

Module 7: NetWorker Database Management

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

- Describe the:
 - Function and content of the media database and client file index (CFI)
 - Volume selection process when a backup is performed
- Query and manage CFI's and the media database using:
 - NetWorker Administration
 - NetWorker command-line utilities



This module focuses on the various management tasks related to the media database and client file indexes.

Module 7: NetWorker Database Management

Lesson 1: Querying a Client File Index and the Media Database

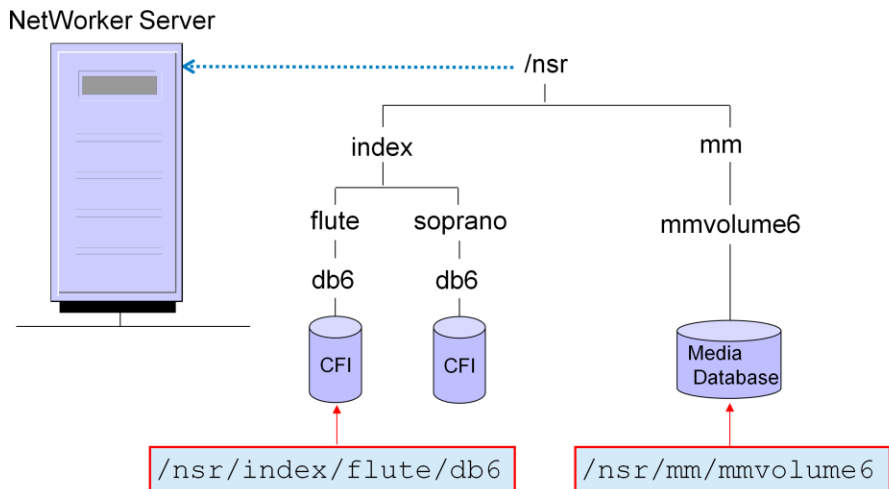
During this lesson the following topics are covered:

- Directory structure and content of the CFI , media database, and jobs database
- Viewing CFI and media database information using various NetWorker interfaces



This lesson covers the CFI, media database and jobs database content and how to view CFI and media database information using various NetWorker interfaces.

NetWorker Database Overview



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The NetWorker server maintains tracking information for save sets in both the client file indexes (CFIs) and in the media database. Volume information is maintained only in the media database.

Client File Index (CFI)

A CFI stores information about each file backed up by a NetWorker client. There is one CFI per physical NetWorker client. The stored information includes file characteristics such as owner, size, permissions, and modification and access times, as well as the timestamp of when the file was backed up. All files in a given save set have the exact same backup timestamp. This information is used to support browsable recoveries, which allow you to easily recover a client to a specific point in time.

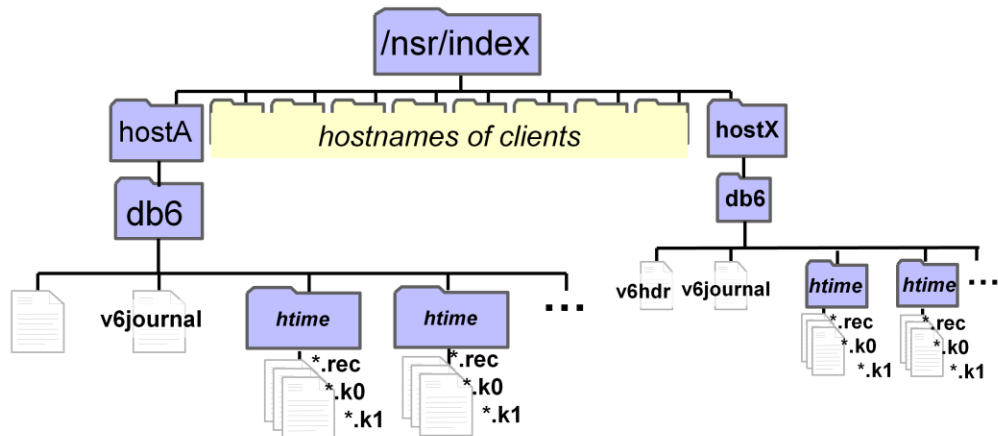
As a save set ages, its CFI records are automatically purged to save space. The length of time that the records are retained is determined by the **Browse policy** attribute in the client resource. CFIs may require large amounts of space on the NetWorker server. Each record in a CFI uses approximately 160 bytes. The default path of a CFI is `/nsr/index/hostname_of_client/db6`.

Media Database

The media database contains information about all NetWorker volumes and the save sets on those volumes. For each volume there is a volume record. For each save set on a volume, there is a save set record. This information is critical for supporting recoveries and is also used during level and incremental backups to determine the timestamp of a previous backup. The location of the media database is `/nsr/mm/mmvolume6`.

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Client File Index Directory Structure



- One set of record and key files per save set
- `*.rec`, `*.k0`, and `*.k1` filenames represent `nsavetime` value

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A CFI directory contains a header and journal file as well as a series of directories whose names are hexadecimal time stamps. Each save set tracked in a CFI has a record and a key file which are stored in a subdirectory determined by the time stamp of the save set (`nsavetime` value). The record and key files are named `nsavetime.rec`, `nsavetime.k0` and `nsavetime.k1`.

The data in the CFI files is XDR encoded for NetWorker use. Therefore, only NetWorker GUI/CLI interfaces should be used to view and manage the CFI data.

Client File Index Content

```
C:\Documents and Settings\Administrator>nsrinfo leg1-win2 inore
scanning client leg1-win2 for save sets from the backup namespace
C:\NTTemp\A1.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\A2.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\A3.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\A4.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\A5.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\A6.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins\Install\naitcpp.dll, date=1303971833 4/28/2011 2:
23:53 AM
C:\NTTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins\Install\naitcpp.inf, date=1303971833 4/28/2011 2:
23:53 AM
C:\NTTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins\Install\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Cisco Systems\CiscoTrustAgent\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\avscan.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\avclean.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\avnames.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\config.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\license.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\nc5300up.001, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\mccan32.dll, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\messages.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\avclean.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\avnames.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\avscan.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\config.dat, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\nc5300up.001, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\mccan32.dll, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\nc64, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\OldEngine\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\scan.exe, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\signlic.txt, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\Engine\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\McAfee\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DAO\dao360.dll, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DAO\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1025\DWINTL20.DLL, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1025\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1028\DWINTL20.DLL, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1028\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1031\DWINTL20.DLL, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1031\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1033\DWINTL20.DLL, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1033\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1036\DWINTL20.DLL, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1036\, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1040\DWINTL20.DLL, date=1303971833 4/28/2011 2:23:53 AM
C:\NTTemp\Common Files\Microsoft Shared\DW\1040\, date=1303971833 4/28/2011 2:23:53 AM
```

Pathname

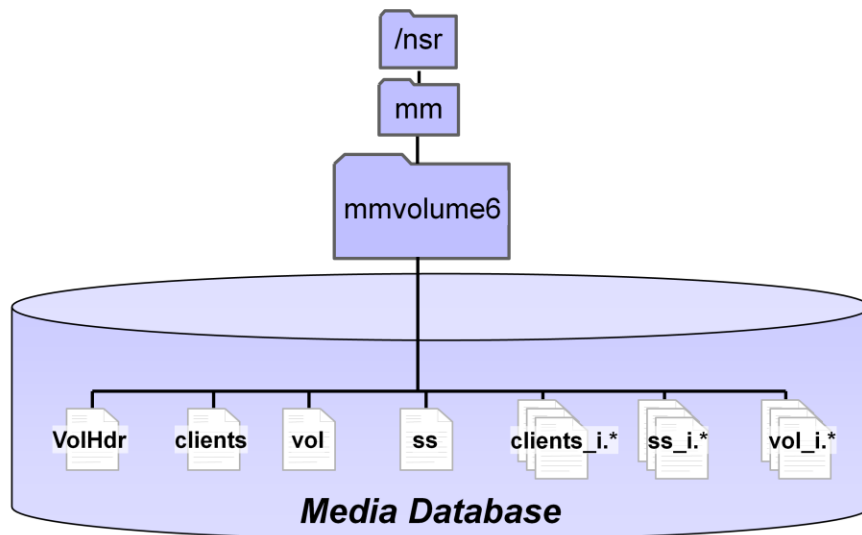
Backup Time
(save time)



Each record in a CFI contains the path name of a backed up file or directory, and the timestamp associated with the save set that it is part of. The timestamp matches the timestamp of a save set record in the media database, and is used in determining which save set and volume is needed when recovering the file. File attribute and backup information are also stored in the CFI.

`nsrinfo` displays the timestamp in two formats. The `nsavetime` format is the number of seconds since January 1, 1970. This is the time format used internally by NetWorker. The `savetime` format is a more human-readable form of the date and time.

Media Database Directory Structure



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The media database directory structure includes a header file and files to store client records, save set records, and volume records. Each client record, save set record, and volume record file has a set of supporting index files.

