount point, file system) results in 1, 2, 3 or 4 (maximum) physical save sets. Each save set has a corresponding media database record. Both fulls and incrementals are supported.

This feature is enabled for scheduled file system backups by checking the 'parallel save streams per save set' client resource property in NMC.

With NetWorker 8.1 this is only supported on Unix and Linux, there is no current support for Windows clients, Synthetic Fulls, or Check Point Restarts.

Parallel Save Streams: Requirements and Best Practices

- Requirements
  - NetWorker client and server must be at version 8.1 or higher
- Limits
  - Only scheduled file system backups are supported
  - Significantly unbalanced file systems might not benefit
    - (ex. If a single large file takes up the majority of the disk space)
  - No current support for Windows, Synthetic Full, or Checkpoint Restart
- Best practices
  - Target PSS for large file systems residing on disks that support high read parallelism
  - Consider separating targeted file systems into a new PSS-enabled client resource and group to optimize overall client scheduled backup performance

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Parallel save streams was introduced with NetWorker 8.1 and therefor requires that both the client and server software be at NetWorker 8.1 or higher.

With this version there are certain limits to the support for PSS. It is important to check the release notes and NetWorker documentation for the version of the software you are installing to determine what specific limitations apply to your environment.

Parallel Save Streams: Configure and Enable

To enable and configure parallel save streams select the client and select Modify Client Properties.

Select Globals (1 of 2) and set the client parallelism for static division among listed save set entries, and then select the Parallel save streams per save set check box. The number of PSS run time save streams for a resource in a save set entry is determined at the start of the backup to be a fixed portion of the client parallelism value (maximum of 4). This fixed number will equal the number of 'partial' physical save sets on backup media and also the number of mmdb save set records.

For example, a PSS client resource with parallelism of 8 and three listed save set entries '/filesystemA', '/filesystemB', and '/filesystemC', the corresponding number of save streams will be 3, 3 and 2 respectively. Static round-robin division of the client parallelism is performed by the savegrp prior to starting any of the client's save streams. The number of streams remain fixed regardless of one of the file systems finishing before the other. Client parallelism has been in NetWorker since the early 1990s; this allowed multiple client resource save set list entries to run in parallel (usually an entry is a file system dir AKA save point or save path) but there is only one save stream per save set entry and hence only one resultant mmdb save set record (mminfo). Parallel Save Streams introduced in NetWorker 8.1 allows for multiple save set list entries.

Module 11 : Administering NetWorker

Lesson 4 : Summary

During this lesson the following topics were covered:
- NetWorker Parallelism
  - Server
  - Group
  - Client
  - Pool

This lesson discussed NetWorker parallelism, including server, group, client, and pool parallelism settings.

Lab 11: Administering NetWorker

In this lab, you will perform several tasks relating to the management of the NetWorker Server.

- Lab Exercise 11-2: Administer the NetWorker Server

In this lab you will perform several tasks relating to the management of the NetWorker server.

Module 11 : Administering NetWorker

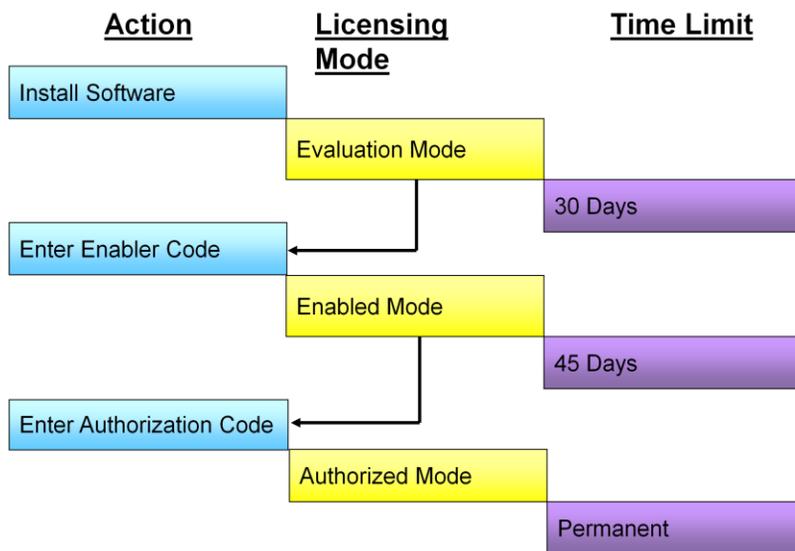## Lesson 5 : NetWorker Licensing

During this lesson the following topics are covered:
- NetWorker licensing
- Server versions
- Add-on modules
- NetWorker server components
- NetWorker Fast Start
- Enabler codes

This lesson covers NetWorker licensing including server versions and add-on modules, licensable NetWorker server components, the NetWorker Fast Start edition, and registrations and enabler codes.

NetWorker Licensing - Timeline

Action	Licensing Mode	Time Limit
Install Software		
	Evaluation Mode	30 Days
Enter Enabler Code		
	Enabled Mode	45 Days
Enter Authorization Code		
	Authorized Mode	Permanent

EMC provides flexibility in evaluating and purchasing EMC NetWorker through the use of licensing modes. NetWorker provides three licensing modes:

- Evaluation mode
- Enabled mode
- Authorized mode

Evaluation Mode

In Evaluation mode, all NetWorker features and add-on modules are enabled for a period of 30 days, from the date of software installation.

You can use and evaluate the software without entering an **enabler code** for 30 days after you install the software. If you decide you want to continue using the NetWorker software, you must purchase it and you will receive an enabler code for each feature you want to continue using.

If you do not enter the enabler code(s) before the evaluation period ends, the NetWorker software will not allow further backups or configuration to take place. However, you can still recover all data that was backed up during the evaluation period.

Important: If you already have a NetWorker product installed and enabled and you want to evaluate additional product features, you must enter a separate evaluation enabler for each additional feature.

Note: The Network edition of NetWorker is used during the evaluation period.

Enabled Mode

Installing an enabler code places the software in **Enabled mode**. Each NetWorker server will have at least a **base enabler** which enables a specific edition of NetWorker software. Each additional product feature that is licensable will have a separate enabler code.

Enabler codes are generic to the product release and are entered as an attribute value in a NSR License resource on the NetWorker server. In enabled mode, you can use the enabled feature for 45 days from the date the code is entered. After you enter the code, you must authorize the product to continue using the feature after the 45 days expire.

Important: If you do not purchase the product and obtain and enter the authorization code during the 45-day enabled period, the NetWorker software will not allow further backups to take place. However, you can still recover all data that has been backed up.

Update Enabler

When updating from a NetWorker release earlier than 7.3, an update enabler is required.

Authorized Mode

Whereas an enabler code is generic to a product, an authorization code is specific to a NetWorker server. To obtain an authorization code you must provide EMC with the host ID of the NetWorker server, which EMC incorporates into a unique **authorization code** binding the license to a specific NetWorker server.

After entering the authorization code in the NSR License resource, the product is permanently licensed to the NetWorker server.

Note: Refer to the *EMC NetWorker Licensing Guide* and the latest product release notes for current information about software licensing.

NetWorker Software Editions

Support by NetWorker Edition	Power	Network	Workgroup	Business
Number of included client connections	12	10	8	8
Parallel data streams per NetWorker server	64	32	32	32
Parallel data streams per storage node	64	32	N/A	N/A
Physical devices included with base enabler	32	16	4	4
Increase in datazone's devices, per storage node license	32	16	N/A	N/A
Maximum number of devices	512	512	4	4
Additional client connections & storage nodes available	Yes	Yes	No	No
Autochanger software modules available	All	All	1-9, 1-16, 1-20, 1-32	One 1-26 included
Disk/Cloud Backup Option	Yes	Yes	Yes	Yes
Dynamic Drive Sharing	Yes	Yes	N/A	N/A

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In the traditional NetWorker licensing model, the NetWorker server software is licensed per edition type and operating system platform. The editions are: Business, Workgroup, Network and Power editions. As backup requirements grow and change, additional NetWorker options may be purchased to tailor the backup environment to meet the changing demands.