All the files under `/nsr/mm` make up a Legato WISS (*Wisconsin Storage System*) database.

To maintain its integrity only use NetWorker GUI or CLI interfaces to view and manage the data contained in the media database.

Media Database Content

Save Set Records

```
C:\Documents and Settings\Administrator>wminfo -a /more
volume      client      date        size  level  name
DFE00L00   leg1-win2  4/26/2011  5185 MB manual C:\
DFE00L00   leg1-win2  4/26/2011  2871 KB manual USS ASR DISK:\
DFE00L00   leg1-win2  4/26/2011  536 MB manual USS SYSTEM FILESET:\
DFE00L00   leg1-win2  4/26/2011  496 B manual USS USER DATA:\
DFE00L00   leg1-win2  4/26/2011  496 B manual USS OTHER:\
DFE00L00   leg1-win2  4/26/2011  28 MB manual USS SYSTEM SERVICES:\
DFE00L00   leg1-win2  4/26/2011  18 MB manual USS SYSTEM BOOT:\
DFE00L00   leg1-win2  4/28/2011  374 MB manual C:\MUTemp
DFE00L00   leg1-win2  5/10/2011  496 B full USS OTHER:\
DFE00L00   leg1-win2  5/10/2011  28 KB full F:\
DFE00L00   leg1-win2  5/10/2011  28 KB full E:\
DFE00L00   leg1-win2  5/10/2011  44 MB 1 C:\
DFE00L00   leg1-win2  5/10/2011  496 B full USS USER DATA:\
DFE00L00   leg1-win2  5/10/2011  496 B full USS OTHER:\
DFE00L00   leg1-win2  5/10/2011  4 B incr E:\
DFE00L00   leg1-win2  5/10/2011  374 MB full C:\MUTemp
DFE00L00   leg1-win2  5/10/2011  6 KB incr F:\
DFE00L00   leg1-win2  5/10/2011  496 B full USS USER DATA:\
DFE02400   leg1-win2  5/10/2011  496 B full USS OTHER:\
DFE02400   leg1-win2  5/10/2011  496 B full USS USER DATA:\
DFE02400   leg1-win2  5/10/2011  6 KB incr F:\
DFE02400   leg1-win2  5/10/2011  4 B incr E:\
DFE02400   leg1-win2  5/10/2011  4 B incr C:\MUTemp
```

Volume Records

```
C:\>wminfo -m
volume      written (x) expires  read counts  capacity
11PM.001    101 MB 100x 5/10/2012  0 KB 4 0 KB
11PM.001.R0 0 KB 0x 5/10/2012  0 KB 3 0 KB
DFE00L00    8113 MB 8x 5/10/2012  4948 KB 1 105 GB
DFE02400    4106 MB 4x 5/10/2012  0 KB 24 105 GB
DFE02401    0 KB 0x undef 0 KB 21 105 GB
```

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The media database contains a record for each NetWorker volume and for each save set written to a volume.

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NetWorker Jobs Database

- Jobs database is responsible for managing and monitoring NetWorker jobs
 - ▶ Embedded SQLite database server
 - ▶▶ Full DB engine that can handle high loads without performance concerns
 - ▶▶ Consists of a single file on the NetWorker server
 - `/nsr/res/jobsdb/jobsdb.db`
 - ▶ JobsDB size is below 1 GB
 - ▶ Uses time-based purging
 - ▶ No longer a part of the bootstrap backup in NetWorker 8 or higher



The jobs database in NetWorker is responsible for managing and monitoring all jobs within the environment. These jobs include server activities such as cloning, staging, and recovery operations as well as client activities like save or save groups. When these jobs are started the jobs database collects all the runtime information as well as completion information.

The jobs database consists of an embedded SQLite database server which is a full database engine that can handle high loads without performance concerns. The database itself is stored in a single file on the NetWorker server and is managed via time-based purging. The database should not exceed 1 GB in size. Additionally, beginning with release 8, the jobs database is no longer a part of the bootstrap backup; rather, the jobs database is re-created during NetWorker server disaster recovery procedures.

Querying NetWorker Databases

| Interface | Function |
|---|---|
| NetWorker Administration | GUI to manage and query CFIs and the media database |
| <code>nsrinfo</code> | CLI to query a CFI |
| <code>nsrls</code> | CLI to display CFI summary usage |
| <code>mminfo</code> | CLI to query the media database |
| <code>jobquery</code> | CLI interface to query JobsDB |
| <code>nwrecover</code> (UNIX) NetWorker User (Windows) <code>recover</code> | NetWorker recovery interfaces |

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This slide shows the NetWorker interfaces available for displaying the contents of, and/or querying, the media database and client file indexes.

`nsrinfo`, `nsrls`, and `mminfo` are usually executed on the NetWorker server. However, both `nsrinfo` and `mminfo` have a “`-s nw_server`” option which allows you to run the command from any NetWorker host.

Querying a CFI Using nsrinfo

```
nsrinfo [-options] clientname
```

```
C:\Documents and Settings\Administrator>nsrinfo leg1-win2 inore
scanning client 'leg1-win2' for all savetimes from the backup namespace
C:\NUTemp\A1.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\A2.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\A3.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\A4.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\A5.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\A6.TXT, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins\Install\naitcpp.dll, date=1303971833 4/28/2011 2:
23:53 AM
C:\NUTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins\Install\naitcpp.inf, date=1303971833 4/28/2011 2:
23:53 AM
C:\NUTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins\Install, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\Common Files\Cisco Systems\CiscoTrustAgent\Plugins, date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp\Common Files\Cisco Systems\CiscoTrustAgent, date=1303971833 4/28/2011 2:23:53 AM

C:\Documents and Settings\Administrator>minfo -c leg1-win2 -N 'C:\NUTemp' -q 'Level=inc' -r 'Client,name,sav
etime(20),nsavetime'

client name      date      time      save time
leg1-win2 C:\NUTemp      5/10/2011 2:45:37 AM 1305009937
leg1-win2 C:\NUTemp      5/10/2011 4:51:49 AM 1305017507
leg1-win2 C:\NUTemp      5/10/2011 5:01:30 AM 1305018090
leg1-win2 C:\NUTemp      5/10/2011 5:30:25 AM 1305019825
leg1-win2 C:\NUTemp      5/10/2011 5:47:01 AM 1305020821
leg1-win2 C:\NUTemp      5/11/2011 6:04:24 AM 1305108264

C:\Documents and Settings\Administrator>nsrinfo -t 1305009937 leg1-win2 inore
scanning client 'leg1-win2' for savetime 1305009937(5/10/2011 2:45:37 AM) f
1 objects found

C:\Documents and Settings\Administrator>nsrinfo -U -s leg1-win2 -N C:\NUTemp\ leg1-win2
scanning client 'leg1-win2' for all savetimes from the backup namespace on server leg1-win2
C:\NUTemp, size=684, off=52426876, app=backup(1), date=1305109782 5/11/2011 6:29:42 AM
C:\NUTemp, size=684, off=816, app=backup(1), date=1305108264 5/11/2011 6:04:24 AM
C:\NUTemp, size=668, off=491883732, app=backup(1), date=1305010375 5/10/2011 2:52:55 AM
C:\NUTemp, size=668, off=383581932, app=backup(1), date=1305008519 5/10/2011 2:21:59 AM
C:\NUTemp, size=668, off=45180040, app=backup(1), date=1305003545 5/10/2011 12:59:05 AM
C:\NUTemp, size=668, off=383581924, app=backup(1), date=1303971833 4/28/2011 2:23:53 AM
C:\NUTemp, size=488, off=518091660, app=backup(1), date=1305025225 4/26/2011 9:40:25 AM
7 objects found

C:\>
```



The NetWorker `nsrinfo` command, when specified with only a client name as an argument, displays a list of all files being tracked in that client's CFI. With additional options, `nsrinfo` can list all files backed up at a specific time or with a specific pathname.

When using a Windows pathname on a UNIX command-line, single quotes are required to turn off the special meaning of the backslash. An ending `'\'` or `'/'` in a pathname is required to match a directory with that pathname.

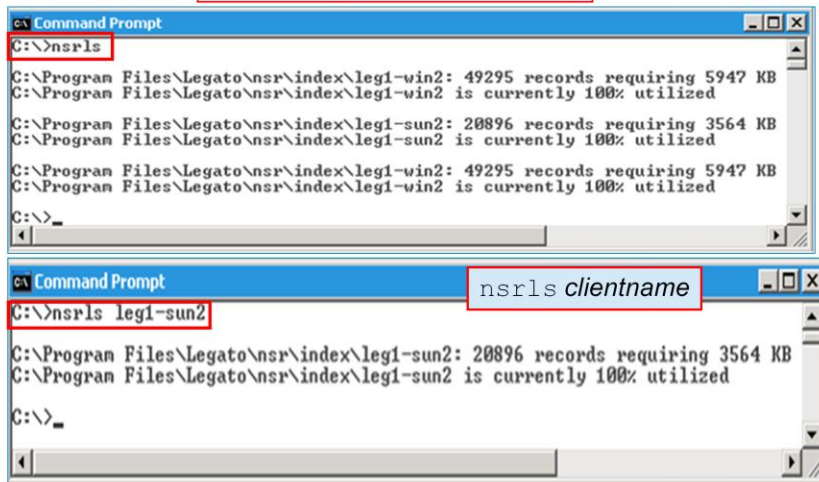
nsrinfo(1m) syntax:

```
nsrinfo [-options] clientname
```

`clientname` is the name of a NetWorker client and is a required argument. The output of `nsrinfo` includes the pathname of each file, and the date and time it was backed up, in both `savetime` and `nsavetime` formats.

Summarizing CFI Usage with nsrls

```
nsrls [clientname]
```



```
Command Prompt
C:\>nsrls
C:\Program Files\Legato\nsr\index\leg1-win2: 49295 records requiring 5947 KB
C:\Program Files\Legato\nsr\index\leg1-win2 is currently 100% utilized
C:\Program Files\Legato\nsr\index\leg1-sun2: 20896 records requiring 3564 KB
C:\Program Files\Legato\nsr\index\leg1-sun2 is currently 100% utilized
C:\Program Files\Legato\nsr\index\leg1-win2: 49295 records requiring 5947 KB
C:\Program Files\Legato\nsr\index\leg1-win2 is currently 100% utilized
C:\>_

Command Prompt
C:\>nsrls leg1-sun2
C:\Program Files\Legato\nsr\index\leg1-sun2: 20896 records requiring 3564 KB
C:\Program Files\Legato\nsr\index\leg1-sun2 is currently 100% utilized
C:\>_
```

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The NetWorker `nsrls` command displays summary information concerning CFI usage.

nsrls(1m) syntax:

```
nsrls [ clientname | -m ]
```

clientname is the name of a NetWorker client and, if specified, causes that client's CFI usage to be summarized. If no arguments are specified, summary information is displayed for all CFIs.

Output of `nsrls` includes the total number of records contained in the CFI and the total amount of disk space used by the CFI.

`nsrls` has a `-m` option which displays the number of records in each of the media database files and the amount of disk space used by each file.

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Viewing CFI Info within NetWorker Administration

The screenshot shows the NetWorker Administration interface. In the left pane, 'Indexes' is selected under 'leg1-win2'. The main pane shows 'Indexes (2)' for client 'leg1-win2'. A context menu is open over 'leg1-win2', with 'Show Save Sets...' selected. The 'Index Save Sets' window is open, showing a table of save sets for client 'leg1-win2'. The table has columns for 'Save Set', 'Cycles', and 'Size'. The save sets listed are 'VSS USER DATA:1', 'VSS OTHER:1', 'E:\', 'F:\', 'C:\WUTemp', and 'C:\'. Below this, the 'Save Set: VSS OTHER:1' is expanded to show a table of cycles with columns for 'SSID', 'Files', 'Size', 'Time', and 'Level'. The 'Remove Oldest Cycle' button is highlighted with a red box. Callout boxes provide instructions: 'List of client's save sets, by save set name' points to the save set list; 'List of save sets with selected name' points to the expanded save set table; 'Remove oldest Full save set and all its dependent save sets' points to the 'Remove Oldest Cycle' button.

| Save Set | Cycles | Size |
|-----------------|--------|---------|
| VSS USER DATA:1 | 7 | 2 KB |
| VSS OTHER:1 | 7 | 2 KB |
| E:\ | | 6 KB |
| F:\ | | 7 KB |
| C:\WUTemp | 1 | 237 KB |
| C:\ | 1 | 5590 KB |

| SSID | Files | Size | Time | Level |
|------------|-------|------|---------------------|-------|
| 2009664048 | 1 | 1 KB | 5/10/11 5:47:09 AM | full |
| 2462648014 | 1 | 1 KB | 5/10/11 5:35:09 AM | full |
| 2731081477 | 1 | 1 KB | 5/10/11 5:01:57 AM | full |
| 2848521535 | 1 | 1 KB | 5/10/11 4:52:01 AM | full |
| 3385384690 | 1 | 1 KB | 5/10/11 2:45:05 AM | full |
| 3637041507 | 1 | 1 KB | 5/10/11 2:21:20 AM | full |
| 3905471987 | 1 | 1 KB | 5/10/11 12:58:19 AM | full |

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To view information about each client's CFI or to manually remove CFI entries, click **Indexes** in the left pane of the NetWorker Administration's *Media* window. A list of all NetWorker clients is displayed along with the overall size of each client's CFI and the number of cycles being tracked.

Right-clicking a client pops up a context menu from which you can display more detailed information about the client's CFI or perform a consistency check on it.

If you choose **Show Save Sets** from the context menu, the *Index Save Sets* window pops up which displays the names of all the client's browsable save sets and the amount of space in the CFI used for file entries from those save sets. Upon selecting a save set name in the upper pane, information for each individual save set with that name is displayed in the bottom pane.

A CFI commonly contains several cycles worth of entries for each save set name.

A **cycle** is defined in NetWorker as a Full backup and all its dependent save sets. Incremental and Level 1-9 save sets are dependent on the most recent Full save set for a current recovery of the save set.

To give an example of what a cycle is, if a client has a 28 day browse policy, uses the Default schedule, and has a save set list of **/export/home**, the client's CFI will contain 4 or 5 cycles of the **/export/home** save sets, with each cycle being comprised of a Full backup and its 6 dependent incremental save sets.

To manually remove entries from a CFI prior to the entries being automatically purged due to normal aging of data, **Remove Oldest Cycle** removes all entries belonging to the oldest full save set of the selected save set name and all entries belonging to its dependent save sets. This is commonly done to quickly reduce the size of a CFI.

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Querying The Media Database using mminfo

```
mminfo [-options] [-q query] [-r report] [volname]
```

```
C:\Documents and Settings\Administrator>mminfo
volume      client      date      size      level      name
DFE00L00    leg1-win2  5/10/2011 496      B          full      USS OTHER:\
DFE00L00    leg1-win2  5/10/2011 28      KB         full      F:\
DFE00L00    leg1-win2  5/10/2011 28      KB         full      E:\
DFE00L00    leg1-win2  5/10/2011 44      MB         i         C:\
DFE00L00    leg1-win2  5/10/2011 496      B          full      USS USER DATA:\
DFE00L00    leg1-win2  5/10/2011 496      B          full      USS OTHER:\
DFE00L00    leg1-win2  5/10/2011 4      B          incr      E:\
DFE00L00    leg1-win2  5/10/2011 374      MB         full      C:\WUTemp
DFE00L00    leg1-win2  5/10/2011 6      KB         incr      F:\
DFE02400    leg1-win2  5/10/2011 496      B          full      USS USER DATA:\
DFE02400    leg1-win2  5/10/2011 496      B          full      USS OTHER:\
DFE02400    leg1-win2  5/10/2011 6      KB         incr      F:\
DFE02400    leg1-win2  5/10/2011 4      B          incr      E:\
DFE02400    leg1-win2  5/10/2011 4      B          incr      C:\WUTemp
DFE02400    leg1-win2  5/10/2011 4093     MB         full      C:\
```

```
C:\Documents and Settings\Administrator>mminfo -av more
volume      type      client      date      time      size      cid      fl      vol name
DFE00L00    LTO      Ultrium    leg1-win2  4/26/2011 9:40:25 AM 5185     MB      4286284234 cb annual C:\
DFE00L00    LTO      Ultrium    leg1-win2  4/26/2011 10:19:48 AM 2871     KB      4172731525 cb annual USS A
DFE00L00    LTO      Ultrium    leg1-win2  4/26/2011 10:20:11 AM 536     MB      4155954331 cb annual USS SY
DFE00L00    LTO      Ultrium    leg1-win2  4/26/2011 10:22:15 AM 496     B       413917725  cb annual USS USER DRIN:\
DFE00L00    LTO      Ultrium    leg1-win2  4/26/2011 10:22:15 AM 18      MB      4122400628 cb annual USS OTHER:\
DFE00L00    LTO      Ultrium    leg1-win2  4/26/2011 10:22:28 AM 28      MB      4185622821 cb annual USS SYSTEM SERVICES:\
DFE00L00    LTO      Ultrium    leg1-win2  4/26/2011 10:22:15 AM 18      MB      4088845631 cb annual USS SYSTEM ROOT:\
DFE00L00    LTO      Ultrium    leg1-win2  4/27/2011 2:16:42 AM 1448    MB      4855348438 ca annual /
DFE00L00    LTO      Ultrium    leg1-win2  4/27/2011 2:48:07 AM 374     MB      482179592  cr full index:leg1-win2
DFE00L00    LTO      Ultrium    leg1-win2  4/27/2011 2:48:14 AM 219     KB      4895818679 cr full bootstrap
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 12:53:05 AM 44      MB      3886808738 cb 1 C:\
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 12:58:20 AM 496     B       3754477167 cb full USE USER DATA:\
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 1:01:06 AM 5175    KB      3784145554 cr 1 index:leg1-win2
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 1:01:10 AM 238     KB      3697368342 cr full bootstrap
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 2:21:20 AM 491     B       357841587 cb full USE OTHER:\
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 2:21:50 AM 4      B       3569932671 cb incr E:\
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 2:22:00 AM 374     MB      3536378249 cb incr F:\
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 2:21:22 AM 496     B       3486446713 cb full USE USER DATA:\
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 2:24:26 AM 323     KB      345242214  cr 2 index:leg1-win2
DFE00L00    LTO      Ultrium    leg1-win2  5/10/2011 2:24:29 AM 292     KB      3435715101 cr full bootstrap
DFE02400    LTO      Ultrium    leg1-win2  5/10/2011 2:45:07 AM 496     B       3351830268 cb full USE OTHER:\
DFE02400    LTO      Ultrium    leg1-win2  5/10/2011 2:45:28 AM 6      KB      333583868  cb incr F:\
DFE02400    LTO      Ultrium    leg1-win2  5/10/2011 2:45:34 AM 4      B       3381498648 cb incr E:\
DFE02400    LTO      Ultrium    leg1-win2  5/10/2011 2:45:37 AM 6      KB      3284721426 cb incr C:\WUTemp
DFE02400    LTO      Ultrium    leg1-win2  5/10/2011 2:52:55 AM 4093    MB      3184058568 cb full C:\
```