The slide shows the features provided with the base enablers and some of the additional features that are available.

Workgroup edition allows you to purchase an autochanger license up to 32 slots. Power edition and Network edition support NDMP and cluster client connections, and the SnapImage module while Workgroup edition does not. Support for a clustered NetWorker server requires Power edition.

Note: For Network and Power editions, the maximum parallelism and the maximum number of device resources allowed are increased with each storage node license purchased.

Important: For the latest information on NetWorker licensing, please see the release notes for the specific NetWorker release and other NetWorker documentation available on EMC Powerlink.

NetWorker Add-on Modules and Options (1 of 2)

NetWorker add-on modules:
- Required for enabling or extending some NetWorker features
- Requires additional license (enabler) for each add-on module
- May require additional software to be installed
- All licenses are managed on the NetWorker server
- Examples:
  - Client Connections
  - Storage Node (Normal and Dedicated)
  - NetWorker Module for Databases and Applications
  - NetWorker Module for Microsoft Applications
  - NetWorker Disk Backup Option

EMC²

EMC offers numerous add-on modules that provide additional features and benefits. Add-on modules work in conjunction with the base edition of NetWorker.

Each EMC NetWorker add-on module requires a separate license and some add-on modules require that additional software be installed.

All enabler and authorization codes are entered in a NSR License resource on the NetWorker server. This is true even if software supporting an add-on module is installed on a client or storage node.

The slide lists a few of the more common add-on modules.

Refer to the *EMC Information Protection Software Compatibility Guide* for a complete list of all available EMC NetWorker add-on modules.

If a NetWorker License Manager (NLM) server is being used to manage NetWorker licenses from one or more data zones, all licenses are installed and managed on the NLM server instead of the NetWorker server. See the *Implementing EMC License Manager* web-based course for more details on NLM.

Two types of licenses must be enabled for the NetWorker deduplication node to interact with the Avamar server: a deduplication option enabler for each Avamar server and DBO (disk-based backup) for an AFTD device (supplied free for the first 1 TB of backup data).

For Data Domain devices configured as a Data Domain media type (in contrast to legacy modes such as AFTD or VTL), the NetWorker software requires a Data Domain Storage System Enabler for each Data Domain host it uses. The amount of Data Domain raw storage available in a NetWorker datazone is provided by a Data Domain 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. However, there must be sufficient Data Domain storage capacity entitlement licenses for the amount of Data Domain storage used in the datazone.

NetWorker client licensing differentiates between stand-alone computers and computers that participate in a cluster. A client connection license is required for each physical node in the cluster on which you intend to run the highly available NetWorker server. The licenses are bound to physical nodes. Therefore, once a client connection license is allocated, any virtual clients that are running on that physical node can be backed up. In addition, a storage node that is configured locally, that is, a storage node that uses a hostname that matches the physical hostname of the node that is running the NetWorker virtual server, does not require a separate storage node enabler.

Autochanger and VTL Licenses

- Autochangers licensed by number of slots:
  - Licenses available for a variety of slot ranges to unlimited
  - Autochanger license also used for silos
- VTL is licensed by capacity of the hardware (frame) containing the VTL:
  - Base VTL license supports up to 10 TB of storage
  - Additional capacity supported with add-on licenses
  - Autochanger resource includes new **Virtual jukebox frameid** attribute for user to specify frame ID:
    - For each unique frame ID, one VTL license is required per data zone

Autochangers are licensed according to the number of (media) slots supported by the robotic device. One autochanger license is required for each autochanger. Since there is a large variation in the number of slots contained in various autochangers, licenses are available for different slot ranges and unlimited.

Additionally, a standard autochanger license is used for silos in place of the previously used silo license. Customers already using silo licenses will not see an impact and functionality. Beginning with release 7.4, a Virtual Tape Library (VTL) is now licensed by capacity of the hardware (frame) containing the VTL. Formerly, each VTL required its own autochanger license based on the number of media slots assigned to the VTL.

NetWorker uses the **Virtual jukebox frameid** attribute in each autochanger resource to determine the number of frames to license. This attribute must be assigned a string value by the NetWorker administrator. Each VTL in the same frame would have the same value, for example, "vtl-1", in the attribute. If a VTL frame provides a VTL to multiple data zones, a separate VTL license is required for each data zone.

Source Capacity Licensing Model (1 of 2)

- License based on source capacity metric.
- Source capacity is measured as the aggregate of full backups (measured in terabytes) from all data sources.
- Quantity of pre-deduplicated data is included in the source capacity calculation.
- Allows unlimited access and deployment of all the NetWorker features and modules.
- Simplifies license management and maintenance renewals.
- The EMC AMP utility is used to determine and track the source capacity usage.

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NetWorker Release 7.6 Service Pack 1 introduced a capacity licensing model whereby the NetWorker software is licensed based on a source capacity metric. Source capacity is measured as the aggregate of full backups (measured in terabytes) from all data-sources that are protected by the NetWorker software , irrespective of where the data is moved (for example, from tape, disk, VTL, Avamar Data Store, or Data Domain).

The quantity of pre-deduplicated data is included in the calculation. The source capacity licensing model allows for unlimited access and deployment of all NetWorker features, modules, and options, and simplifies license management and maintenance renewals, since only the source capacity of the datazone is tracked.

The EMC AMP Utility, a virtual appliance, is used to determine and track the backup environment's source capacity usage. The utility is available as a free download from EMC Powerlink.

Source Capacity Licensing Model (2 of 2)

There are two types of license enablers associated with capacity licensing:

- NetWorker Source Capacity Datazone enabler:
    - This enabler turns on the software for capacity licensing and includes the right to deploy unlimited quantities of the NetWorker product .
    - It only protects the amount of purchased licensed source terabytes.
- Tiered Capacity Entitlement License enabler:
    - The appropriate number of Capacity Entitlement License enablers must be applied per NetWorker server or datazone to protect up to the amount of purchased license source terabytes.

Each installation of NetWorker server software must be licensed with a NetWorker Source Capacity Datazone enabler. This enabler turns on the software for capacity licensing and includes the right to deploy unlimited quantities of the NetWorker product, but only to protect up to the amount of purchased licensed source terabytes. One NetWorker Source Capacity Datazone license is required for each NetWorker server or datazone.

The appropriate number of Capacity Entitlement License enablers must be applied per NetWorker server or datazone to protect up to the amount of purchased license source terabytes.

NetWorker Fast Start

- NetWorker Fast Start is a NetWorker solution for simplifying installation, configuration, and licensing processes.
- Fast Start pre-packages the NetWorker components required to back up Windows and Linux-based systems into a single license enabler.
- NetWorker Fast Start is licensed in 2 models: 10 Clients, 20 Clients:

Models	# Applications	TB of Disk, Disk Library, Data Domain	# Slot Autochanger	TB Data Domain Device Type
10 Clients	1	5 TB	20	1 TB
20 Clients	5	10 TB	40	3 TB

- Add-on components can be purchased to scale systems.

EMC NetWorker Fast Start is a NetWorker solution designed to get a backup and recovery environment up and running in a minimal amount of time by simplifying the installation, configuration and licensing processes.

NetWorker Fast Start pre-packages the NetWorker components required to back up Windows and Linux-based systems, including one backup server (Linux or Windows); up to 20 clients; up to 5 application modules, including a combination of NetWorker Module for Microsoft SQL (NMSQL), NetWorker Module for Oracle (NMO), NetWorker Module for Microsoft Exchange Server (NME), and NetWorker Module for Microsoft Applications (NMM); one 20 or 40-slot autochanger; up to 10 TB in backup to disk or disk library; and up to 3 TB of Data Domain device type. As backup requirements grow and change, add-on NetWorker components can be purchased.