-a and -v options

The NetWorker `mminfo` command is used to display information from media database volume and save set records. It is also used to perform queries of the media database and generate customized reports.

`mminfo(1m)` syntax:

```
mminfo [-options] [-q queryspec] [-r reportspec]
[ volname ]
```

If no arguments are specified, the output includes all browsable save sets created since midnight of the previous day. By default, the fields displayed include the save set name, client name, timestamp, size, backup level, and the name of the volume containing the save set.

If portions of a save set reside on multiple volumes, there is a line of output for each volume.

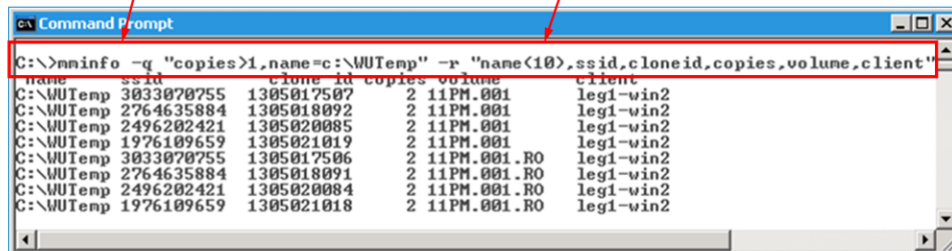
Options and arguments are used to define other queries and reports. If the `volname` argument is used, the output is restricted to save sets on that volume.

Several common `mminfo` usage examples are shown in the slide.

mminfo: Querying (-q) and Reporting (-r) Options

-q performs a query on save set and volume record attributes.

-r specifies which attributes to display in the output (report).



```
C:\>mminfo -q "copies>1,name=c:\WUTemp" -r "name(10),ssid,cloneid,copies,volume,client"
name          ssid          clone id      copies  volume      client
C:\WUTemp     3033070755   1305017507   2       11PM.001    leg1-win2
C:\WUTemp     2764635884   1305018092   2       11PM.001    leg1-win2
C:\WUTemp     2496202421   1305020085   2       11PM.001    leg1-win2
C:\WUTemp     1976109659   1305021019   2       11PM.001    leg1-win2
C:\WUTemp     3033070755   1305017506   2       11PM.001.RO leg1-win2
C:\WUTemp     2764635884   1305018091   2       11PM.001.RO leg1-win2
C:\WUTemp     2496202421   1305020084   2       11PM.001.RO leg1-win2
C:\WUTemp     1976109659   1305021018   2       11PM.001.RO leg1-win2
```



The query option, -q *queryspec*, allows you to specify a custom query on fields (attributes) within the media database. The “\-r *reportspec*” option allows you to specify which fields to include in the output of matching records.

Queries may use the operators ‘<’, ‘>’, and ‘=’ to compare a field to a value. Commas are used to separate multiple queries. If *queryspec* begins with the negation operator ‘!’, the comparison matches only if the field *does not* match the value.

Reports are generated by providing a comma-separated list of volume or save set attributes which are displayed in the order specified. To specify a field width within a report, append “(width)” to the attribute keyword, for example “name(10)”.

In the slide, the -q *queryspec* syntax is used to query the database for save sets named **/etc** that have more than one copy:

```
mminfo -q "copies>1, name=/etc" ...
```

“-r *reportspec*” is used to display the name of the save set truncated (or blank-padded) to 10 characters, the save set ID, the clone ID, the number of copies, the volume containing the save set, and the client name:

```
mminfo ... -r "name(10), ssid, cloneid, copies, volume, client"
```

Important: There are many volume and save set attributes that may be used for querying and reporting. All of these options are listed and described in the `mminfo(1m)` man page.

mminfo: Querying NSM Snapshot Save Sets

Clients Snapshot save sets can be queried with mminfo.

- ▶ **-q snap** option must be specified
- ▶ **mminfo -s server -q snap -c client**
- ▶ Where:
 - ▶▶ Server – hostname of NetWorker server
 - ▶▶ Client – hostname of the client from which NSM backed the data up.

```
$ mminfo -s ledma038 -c ledma218 -q snap
volume      client      date        size  level  name
ledma038.003 ledma218  02/11/13   2 KB  full  /syymm_403_ufs
```



Another way to query a client snapshot save sets is with the mminfo command. The **-q snap** option lists all snapshot save sets for a particular client.

To list the snapshot save sets for a client type the following command at the prompt:

```
mminfo -s server -q snap -c client
```

The *EMC Command Reference Guide and NetWorker* man pages provide further details on these operations.

Comment mminfo Options

| Option | Description |
|----------------------|--|
| -a | Display all complete, browsable save sets |
| -v | Display additional fields of information and, in addition to the default, display aborted, purged, incomplete and recoverable save sets. |
| -o <i>sort_order</i> | Sort output by order. (For example, "-o cn" sorts primarily by client name and secondarily by save set name.) |
| -s <i>nw_server</i> | Query the media database of the specified NetWorker server. |
| -c <i>nw_client</i> | Show only save sets belonging to the specified NetWorker client. |
| -m | Display media report instead of save set report |
| -N <i>ss_name</i> | Show only save sets that match the specified save set name |
| -p | Display browse and retention times of save sets. |
| -xm -xcchar | Write output in XML (-xm) or character-separated (-xcchar) format. |
| -t <i>save_time</i> | Display only save sets created on or after time. |

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The slide lists common `mminfo` options for querying the media database and generating reports.

Additional mminfo Examples

Query NetWorker server **bongo**'s media database, reporting on all browsable save sets, with a colon (:) separating each field of output. This can be executed on any NetWorker client.

```
mminfo -s bongo -a -xc:
```

Display all save sets with a name of **/stardata** that were backed up from **alto**, generate verbose output and separate the fields with a semi-colon. The semi-colon must be quoted (UNIX only) because it is special to all UNIX shells.

```
mminfo -c alto -N /stardata -v -xc';'
```

Query the database for save sets older than 2 days. The default set of attributes is displayed.

```
mminfo -q "savetime < 2 days ago"
```

Query the database for save sets backed up from **flute** within the past 2 days.

```
mminfo -q "savetime > 2 days ago, client=flute"
```

Display information on volumes containing save sets backed up from **flute** and which were written to during the past week.

```
mminfo -m -t "last week" -q client=flute
```

Note: See the `mminfo(1m)` man page for examples and further information.

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Viewing Media DB Info from NW Administration

The screenshot shows the NetWorker Administration GUI. In the left pane, 'Tape Volumes' is selected. The main pane displays a table of volumes. A red circle highlights the 'Tape Volumes (3)' header. A red arrow points from the 'Show Save Sets...' option in the context menu to the 'Volume Save Sets' dialog box. A red box labeled 'Right-click' points to the context menu.

| Volume Name | Barcode | Used | % Used | Mode | Expiration | Pool | Location |
|-------------|----------|---------|--------|------|------------|---------|------------------------|
| DFE00L00 | DFE00L00 | 6113 MB | | | | Default | Leg1-sun2-STK@2.5.3 |
| DFE02400 | DFE02400 | 4106 MB | | | | 1PM | rd-Leg1-sun2-STK@2.5.3 |
| DFE02401 | DFE02401 | 0 KB | | | | | |

| Client | Save Set | SSID | Checkpoint ID | Save Time | Clone Retention Time | Level | Status | Size | Flags |
|-----------|-------------|------------|---------------|---------------------|----------------------|-------|-------------|---------|-------|
| leg1-win2 | bootstrap | 3435715101 | | 5/10/11 2:24:29 AM | 5/10/12 11:59:59 PM | full | recoverable | 292 KB | cr |
| leg1-win2 | indexleg... | 3452492314 | | 5/10/11 2:24:26 AM | 5/10/12 11:59:59 PM | 9 | recoverable | 324 KB | cr |
| leg1-win2 | F:\ | 3536378249 | | 5/10/11 2:22:00 AM | 5/10/12 11:59:59 PM | incr | browsable | 6 KB | cb |
| leg1-win2 | C:\MUTemp | 3553155464 | | 5/10/11 2:21:59 AM | 5/10/12 11:59:59 PM | full | browsable | 374 MB | cb |
| leg1-win2 | E:\ | 3569932671 | | 5/10/11 2:21:50 AM | 5/10/12 11:59:59 PM | incr | browsable | 4 B | cb |
| leg1-win2 | VSS USE... | 3486046713 | | 5/10/11 2:21:22 AM | 5/10/12 11:59:59 PM | full | browsable | 496 B | cb |
| leg1-win2 | VSS OTH... | 3637041507 | | 5/10/11 2:21:20 AM | 5/10/12 11:59:59 PM | full | browsable | 496 B | cb |
| leg1-win2 | bootstrap | 3687368342 | | 5/10/11 1:01:10 AM | 5/10/12 11:59:59 PM | full | recoverable | 238 KB | cr |
| leg1-win2 | indexleg... | 3704145554 | | 5/10/11 1:01:06 AM | 5/10/12 11:59:59 PM | 1 | recoverable | 5175 KB | cr |
| leg1-win2 | E:\ | 3788031515 | | 5/10/11 12:59:06 AM | 5/10/12 11:59:59 PM | full | browsable | 28 KB | cb |
| leg1-win2 | C:\ | 3804902730 | | 5/10/11 12:59:05 AM | 5/10/12 11:59:59 PM | 1 | browsable | 44 MB | cb |

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The NetWorker Administration GUI can be used to display volume and save set information by using the **Volumes** selection in the *Media* window.

When **Volumes** option is selected in the left pane, a list of all volumes is displayed. Right-clicking on a volume pops up a context menu used for performing tasks associated with volumes; such as displaying all save sets on a volume and deleting a volume from the media database.

Double-clicking a volume will also display all save sets on the volume. The information displayed is equivalent to that generated by using `"mminfo -v volumename"`.

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Querying the Media DB with NW Administration

The screenshot displays the NetWorker Administration GUI. The top pane shows the 'Query Save Set' dialog with the following fields and options:

- Client Name:** Leg1-win2
- Save Set ID:** C:\WUTemp
- Volume:** 11PM.001
- Pool:** 11PM
- Checkpoint ID:** (empty)
- Copies:** (dropdown menu)
- Save Time:** From [May 9, 2011 12:00:00 AM] To [May 10, 2011 11:59:59 PM]

The right pane shows the 'Query Parameters' section with the following options:

- Status:** All, Select from (Browseable, Scanned-in, In-Progress, Suspect, Recyclable, Recoverable, Aborted, Checkpoint Encountered)
- Type:** All, Select from (Normal, Backup, Data Domain, Snapshots, Avast, Snapshot)
- Maximum Level:** Full, 1, 2, 3, 4, 5, 6, 7, 8, 9, All

The bottom pane shows the 'Save Set List' table with the following data:

| Client | Save Set | SSD | Clone ID | Level | Status | Type | Media Type | Volume Name | Pool | Size | Files | Save Time | Clone Retention Time | Checkpoint ID |
|-----------|-----------|------------|------------|-------|-----------|----------|-----------------|-------------|------|------|--------------------|---------------------|----------------------|---------------|
| leg1-win2 | C:\WUTemp | 3033070755 | 1305017507 | incr | browsable | adv_file | 11PM.001 (0, c) | 11PM | 4 B | 0 | 5/10/11 4:51:47 AM | 5/10/12 11:59:59 PM | | |
| leg1-win2 | C:\WUTemp | 2764635884 | 1305018092 | incr | browsable | adv_file | 11PM.001 (0, c) | 11PM | 4 B | 0 | 5/10/11 5:01:30 AM | 5/10/12 11:59:59 PM | | |
| leg1-win2 | C:\WUTemp | 2496202421 | 1305020085 | incr | browsable | adv_file | 11PM.001 (0, c) | 11PM | 4 B | 0 | 5/10/11 5:30:25 AM | 5/10/12 11:59:59 PM | | |
| leg1-win2 | C:\WUTemp | 1976109659 | 1305021019 | incr | browsable | adv_file | 11PM.001 (0, c) | 11PM | 4 B | 0 | 5/10/11 5:47:01 AM | 5/10/12 11:59:59 PM | | |

Two callout boxes provide instructions:

1. Specify save set characteristics
2. Perform query by changing tabs

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The NetWorker Administration GUI also provides the ability to query the media database and display information concerning save sets matching the query.

To perform a query, click **Save Sets** in the left pane of the *Media* window. In the right pane, specify the save set characteristics of those save sets you want information about. Change to the *Save Set List* tab to perform the query and report matching save sets.

In the *Query Save Set* tab, you can choose to display only those save sets matching a specific status and type. The default value is **All** for both **Status** and **Type**.

Copies commonly refers to how many times a save set has been cloned. A save set that has been cloned once has 2 copies, the original and one clone. Additionally, any save set written to an advanced file type device is seen as having 2 copies. The drop-down menu in the **Copies** field allows you to perform comparisons using the '=', '>' and '<' operators.

You can specify the maximum backup level of the save set. Since a full backup is equivalent to a level 0, selecting **Full** matches only full level backups. Selecting **9** would match all save sets backed up at a level 9, level 8, level 7, etc. To match incremental and client-initiated save sets, **All** must be selected.

When selecting a range of values for the **Save Time** field, a calendar is displayed from which you select the desired date. A specific time of day can be specified by manually editing the **From** and **To** fields.

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Module 7: NetWorker Database Management

Lesson 1 Summary

During this lesson the following topics were covered:

- Directory structure and content of the CFI , media database, and jobs database
- Viewing CFI and media database information using various NetWorker interfaces



This lesson covered the CFI, media database and jobs database content and how to view CFI and media database information using various NetWorker interfaces.

Module 7: NetWorker Database Management

Lesson 2: Save Set and Volume Lifecycles and Statuses

During this lesson the following topics are covered:

- Media database and CFI management interfaces
- Save set and volume status and aging
- How NetWorker selects a volume for writing



This lesson covers interfaces for managing the media database and CFI; save set and volume status and aging; as well as how NetWorker selects a volume for writing.

Media Database and CFI Management Interfaces

| Interface (CLI) | Purpose |
|-----------------------|--|
| <code>nsrim</code> | Performs aging of control data and a consistency check of the media database |
| <code>nsrmm</code> | Modifies media database records (deletes, ages, etc.) |
| <code>mmlocate</code> | Sets the location field of volume records in the media database |
| <code>nsrck</code> | Performs a consistency check or a recovery of a CFI |



Much of the management of the NetWorker databases is performed automatically, such as aging of save sets and volumes, and performing of consistency checks. NetWorker also provides command-line and GUI administrative interfaces for manual administration of the databases and their content. This slide lists these interfaces and their functions.

While the command-line utilities in the slide are usually executed on the NetWorker server, both `nsrmm` and `mmlocate` include a “`-s nw_server`” option which allows you to run the command from any NetWorker host.

Note: The `nsrmm` command has numerous functions. In the context of database management, it is used to change the save set and volume status, delete save sets and volume records from the media database, and age save sets. `nsrmm` can also be used to manage standalone devices, including the labeling and mounting of volumes.

Save Set Browse and Retention Times

A client's browse policy is used to set the date on which the save set will become *recoverable* (**ssbrowse** field in media database save set record), which controls the size of the CFI.

A retention policy is used to set the date on which the save set becomes *recyclable* (**ssretent** field in media database save set record), which affects volume aging.