Installing NetWorker Enablers & Authorization Codes

- Administrative-side of licensing is handled through EMC Powerlink.
- Download NetWorker enablers and authorization codes from the License Management portal of EMC Powerlink:

EMC² Powerlink Licensing

⊕ Search for Download Enabler Codes

Search for Enabler Codes to list and download.
Enter a full Host ID to list its Enabler Codes.
Or enter a partial Host ID - with % wildcard - to list Host IDs.

% HostID: [   ] [Search]

Download CSV
Download nsradmin
Download ReadMe

- Run nsradmin –i command to install the NetWorker licenses on the NetWorker server.
- Refer to the *EMC NetWorker Licensing Guide* for detailed instructions.

To permanently use the NetWorker software, a license enabler code must be purchased, entered and authorized. This process is the same for all NetWorker software editions, individual modules, and features.

The administrative side of licensing is handled through EMC Powerlink Licensing. A License Authorization Code (LAC), along with instructions for activating the software license certificate, is sent as part of the software purchasing process. LACs are used in Powerlink Licensing to obtain and activate the license keys that contain both enabler and authorization codes. The NetWorker server's host ID is required for the authorization.

With NetWorker 7.5 and above, after the LAC has been entered, activated and associated with the host ID, access Powerlink Licensing to download the three files containing the enablers and instructions for loading the enablers into NetWorker. These are a text ReadMe file describing the process and instructions on loading the enablers, a CSV file containing the codes and related information, and the nsradmin input file. Note that the NetWorker server's host ID is required for this step.

The enabler codes are installed by using the nsradmin –i command.

Important: Refer to the *EMC NetWorker Licensing Guide* for a detailed description of the licensing process and steps for downloading and applying the NetWorker license enabler codes.

Manually Entering & Authorizing Enablers (1 of 2)

If you cannot automatically import and install the NetWorker license enablers and authorization codes from Powerlink, you can manually enter them into NetWorker using NetWorker Administration.

First, after obtaining an enabler code, enter the code into NetWorker by creating a new NetWorker License resource. This is done by selecting **Registrations** from the *Configuration* window.

When creating a new license resource, fill in only the **Enabler code** field. Since an enabler code is generic, NetWorker automatically determines the name of the license from the enabler code.

Once enabled, the product/feature can be used for an additional 45 days. However, the authorization phase of licensing is commonly performed immediately upon enabling the product.

Notes:

Enter the base enabler last. Otherwise, once a base enabler is entered, devices that do not yet have licenses entered my be disabled. Those devices would then have to be re-enabled manually after their licenses are installed.

It is a best practice to not use a NetWorker system as a production system until/unless the auth codes have been applied.

Manually Entering & Authorizing Enablers (2 of 2)

After the new license resource is created, its ***Properties*** window can be opened. The **Name** and **Enabler code** attributes are populated and are now read-only. To complete the licensing process, a unique authorization code specific to the host ID must be entered in the **Auth code** field. If the authorization is successful, the expiration date for the license displays as *Authorized - No expiration date*. The product/feature is now permanently licensed.

Important: The host ID of the NetWorker server is displayed in the **Host id** field in the license resource of any NetWorker license. The **Host id** value on a UNIX NetWorker server is the same as the output of the `hostid` command. The **Host id** for a Windows NetWorker server is derived from the SID (security identifier). Hence, the **Host id** value is derived from the host's primary IP address.

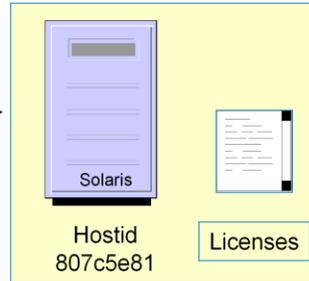## Transferring Licenses to Another NetWorker Server

Original NetWorker Server

Solaris

Hostid
80b0c328

Powerlink Licensing
original host ID and
new host ID

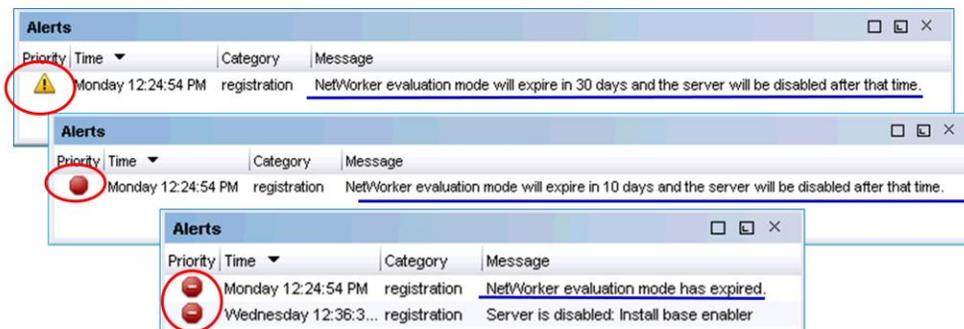New NetWorker Server

Solaris

Hostid
807c5e81

Licenses

If the NetWorker server's host ID changes, all auth codes become invalid. To avoid an interruption in scheduled backups, obtain and install new authorization codes. There is a 15-day period during which a host transfer (re-host) can be done. Obtain the new codes through the License Management portal of EMC Powerlink and install them on the NetWorker server within that period. The host IDs of both the original server and the new server are required.

Actions that might cause the NetWorker server's host ID to change include:

- Changing the Security ID of a Windows NetWorker server.
- Replacing the hardware of a UNIX NetWorker server.
- Transferring NetWorker server functionality to another host.

License Expiration Alerts

- Color-coded alerts are generated daily starting at 30 days before license expiration:
  - 30 to 11 days: Warning (yellow)
  - 10 to 1 days: Critical (red)
  - License has expired: Alert (red)

Alerts

Priority	Time ▼	Category	Message
⚠	Monday 12:24:54 PM	registration	NetWorker evaluation mode will expire in 30 days and the server will be disabled after that time.

Alerts

Priority	Time ▼	Category	Message
●	Monday 12:24:54 PM	registration	NetWorker evaluation mode will expire in 10 days and the server will be disabled after that time.

Alerts

Priority	Time ▼	Category	Message
⊖	Monday 12:24:54 PM	registration	NetWorker evaluation mode has expired.
⊖	Wednesday 12:36:3...	registration	Server is disabled: Install base enabler

Module 11: Administering NetWorker 53

Color-coded alerts are generated in the *Alerts* window of the Administration Console each day starting 30 days before a NetWorker license is due to expire. A warning alert (yellow) is generated from 30 to 10 days before license expiration. This alert continues to appear on a daily basis until 10 days prior to expiration of the license. And, a critical alert (red) is generated each day from 10 days prior to the license expiration date. This alert continues to appear until one day prior to license expiration. An alert (red) is generated starting from the day of license expiration.

The slide shows some examples of the alerts and corresponding messages.

Note: With NetWorker release 7.5, an informational alert (blue) was generated from 14 to 3 days before license expiration. A warning alert (yellow) is generated each day from 2 to 1 days before license expiration. And, a critical alert (red) is generated when the alert has expired. Before NetWorker release 7.5, a critical alert message was generated 14 days before a license was due to expire.

License Monitoring Tools

NetWorker provides tools to assist with administering the licenses on a NetWorker server. These tools include the **License Conformance Summary** report and the `nsrlic` command.

The License Conformance Summary report is available beginning with NetWorker release 7.5. The report provides information about the state of licenses currently on the NetWorker server. With this report, the administrator can quickly determine the type of base license, the products and features that have been enabled, the number of licenses that have been used and how many are remaining, the licenses that are in conformance and any additional licenses that may be needed. The report is run by clicking **License Conformance Summary** from the NetWorker Administration **Configuration** menu. The slide shows the output of the report run on a Windows server.