Browse Time = "Backup Date" + "Browse Policy"

| Name | Comment | Browse policy | Retention policy | Save set |
|-----------|--------------------|---------------|------------------|---|
| leg1-win2 | Client resource 1 | Month | Year | AJ01_AJ02_AJ03_AJ04_bin |
| leg1-win2 | Client resource 2 | Quarter | Year | All |
| leg1-win2 | Backup of All | Quarter | Year | All |
| leg1-win2 | Backup of C: drive | Month | Year | C:\ |
| leg1-win2 | | Week | Quarter | C:\MUTemp |
| leg1-win2 | | Month | Year | C:\MUTemp, E:\, F:\, VSS ASR DISK\, VSS OTHER\, VSS SYSTEM BOOT |
| leg1-win2 | | Month | Year | NMCASA:\gst_on_leg1-win2\lgo_gst |

Retention Time = "Backup Date" + "Retention Policy"

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The **Browse policy** and **Retention policy** attributes in the client resource are used to set the aging values for the client's save sets. When a save set is backed up, the client's browse and retention policies are added to the current date to determine the save set's **browse time** and **retention time**, respectively. These values are stored in the save set record as the **ssbrowse** and **ssretent** attributes, and are used to determine when the save set changes from one status to another (ages).

Browse time (**ssbrowse**) = "Backup Date" + "Browse Policy"

Retention time (**ssretent**) = "Backup Date" + "Retention Policy"

The browse time specifies the date when the save set's entries are removed from the client's CFI, thereby making the save set no longer browsable.

The retention time specifies the date when the save set expires and is no longer required by the NetWorker administrator.

Save sets are checked for aging at the end of a group backup or by manually running `nsrim`. Dependent save sets may delay the aging of certain save sets. For example, a level Full save set that has passed its browse time will remain browsable (and therefore tracked in the CFI) until all incremental save sets that depend on the full save set also pass their browse times. Thus, the aging of save sets may be delayed by up to one cycle period, where a cycle is defined as the length of time between full backups.

Important: Changing a client's browse or retention **policy** attribute does not affect the browse and retention times of existing save sets.

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Save Set Status (Media Database)

| Status (Flag) | Description | Capabilities |
|-----------------------------------|---|---|
| Browsable (b) | The save set has entries in the client's CFI. today < browse time | Browsable and recoverable using all recovery methods. |
| Recoverable (r) | The save set no longer has entries in the CFI. browse time < today < retention time | Recoverable but not browsable (files in the save set cannot be listed). |
| Recyclable (E) | The save set is no longer needed but is still recoverable. retention time < today | When all save sets on a volume are recyclable, NetWorker changes the volume status to recyclable . |
| Suspect (s) (secondary) | Read error occurred when using save set for a recover. | Save set will not be used for recovery or clone operation unless no other copy exists. |
| Aborted (a) | The back up of the save set was aborted before it finished backing up. | Save set record is removed from the media database within 24 hours. |
| In-progress (I) | The save set is in the process of being backed up. | Save set is currently being written to volume. |

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All save sets are tracked in the media database. Each save set record has a status field which reflects the save set's aging status. Primary statuses include **browsable**, **recoverable**, and **recyclable**. A save set may also be assigned a secondary status of **suspect** if a read error occurs during a recovery attempt of the save set contents.

A **browsable** save set has not passed its browse time and is therefore still tracked in both the media database and a client file index. Both a browsable recovery and a save set recovery can be performed on the save set.

A **recoverable** save set has passed its browse time but has not exceeded its retention time. Because it has passed its browse time it is no longer tracked in a client file index. Only a saveset recovery can be performed without rebuilding the client file index for that saveset.

A **recyclable** save set has passed both its browse and retention times. A recyclable save set is treated exactly like a recoverable save set except it will not keep the volume it is on from being automatically recycled (relabelled).

Note: The `mminfo(1m)` man page contains more information for the other `mminfo` status flags.

Important: A recyclable save set on a tape volume is only removed when that tape is relabelled. A recyclable save set residing on a file type or an `adv_file` type device is removed by `nsrim` on the same day it becomes recyclable.

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Volume Status (Media Database)

| Status | Description |
|-------------------|---|
| Appendable | The volume is available for writing. |
| Full | The volume is full and not available for writing. |
| Recyclable | All save sets on this volume are recyclable and the volume may be available for automatic recycling (relabeling). |
| Secondary Status | |
| Read Only | The volume is not appendable. If the volume is also recyclable , the volume may be relabeled. |
| Manual | Volume will not be relabeled automatically when it becomes recyclable . The volume can only be manually recycled (relabelled). |

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NetWorker volumes are also tracked in the media database and have one or more statuses (modes) assigned to them reflecting their age and other conditions. The slide lists the major volume modes.

When NetWorker labels a volume, the volume is assigned a status of **appendable**. Backups can only be written to **appendable** volumes.

When a volume becomes full, it is assigned a status of full and can no longer be used for backups. A tape volume will become full when the physical EOM (end of media) marker is encountered during a save or when a write error results in the save being directed to another volume.

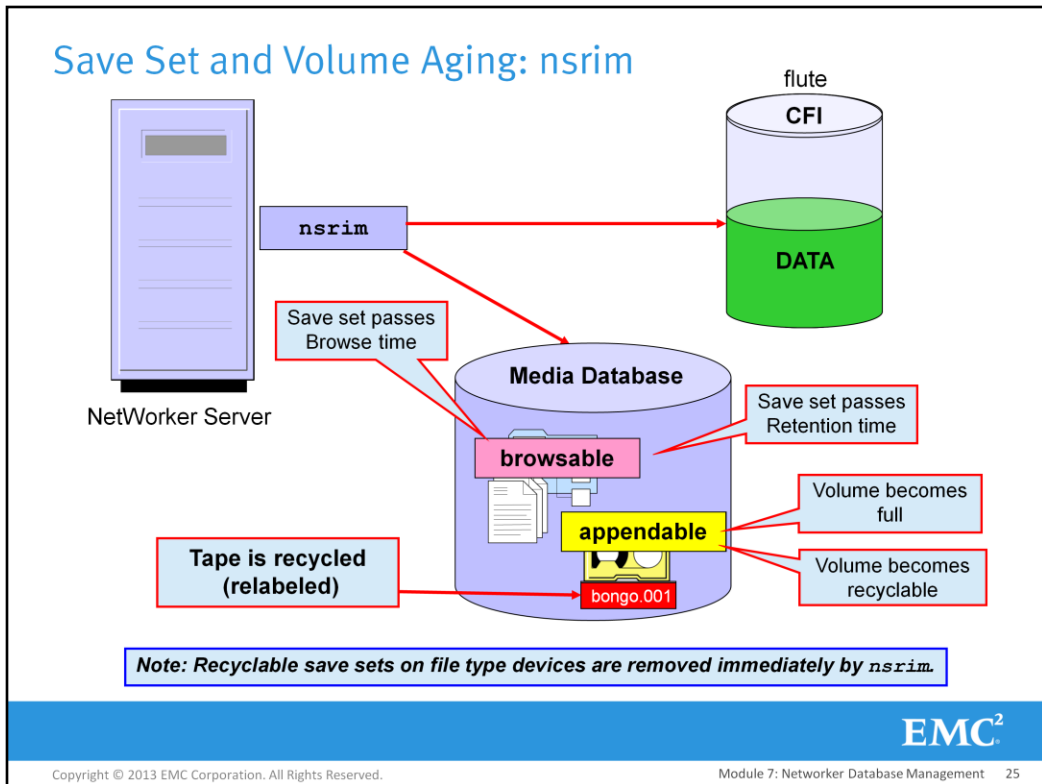
When all save sets on a volume become **recyclable**, the status of the volume itself changes to **recyclable**. Recyclable volumes may be automatically recycled (relabelled) by NetWorker in the event that no **appendable** volumes are available to satisfy a backup request.

An administrator may assign a secondary mode of **manual** (recycle) to a volume. A volume with a status of **manual** will never be automatically relabeled by NetWorker, even if the primary mode of the volume is **recyclable** and a pending backup is waiting for another volume.

A volume can be manually assigned a status of **read only**. This will keep additional data from being written to the volume. **Full** and **recyclable** volumes are automatically given a secondary status of **read only**.

Important: Manually setting a volume to **read only** does not keep it from being recycled, it only prevents further data from being written to it.

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nsrim handles aging of save set and volume records within the media database, and is responsible for enforcing browse and retention times for all clients. nsrim also removes tracking information from the CFI when a save set changes from browsable to recoverable (or recyclable). The nsrim command is typically only invoked automatically at the completion of savegrp. However, you can also run nsrim manually from the command line.

nsrim syntax:

```
nsrim [-option arg] [-option]
```

Note: See the nsrim(1m) man page for more information.