Administrators can use the `nsrlic` command to generate reports displaying the client licenses currently active on a NetWorker server. `nsrlic` shows a breakdown of the types of workstations and servers that are in use. `nsrlic` is run from the command line on a NetWorker server. The slide shows an excerpt of the output from running `nsrlic` on the same Windows server. For more information, see the *NetWorker Administration Guide.*

Module 11 : Administering NetWorker

Lesson 5 : Summary

During this lesson the following topics were covered:
- NetWorker licensing
- Server versions
- Add-on modules
- NetWorker server components
- Enabler codes

EMC²

This lesson covered NetWorker licensing including server versions and add-on modules, licensable NetWorker server components, and registrations and enabler codes.

This lesson covers the NetWorker software distribution facility, including configuring the software repository and inventorying and updating client software packages.

Software Distribution Feature

- Remotely distribute and update NetWorker software from a centralized NetWorker server.
- NetWorker release 7.4 or later client software must already be installed.

Welcome to the Software Administration Wizard
Introduction to Software Administration

This wizard supports the following operations:

1. Manage your software repository. Add or remove packages from your software repository.

2. Inventory your NetWorker clients. Discover the currently installed software on your client machines.

3. Update your NetWorker clients. Distribute the latest software to your clients.

4. Monitor inventory and update activity.

< Back   Next >   Cancel

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NetWorker provides a software distribution feature to remotely distribute and update the NetWorker software from a centralized NetWorker server to one or more NetWorker clients. In addition to distributing and updating NetWorker software, the software distribution feature can be used to:

- Create and manage the software repository.
- Inventory NetWorker software installed on NetWorker clients.
- Monitor software distribution inventory and upgrade operations (with wizard only).

To update NetWorker software packages, NetWorker release 7.4 or later client software must be already installed. The following software packages can be updated:

- Client
- Storage node
- Man pages

Note: Review the NetWorker Administration guide for other restrictions on the software distribution feature in NetWorker.

Software Distribution Interfaces

- Software Administration Wizard
- `nsrpush` command
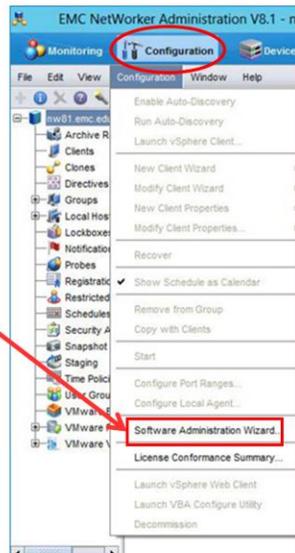
Software distribution can be performed using either the ***Software Administration Wizard*** or the **nsrpush** command.

To perform repository operations using the wizard, select ***Software Administration Wizard*** from the **Configuration** menu in NetWorker Administration ***Configuration*** window.

Repository operations can also be performed by using nsrpush from the command line in both Windows and UNIX environments.

Software Repository
- Contains the packages that can be pushed to NetWorker clients from the NetWorker server
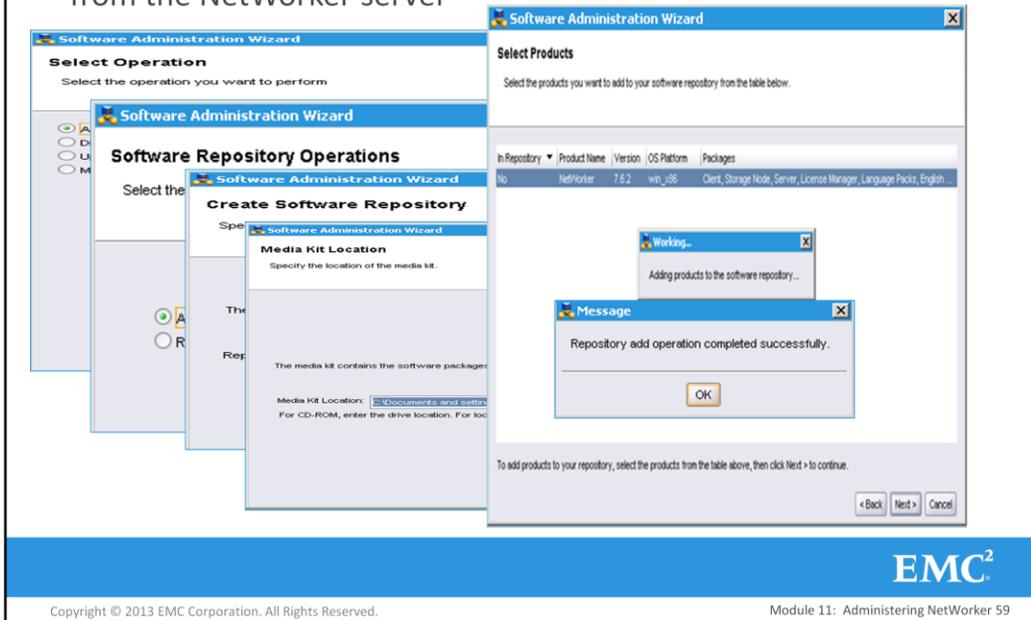
The first step in using the software distribution feature is to set up the software repository database and add the software packages that you want to push to NetWorker clients. The slide shows these steps using the *Software Administration Wizard*. On an on-going basis, manage the repository by adding and deleting software, as needed.

Inventory Currently Installed Products

- Discover the products installed on NetWorker Clients

Next, inventory the clients to determine their currently installed NetWorker software version.

You can choose to update the NetWorker software packages by client, or by product and version for many clients at a time. The slide shows an example of using the **Software Administration Wizard** to upgrade the Client package on client, leg1-win7, from NetWorker version 7.6.2 to version 8.1

Note: Before upgrading, ensure that all NetWorker scheduled backups have been stopped.

Using nsrpush

The **nsrpush** command can also be used for software distribution operations. The slide shows an example of using nsrpush to inventory a client and then, to update the client software on the client. More information on the nsrpush command can be found on the nsrpush man page, nsrpush usage (running the command with no options), and the *EMC NetWorker Installation Guide*.

Upgrade and inventory activities in progress can be monitored using the **Software Administration Wizard**. The slide shows an example of monitoring an inventory operation on two clients: leg1-win4 and leg1-win7.

Module 11: Administering NetWorker

Lesson 6: Summary

During this lesson the following topics were covered:
- Software distribution facility
- Configuring the software repository
- Inventorying installed software
- Updating software packages

This lesson covered the NetWorker software distribution facility, including configuring the software repository and inventorying and updating client software packages.

Module 11: Administering NetWorker

Lesson 7: Configuring NetWorker in a Firewall Environment

During this lesson the following topics are covered:
- Service and connection ports
- Port requirements
- Configuring NetWorker port ranges

This lesson covers configuring NetWorker in a firewall environment, including the differences between service and connection ports, port requirements, and procedures for configuring port ranges.

Configuring NetWorker with Firewalls

Firewall support enables you to back up NetWorker clients that are separated from the NetWorker server by a packet filtering firewall.

Intranet | DMZ | Internet

NetWorker Server
Firewall
Client
Storage Node
Firewall
Internet

Legend:
- Communication (red)
- Tracking data (blue)
- Backup data (green)