Changing Browse and Retention Times: nsrmm

```
C:\Documents and Settings\Administrator>nsrinfo -p inore
date      browse      retain      ssid      client      name
5/10/2011 6/10/2011 5/10/2012 2026441263 leg1-sun2  /bin
5/10/2011 6/10/2011 5/10/2012 3553155464 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 2227767673 leg1-sun2  /var
5/10/2011 6/10/2011 5/10/2012 3804808730 leg1-win2  C:\
5/10/2011 6/10/2011 5/10/2012 3184058568 leg1-win2  C:\
5/10/2011 6/10/2011 5/10/2012 2764635884 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 3284721426 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 3033070755 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 2764635884 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 2496202421 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 1976109659 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 3788031515 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 3569932671 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 3301498640 leg1-win2  E:\

nsrmm [-w ssbrowse] [-e ssretent] -S ssid

C:\>nsrmm -S 2026441263 -w 10/9/2012 -e 12/30/2014
C:\>nsrinfo -p inore
date      browse      retain      ssid      client      name
5/10/2011 10/9/2012 12/30/2014 2026441263 leg1-sun2  /bin
5/10/2011 6/10/2011 5/10/2012 3553155464 leg1-win2  C:\WUTemp
5/10/2011 5/9/2012 12/31/2014 3804808730 leg1-win2  C:\
5/10/2011 6/10/2011 5/10/2012 3184058568 leg1-win2  C:\
5/10/2011 6/10/2011 5/10/2012 2764635884 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 3284721426 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 3033070755 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 2764635884 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 2496202421 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 1976109659 leg1-win2  C:\WUTemp
5/10/2011 6/10/2011 5/10/2012 3788031515 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 3569932671 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 3301498640 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 2831744300 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 2563309491 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 2278098808 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 2194213268 leg1-win2  E:\
5/10/2011 6/10/2011 5/10/2012 3821585939 leg1-win2  F:\
5/10/2011 6/10/2011 5/10/2012 3536378249 leg1-win2  F:\
5/10/2011 6/10/2011 5/10/2012 3335053008 leg1-win2  F:\
5/10/2011 6/10/2011 5/10/2012 3016293546 leg1-win2  F:\
```

You can use `nsrmm` to change an existing save set browse or retention time, using `-w browse_time` and `-e retention_time`, respectively. Using these options sets the save set `ssbrowse` and `ssretent` fields in the media database, which are used by `nsrim` for aging of the save set. Changing an existing save set's browse and retention times is useful for extending or shortening the life cycle of a specific save set.

nsrmm syntax pertaining to browse and retention times:

```
nsrmm [-w browse_time] [-e retention_time] -S ssid
```

You can specify `browse_time` and `retention_time` in any format described in the `nsr_getdate(3)` man page. The time can be an absolute time such as `MM/DD/YY`, or a time relative to the current date, such as "2 Months" or "4 years".

The `-S ssid` option specifies the save set(s) to modify.

Changing the browse or retention time for a save set changes the dates for all instances of the save set.

Note: See the `nsrmm(1m)` man page for more information.

Changing Volume and Savesets Status: nsrmm

```
nsrmm [-o mode] volume | -S ssid
```

| Mode | Description |
|-----------------|--|
| [not]full | Set volume to full or appendable (notfull). |
| [not]readonly | Set or remove (notreadonly) the secondary mode of read only . |
| [not]manual | Set volume to manual recycle or automatic recycle (notmanual). |
| [not]recyclable | Set volume to recyclable . This has no affect on the status of the save sets on the volume. If notrecyclable is specified, the volume is returned to its previous mode, either appendable or full . If “-S <i>ssid</i> ” is specified, only the save set is marked recyclable . |
| [not]suspect | Set or remove (notsuspect) the secondary status of suspect on the specified save set. The “-S <i>ssid</i> ” option must be used with this mode. |

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You can manually change the status of volumes and save sets by using `nsrmm` with the `-o mode` option.

nsrmm syntax pertaining to the `-o mode` option:

```
nsrmm -o mode volume | -S ssid
```

where *mode* can be any of the modes listed in the slide. The *volume* argument is the name of the volume whose record you want to change.

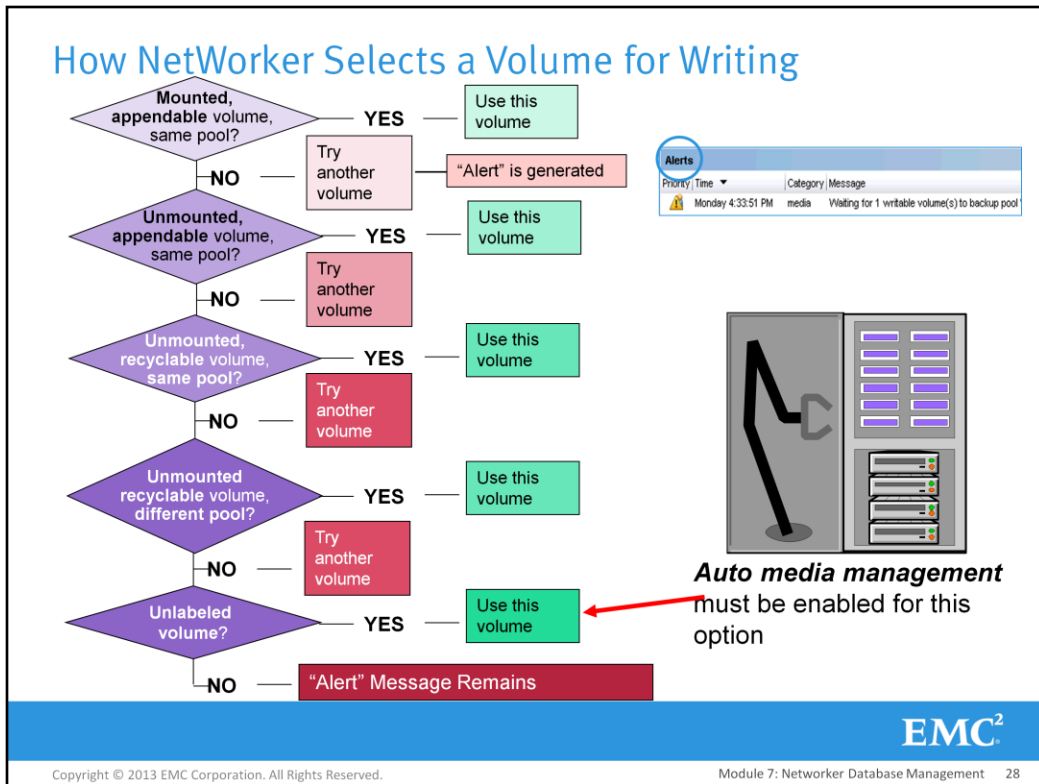
If a write error occurs when writing to a volume, the volume mode is changed to full to avoid trying to write additional data to a volume which is possibly damaged. However, if the error was actually caused by the device, using `nsrmm` with the `notfull` argument can be used to make the volume appendable again.

The `-S ssid` option is used to change the status of specific save sets. A common use is to reset the status of a suspect save set after determining that the volume really is not damaged.

It is important to use caution when manually specifying a volume as recyclable. If the volume being modified contains browsable recoverable savesets the status of those will not be changed. However, the volume itself will become recyclable and any savesets on the volume may be recycled when the volume is recycled, regardless of their status.

Note: You must unmount a volume to change its status.

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After a backup starts and the NetWorker server determines what pool the save set should be written to, it is then necessary to determine what volume within that pool to use.

The volume used falls in one of the five categories listed below in order of priority. Each of these categories requires the volume be available on an appropriate storage node.

1. **Mounted, appendable** volume from the required pool.

If there is no appendable volume currently mounted, the NetWorker server generates an alert stating that a volume from the appropriate pool is not immediately available. The server then continues its search for a volume to use.

2. **Unmounted, appendable** volume from the required pool.

3. **Unmounted, recyclable** volume from the required pool.

4. **Unmounted, recyclable** volume from a different pool. (This is disabled by default.)

If **Auto media management** is not enabled, the volume request is not cleared from the Alerts window, and the NetWorker administrator must manually provide a volume to satisfy the request before the backup can continue. If **Auto media management** is enabled, NetWorker looks for one more type of volume, listed below.

5. **Unmounted, unlabeled** volume.

Any volume without a NetWorker or EDM (EMC Data Manager) label is considered unlabeled.

Lab Exercise 7-1: NetWorker Databases - Part 1



In this lab you will display NetWorker database contents, perform database queries and generate reports, and modify a save set record.

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In this lab, you will:

- Query and display media database information.
- Query and display CFI information.

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Module 7: NetWorker Database Management

Lesson 2 Summary

During this lesson the following topics were covered:

- Media database and CFI management interfaces
- Save set and volume status and aging
- How NetWorker selects a volume for writing



This lesson covered interfaces for managing the media database and CFI; save set and volume status and aging; and how NetWorker selects a volume for writing.

Module 7: NetWorker Database Management

Lesson 3: Manual Management of the NetWorker Databases

During this lesson the following topics are covered:

- Using nsrmm and NetWorker Administration to manage save set and volume records
- Performing a CFI consistency check
- Using scanner to restore NetWorker control data



This lesson covers managing save set and volume records, performing a CFI consistency check, and restoring NetWorker control data with scanner.