EMC²
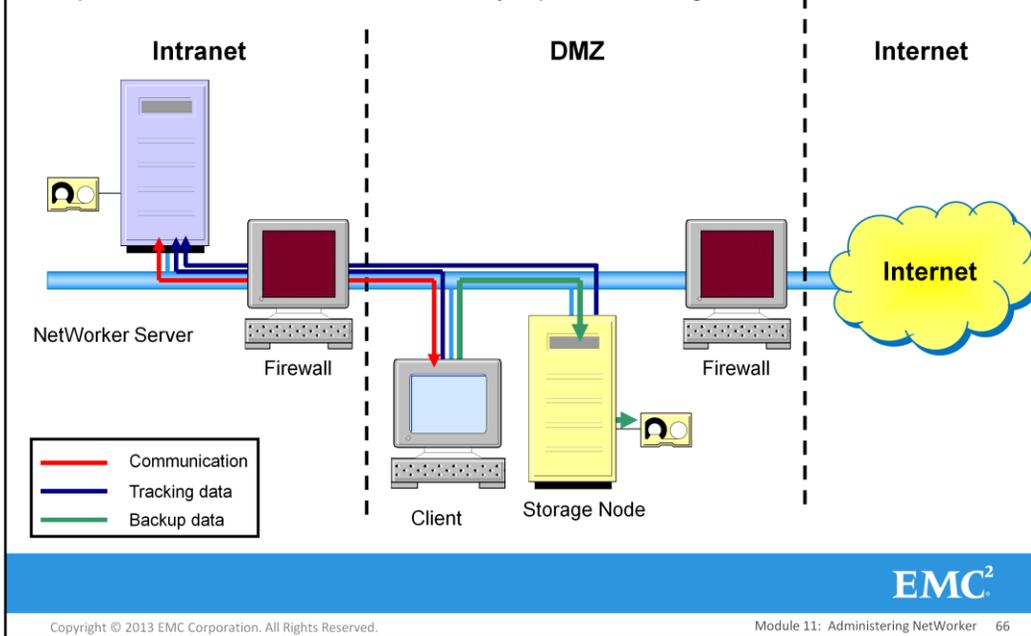
Firewalls monitor all traffic flowing between two or more networks and allow only authorized traffic, as defined by administrative policies.

Firewall support enables you to back up NetWorker clients that are separated from the NetWorker server by a packet filtering firewall. It is first necessary to determine which TCP/IP ports will be utilized by the NetWorker server and which ports will be used by the NetWorker client. The firewall must then be configured to allow packets to be sent to the appropriate range of ports on the destination hosts.

If a storage node must communicate through the firewall with either the NetWorker server or a NetWorker client, it is also necessary to calculate the range of ports that the storage node will use. Then, configure the firewall appropriately to allow communication between the storage node and the other NetWorker hosts.

Service Ports and Connection Ports
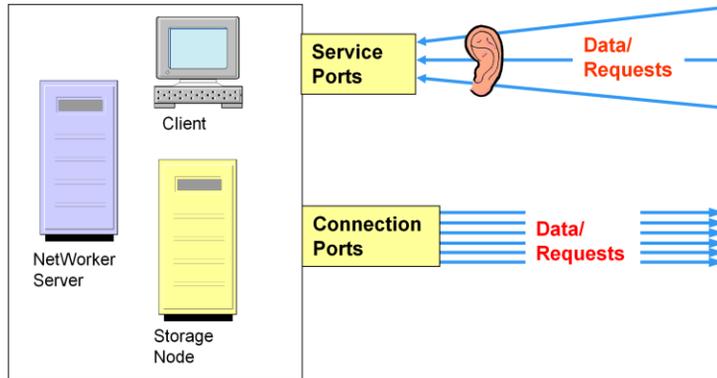
Service Ports
- Default port range of 7937-9936
- Listens for and services backup and recovery requests
- Randomly chosen from configured range by EMC portmapper
- TCP listener ports

Connection Ports
- Default port range of 0-0
- Randomly chosen from configured range by EMC portmapper
- TCP client-side ports

NetWorker uses two types of TCP/IP ports for interprocess communication: **connection ports** and **service ports**.

Communication between NetWorker processes is initiated from a **connection port** on the source host. The communication request is sent to a **service port** on the destination host where a NetWorker process is listening.

Examples of NetWorker interprocess communication include:

- `nsrjobd` on the NetWorker server asking `nsrexecd` on the client to spawn a `save` process.
- `savefs` on a NetWorker client sending file index information to `nsrindexd` on the server.

TCP/IP fallback ports include Ports 111 and 514.

NSR Port Range Resource

Default port ranges:
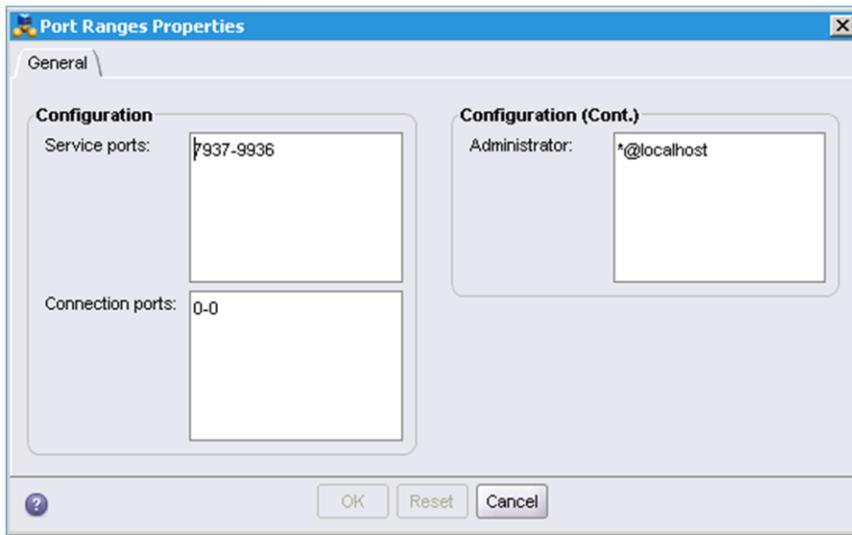
Port Ranges Properties

General

Configuration
Service ports: 7937-9936

Connection ports: 0-0

Configuration (Cont.)
Administrator: *@localhost

OK   Reset   Cancel

EMC²

When a NetWorker daemon/service is started, it begins listening on a service port assigned to it by the EMC portmapper. NetWorker processes initiate communication using client-side ports within the host's connection port range. If the configured service port range is not large enough, the associated services and processes cannot communicate through the firewall.

The port numbers used by the NetWorker processes or services, except for `nsrexecd`, are assigned from the service port range that is set in the NetWorker software.

Note that `nsrexecd` on every type of NetWorker host will always try to listen on ports 7937 and 7938. The ports will be used no matter what the value of the range in the NetWorker software, unless another process is already listening on those ports when NetWorker is started. NetWorker requires the port 7938 or for rpcbind (portmapper) to be running and available through the firewall, or NetWorker will cease to function correctly.

Permitted port ranges are stored in the **NSR system port ranges** resource in the resource database, `/nsr/res/nsrladb` on each NetWorker host. The resource is used and managed by `nsrexecd`. Whenever NetWorker daemons/services are started, `nsrexecd` is always the first process to start. It is important that whenever NetWorker server processes are started manually, `nsrexecd` is started first. Failure to do so might cause the ports to be assigned randomly or outside the desired range.

Port Requirements NetWorker 8.0 and Later

Port requirements for NetWorker services:

Daemon / Process	Ports Required	Function
nsrd	1	Server
nsrexecd	4	Server/SN/Client
nsrindexd	1	Server
nsrjobd	1	Server
nsrlogd	1	Audit log server only
nsrmmgd	1	Server
nsrmmdbd	1	Server
nsrpush	1	Server
nsrsnmd	1	Server/SN

EMC²

Port requirements vary based on the components that you are installing, the environment you are installing in, and the version of NetWorker you are using. Because of this, it is important to understand the processes and subsequently, the ports used by each of the NetWorker components.

The table displayed here lists the standard NetWorker services, the ports required for each and the function(s) for which the process is used: either server, storage node, client, or the audit log server. Library and device related processes are discussed on the next slide. Additional applications and features may use additional ports, therefore it is important to identify the features and components that will be used in your environment and determine the port requirements specific to that unique environment.

For the most detailed information regarding NetWorker services and port requirements refer to Appendix B of the *NetWorker Administration Guide*.

Device Related Port Requirements

Device related ports used by storage nodes and the NetWorker server:

Daemon or Process	Ports Required
nsrlcpd	1 for each jukebox managed by the Storage Node it's on
nsrmmd (AFTD or Boost)	Sum of the Max nsrmmd Count settings of all these devices managed by the storage node
nsrmmd (non AFTD or Boost)	2 for each device managed by the remote storage node

- With NetWorker 8.0 and higher, devices are no longer directly polled by the NetWorker server.
- Ports required between NetWorker server and storage node are greatly reduced.
- Storage node settings can further reduce the port requirements.

EMC²

The ports listed on the slide are for device related ports used by the storage nodes and NetWorker server when devices are attached. It is important to note that one port is required for each jukebox managed by the storage node, as well as ports for the `nsrmmd` processes.

The number of ports required by the `nsrmmd` processes is determined by the type of devices you're using and how you have them configured. With AFTD or Boost devices, the number of ports required is determined by the sum of the **Max nsrmmd Count** settings of all devices managed by the storage node. For non-AFTD or Boost devices, two ports are required per device managed by the storage node.

In enterprise environments where unattended firewall ports need to be restricted for security reasons, the storage node settings for **MMD's for disabled devices** and **dynamic nsrmmd's** offer more control because they cause all available `nsrmmd` firewall ports to be attended by running `nsrmmd` services. This is particularly useful in cases where security will not allow ports to be open and unused. When these options are configured correctly it can keep an active process running for all devices even when they are not in use or disabled.

For more information on both of these settings refer to the *NetWorker Administration Guide.*

Determining Service Port Ranges – Example
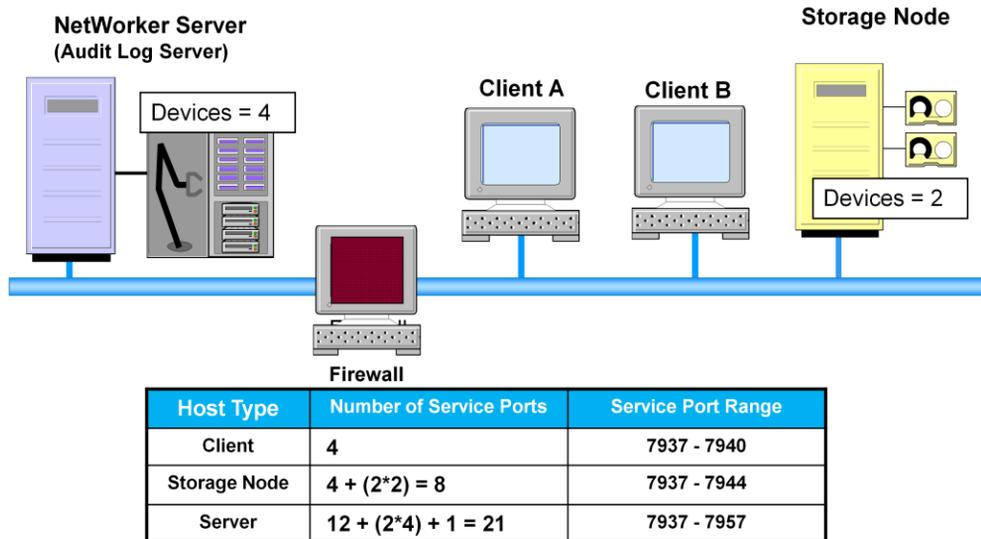
NetWorker Server
(Audit Log Server)

Devices = 4

Client A   **Client B**

Storage Node

Devices = 2

Firewall

Host Type	Number of Service Ports	Service Port Range
Client	4	7937 - 7940
Storage Node	4 + (2*2) = 8	7937 - 7944
Server	12 + (2*4) + 1 = 21	7937 - 7957

After calculating the number of service ports required by each NetWorker host, determine the service port range or ranges that will include the calculated number of ports. When specifying a range, begin at port 7937. 7937 is always the first port in the range because `nsrexecd` is always started on that port. Alternatively, you can specify one range of 7937-7938 and then one or more additional ranges for the remainder of the ports.

The actual configuration of the firewall is done by the firewall administrator, based on the port information you provide. The number of ports that need to be opened in the firewall depend on those NetWorker hosts that are separated by the firewall. In the example shown here, the firewall should be configured to allow transmission of TCP/IP packets destined for the following hosts/ports:

- NetWorker Server   7937-7957
- Storage Node   7937-7944
- Client A   7937-7940
- Client B   7937-7940

Note: Additional service ports are required for software distribution; specific applications and modules may require additional ports as well. In this example, the NetWorker server is configured as the audit log server and that required port is factored into the base number of 12. This example does not take into account any `nsrmmd` related storage node or device configurations such as `nsrmmd`'s for disabled devices or dynamic `nsrmmd`'s, as these settings may impact the ports required.

Configuring NetWorker Port Ranges

To configure service port ranges:
- Determine and configure the port settings on each host.
- In order to change the port ranges on a system, the user must have update access to the **NSR system port ranges** resource in nsrexecd on the host.
  - User must be in the administrator list for that resource on that host
  - Run nsradmin -p nsrexec to update the resource.
- Use one of the NetWorker interfaces below to configure service port ranges:
  - nsrports
  - NetWorker Administration Console
  - nsradmin
- Restart NetWorker on each modified host.

The slide lists the steps to be performed to restrict the NetWorker service port range. Note that this must be performed for each host where it is desired to change the service port range.

The following administrative interfaces are available for configuring NetWorker port ranges:

- nsrports
- NetWorker Administration window
- nsradmin

In order to change the port ranges on a host, the user must have update access to the **NSR system port ranges** resource for that host. Unlike NetWorker resources that reside on the NetWorker server and are managed by users belonging to the server's Administrator list, the **NSR system port ranges** resource has its own administrator list on each NetWorker host. To give the user update privileges, add it to the administrator list for the resource on the host.

1. On the host, type: **nsradmin –s *server* –p nsrexec** where *server* is the host for which ports are to be modified.
2. Use the print sub-command to list the **NSR system port ranges** resource.
3. Use the update sub-command to modify the **administrator** attribute.
4. Save the update and quit nsradmin.

Configuring the Service Port Range: nsrports

```
nsrports [ -s host ] [ -S starting_port#-ending_port# ]
```

Option	Description
-s *host*	Specifies the host to contact.
-S	Sets the host's service port range to the specified range.
-C	Sets the host's connection port range to the specified range. By default, NetWorker defines range of 0-0.
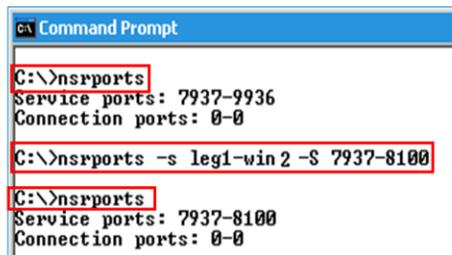
```
C:\>nsrports
Service ports: 7937-9936
Connection ports: 0-0

C:\>nsrports -s leg1-win 2 -S 7937-8100

C:\>nsrports
Service ports: 7937-8100
Connection ports: 0-0
```

The **nsrports** program can be used to view or update the port ranges from the command line.

The syntax of **nsrports** is:

nsrports −s *networker_host* [**-S** | **-C**] *port_range*

nsrports can be run from any host. The −s option is used to specify a remote host whose service port range will be modified.

If the −s option is not used, the port ranges on the local host will be modified.

The −S option is used to specify a new service port range for the host.

The −C option is used to specify a new connection port range for the host. By default, NetWorker defines a range of 0-0 for connection ports.

If neither option is used, the current port ranges are displayed. Non-contiguous ranges may be specified by including more than one range.

Configuring the Service Port Range: NetWorker Administration Window
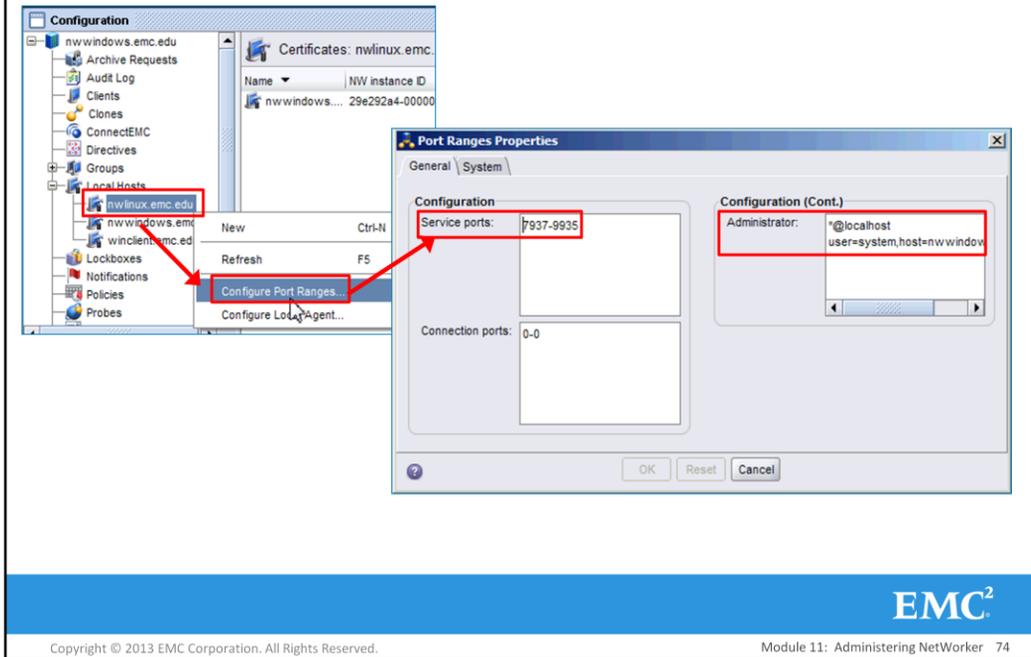
The slide illustrates the steps required to configure a port range using the NetWorker Administration window.

1. Click *Configuration* from the NetWorker Administration tool bar.

2. Right-click a host from the list of Local Hosts and select **Configure Port Ranges**.

3. In the *General* tab, modify the **Service Ports** attribute and, if desired, the **Administrator** attribute. Non-contiguous service port ranges may be specified by including more than one range in the **Service Ports** attribute.

4. Click **OK**.

Configuring the Service Port Range: nsradmin

The slide illustrates the steps required to configure a port range using nsradmin.

1. Type: **nsradmin –s server –p nsrexec** where server is the host for which ports are to be modified.

2. Use the print sub-command to list the NSR system port ranges resource.

3. Use the update sub-command to modify the service ports attribute.

4. Save the update and quit nsradmin.

<u>Note</u>: This command is run for each host for which port changes are to be made.

Service Port Ranges for NMC Server

NetWorker Host Type	Formula
NetWorker Management Console Server	# of Ports = 3 (web server, RPC calls, database queries) +2 for SNMP if using Data Domain
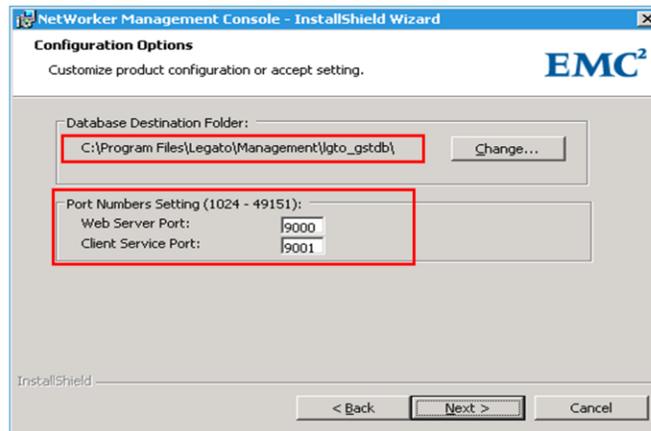
NetWorker Management Console - InstallShield Wizard

Configuration Options
Customize product configuration or accept setting.

EMC²

Database Destination Folder:
C:\Program Files\Legato\Management\lgto_gstdb\   [Change...]

Port Numbers Setting (1024 - 49151):
Web Server Port: 9000
Client Service Port: 9001

InstallShield

[< Back] [Next >] [Cancel]

Three ports are required for connections between the Console server (`gstd`) and Console clients.

One port, default 9000, is used for the web server. The second port, default 9001, is used for RPC calls from the NMC Java client to the Console server. These ports are not taken from the range configured using `nsrports`. Instead, they can be changed during the installation of NMC server.

The third port is used for database queries and is always 2638. This port cannot be changed.

The firewalls protecting the Console server and the client must be configured to allow communication over these three ports. It is important that the range of ports used by NetWorker on the host where the NMC server is installed do not overlap with these ports.

In addition to these ports, two more ports are required if using Data Domain within the environment. SNMP requires the use of port 161 as well as 162 for capturing SNMP traps from the Data Domain device.

Configuring the Firewall

Client

Client IP address
Ports 7937-7940

Firewall

Allow communication
to NW client's service
port range

NetWorker Server

Allow communication
to NW server's
service port range

Server IP address
Ports 7937-7957

Storage Node

Storage Node IP address
Ports 7937-7944

Allow communication
to NW storage node's
service port range
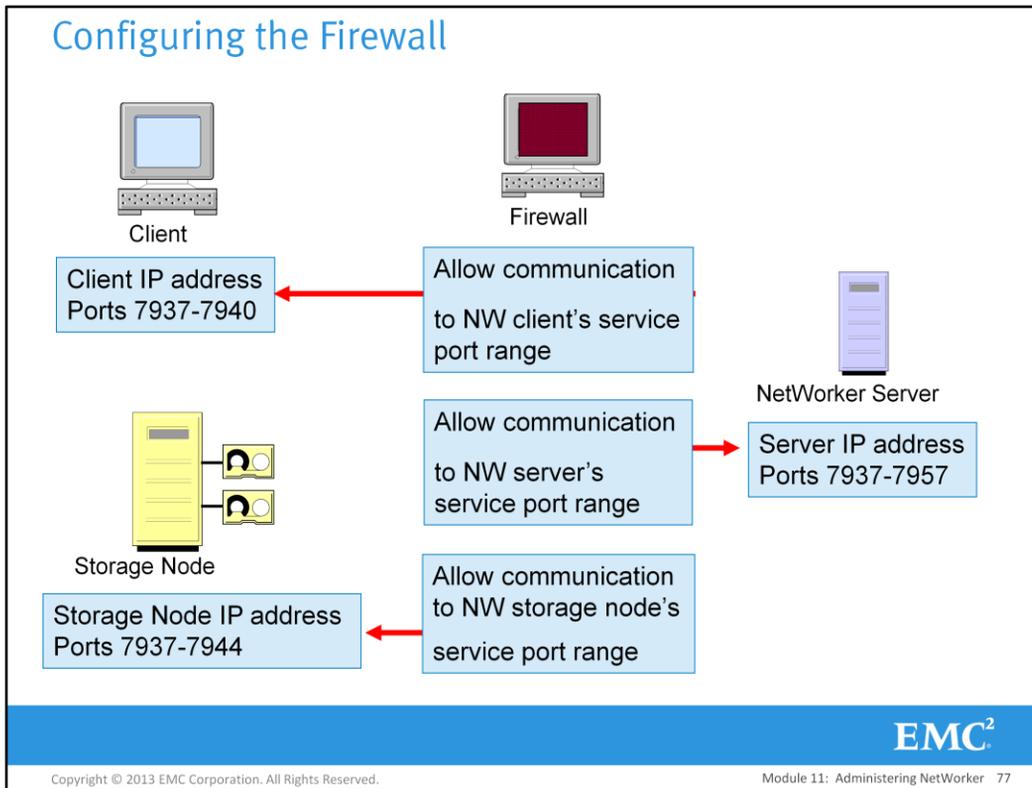
After determining the minimum service port ranges for the NetWorker server and clients, the firewall must be configured to allow transfer of the following types of packets. The port ranges used are from the example shown on the slide.

- Packets are destined for the NetWorker server's IP address, if they are going to a port in the range 7937-7957.

- Packets are destined for the NetWorker client's IP address, if they are going to a port in the range 7937-7940.

- Packets are destined for the NetWorker storage node's IP address, if they are going to a port in the range 7937-7944.

It is possible to fine-tune the firewall configuration. In this example, if the NetWorker storage node was on the same side of the firewall as the NetWorker server, the firewall would not necessarily need to allow packets to be sent to port 7937 of the storage node. This is because the client will normally communicate only with the portmapper and `nsrmmd` processes on the storage node and not with `nsrexecd`. However, by restricting packets going to port 7937, the client would not be able to perform tasks such as a directed recovery to the storage node.

It is important that the firewall rules be configured to accept packets with the SYN bit for ports in the service ports range.

The RPC protocol underlies all NetWorker services. RPC is a protocol which allows a program running on one host to cause code to be executed on another host.

The **rpcinfo** command is used to determine which ports are registered to NetWorker processes. rpcinfo might be helpful in fine-tuning the exact number of ports needed for a particular environment.

netstat is used to display a list of ports that are in use and, if appropriate, what destination port they are connected to.

Use the **netstat -a** command to determine port allocation.

iperf is used as network testing tool that can create TCP and UDP data streams and measure the throughput of the network. iperf allows the user to set various parameters that can be used for testing a network or alternately for optimizing or tuning a network. iperf works on various platforms.

Note: rpcinfo may not work successfully through a firewall.

Module 11: Administering NetWorker

Lesson 7: Summary

During this lesson the following topics were covered:
- Service and connection ports
- Port requirements
- Configuring NetWorker port ranges

This lesson covered configuring NetWorker in a firewall environment, including the differences between service and connection ports, port requirements, and procedures for configuring port ranges.

Module 11: Administering NetWorker

Lesson 8: Multi-Tenancy

During this lesson the following topics are covered:
- Restricted data zones

EMC²

This lesson covers the NetWorker multi-tenancy facility and the use of restricted data zones.

Multi-Tenancy Facility: Restricted Data Zones

- Restricted data zones (RDZ) are logical data zones within a single NetWorker server.
  - Multiple "tenants" sharing a backup environment.
  - NetWorker resources are allocated to a logical data zone.
    - Isolation of data, separation of users.
- Standard feature.
  - No additional licensing required.
- Provides capability for:
  - Autonomy for tenants in a hosted environment (service providers).
  - Simplified experience for NetWorker administrators.

EMC²

Restricted data zones allow multiple tenants to share a single NetWorker environment. This offers customers who need to provide backup services to various clients an ability to create logical data zones within a backup environment. This is particularly useful with service providers managing multiple tenants within a single infrastructure. However, this can also be used to provide a simplified experience for casual NetWorker administrators allowing for departmentalized administration of certain clients and resources.

Multiple resources, such as clients, devices, and storage nodes, etc., can be assigned with a restricted data zone for better utilization. Restricted data zones are a standard feature in NetWorker version 8.0 and higher, therefore no additional licenses are required for use.

The restricted data zone feature results in autonomy for tenants in a hosted or service provider environment, and a simplified experience for NetWorker administrators.

Multi-Tenancy Facility: Roles

- The goal of Restricted Data Zones is the isolation and separation of users and resources.
- Global Administrator:
  - Like a traditional administrator, oversees the whole NetWorker data zone.
  - Sets up and configures Restricted Data Zones.
- Tenant (Restricted) Administrator:
  - Can modify resources associated to them.
  - Can view restricted data zone resources but can only modify designated resources.
  - Can operate devices, run save groups, etc.… within the RDZ.
  - Can still use granular roles for users.
- Restricted Data Zones have strict rules:
  - Example – A device can be shared within a RDZ but not across RDZ's.
- Due to complexity, it is recommended to setup RDZ on an initial install.

EMC²

The restricted data zone is a feature introduced with NetWorker 8 that allows for resources from a single NetWorker environment to be segmented into individual restricted data zones. The overall goal of restricted data zones is to isolate and separate users and resources within a NetWorker environment.

The Global Administrator performs the role of an administrator over the entire data zone as well as setup and configuration of Restricted Data Zones.

The Tenant Administrator can view all resources in a restricted data zone but can only modify resources designated to them for modification.

Restricted data zones have numerous and strict rules that are applied to them. For example, a device can be shared within a RDZ but not across multiple RDZ's.

Additionally, restricted data zones are complex. When attempting to utilize the restricted data zone capabilities in an existing NetWorker environment, changes have to be made in order to fit restricted data zones. If an environment is considering using restricted data zones, it is best to start the process on the initial NetWorker install with a new environment rather than trying to modify an existing NetWorker environment to use restricted data zones.

For a complete list of rules and a more detailed discussion of restricted data zones, please refer to the *EMC NetWorker Administration Guide.*

Creating a Restricted Data Zone

- Create Restricted Data Zone:
  - Configure users
  - Select resources
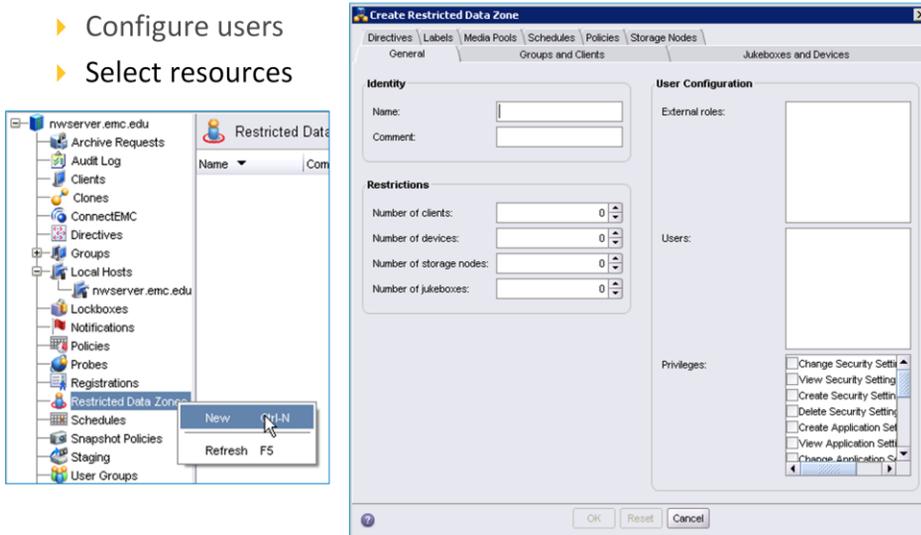
Module 11: Administering NetWorker 83

Configuring a restricted data zone is performed in the same manner as configuring any other resource within NetWorker. From the *Configuration* window, right-click **Restricted Data Zones** and select **New**. The *Create Restricted Data Zone* window will appear from which point you can configure the restricted data zone with the desired resources, users and roles.

Configuration is performed by adding users and roles along with their associated privileges to the user configuration. Next, select the resources available within the NetWorker data zone that you are granting the restricted data zone permission to use.

For more information about configuring restricted data zones, refer to the *EMC NetWorker Administration Guide*.

Module 11: Administering NetWorker

Lesson 8: Summary

During this lesson the following topics were covered:
- Restricted data zones

This lesson covered the NetWorker multi-tenancy facility and the use of restricted data zones.

Module 11: Summary

Key points covered in this module include:

- Server, Client and Savegroup parallelism
- EMC NetWorker licensing and several common licenses
- NetWorker software distribution
- Configuring NetWorker in a firewall environment
- Multi-tenancy
- Configuring Console to manage multiple NetWorker servers
- Viewing preconfigured reports
- Creating customized reports
- Backing up and recovering the Console database (lgto_gstdb)

EMC²

This module covered the log files used by NetWorker and NetWorker Management Console and the various aspects of configuring the NetWorker server. Also, we looked at NetWorker licensing, the software distribution process, configuring NetWorker in a firewall environment and multi-tenancy and security enhancements.

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EMC²