Deleting Save Sets and Volumes : nsrmm

`nsrmm -d[P] -S ssid | volume`

```

C:\>nsrmm -N c:\NUTemp -q "level=incr" -y
volume      type      ctime      date      time      size  ssid      fl      lvl  name
11PM.001   adv_file  leg1-win2  5/10/2011 4:51:47 AM 4 B 3033070755 cb incr C:\NUTemp
11PM.001   adv_file  leg1-win2  5/10/2011 5:01:30 AM 4 B 2764635884 cb incr C:\NUTemp
11PM.001   adv_file  leg1-win2  5/10/2011 5:30:25 AM 4 B 2496202421 cb incr C:\NUTemp
11PM.001   adv_file  leg1-win2  5/10/2011 5:47:01 AM 4 B 1976109659 cb incr C:\NUTemp
11PM.001   adv_file  leg1-win2  5/11/2011 6:04:24 AM 7 KB 1909089493 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/10/2011 4:51:47 AM 4 B 3033070755 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/10/2011 5:01:30 AM 4 B 2764635884 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/10/2011 5:30:25 AM 4 B 2496202421 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/10/2011 5:47:01 AM 4 B 1976109659 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/11/2011 6:04:24 AM 7 KB 1909089493 cb incr C:\NUTemp
11PM.001.RO LTO Ultrium leg1-win2 5/10/2011 2:45:37 AM 4 B 3284721426 cb incr C:\NUTemp

C:\>nsrmm -d -S 3033070755
Delete file and media index entries for save set '3033070755'? y

C:\>nsrmm -N c:\NUTemp -q "level=incr" -y
volume      type      ctime      date      time      size  ssid      fl      lvl  name
11PM.001   adv_file  leg1-win2  5/10/2011 5:01:30 AM 4 B 2764635884 cb incr C:\NUTemp
11PM.001   adv_file  leg1-win2  5/10/2011 5:30:25 AM 4 B 2496202421 cb incr C:\NUTemp
11PM.001   adv_file  leg1-win2  5/10/2011 5:47:01 AM 4 B 1976109659 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/11/2011 6:04:24 AM 7 KB 1909089493 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/10/2011 5:30:25 AM 4 B 2496202421 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/10/2011 5:47:01 AM 4 B 1976109659 cb incr C:\NUTemp
11PM.001.RO adv_file  leg1-win2  5/11/2011 6:04:24 AM 7 KB 1909089493 cb incr C:\NUTemp
11PM.001.RO LTO Ultrium leg1-win2 5/10/2011 2:45:37 AM 4 B 3284721426 cb incr C:\NUTemp

C:\>nsrmm -g
state volume      written (<%) expires      read  mounts  capacity
11PM.001         0 KB 0% 12/30/2014 0 KB 4 0 KB
11PM.001.RO     813 MB 8% manual 4948 KB 1 105 GB
DFE02401        84 MB 0.1% 5/10/2012 0 KB 24 105 GB
DFE02405        19 MB 0.1% 5/11/2012 0 KB 24 105 GB

C:\>nsrmm -d DFE02405
Delete file and media index entries for LTO Ultrium tape DFE02405? y

C:\>nsrmm -g
state volume      written (<%) expires      read  mounts  capacity
11PM.001         0 KB 0% 12/30/2014 0 KB 4 0 KB
11PM.001.RO     813 MB 8% manual 4948 KB 1 105 GB
DFE02401        84 MB 0.1% 5/10/2012 0 KB 24 105 GB
DFE02405        19 MB 0.1% 5/11/2012 0 KB 24 105 GB
    
```

Purge Save Set (-dP -S ssid)
Purge (delete) CFI entries of the save set. The save set is changed from browsable to recoverable.

Delete Volume (-d volume)
Delete volume record and the save set records of all save sets on the volume. CFI entries of browsable save sets are also purged.

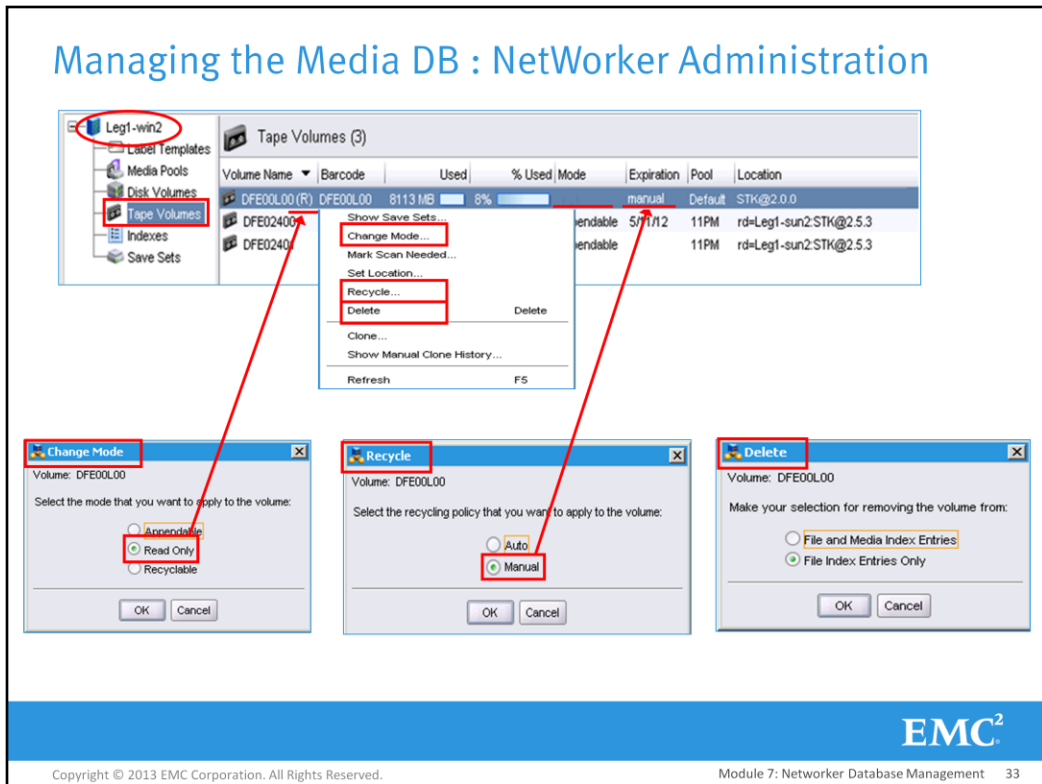
Delete Save Set (-d -S ssid)
Delete save set's CFI entries and its media database save set record.



nsrmm can be used to remove information from CFIs and the media database. Combining the -d and -P options allows you to remove CFI entries of individual save sets or of all save sets on a volume. Removal of CFI records is commonly referred to as **purging**. Using the -d option without -P removes save set and/or volume records from the media database.

Note: To avoid accidental removal of data, be extremely careful when using the -y option. The NetWorker scanner command can be used to restore database information for save sets and volumes that are inadvertently deleted.

Managing the Media DB : NetWorker Administration



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You can also manage save set and volume records from the NetWorker Administration *Media* window. Choose either **Disk Volumes** or **Tape Volumes** in the left pane to display a list of volumes. Then, right-click a volume to bring up a context menu. From the context menu, you can perform the same set of media database management tasks as `nsrmm`.

Change Mode - Allows you to change a volume's mode to either **appendable** or **recyclable**, or set/unset the secondary mode of **read only**. This is the same as

```
nsrmm -o {readonly | notreadonly}.
```

Set Location - This is discussed on the next page.

Recycle - Allows you to set a volume to manual or automatic recycle. This is the same as

```
nsrmm -o {manual | notmanual}.
```

Delete - Allows you to purge CFI entries of all save sets on the volume. You can additionally remove the volume record and all the corresponding save set records. This is the same as `nsrmm -dP volume`.

Setting Volume Location : mmlocate and GUI

`mmlocate [-u] [-n] [volume]`

The screenshot displays the following components:

- Command Prompt:** Shows the execution of `mmlocate` and `mmlocate -u -n DFE00L00 'Moved to 2nd Shelf of cabinet 3'`. The output shows the location for volume DFE00L00 being updated to 'Moved to 2nd Shelf of cabinet 3'.
- Set Location Dialog:** A window titled 'Set Location' with 'Volume: DFE00L00' and 'Location: moved to 2nd shelf of cabinet 3'. It includes 'OK', 'Reset', and 'Cancel' buttons.
- GUI Interface:** A screenshot of the NetWorker Administration console showing 'Tape Volumes (3)'. A context menu is open over the volume DFE00L00, with 'Set Location...' selected. The 'Location' column in the table below is highlighted with a red box.

| Expiration | Pool | Location |
|------------|---------|---------------------------------|
| 5/10/12 | Default | moved to 2nd shelf of cabinet 3 |
| 5/10/12 | 11PM | rd=Leg1-sun2:STK@2.5.3 |
| 11PM | | rd=Leg1-sun2:STK@2.5.3 |

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Volume records in the media database have a **location** field that you can use to track the volume's location. The location can be a string of up to 64 characters. This field is useful for tracking volumes which have been removed from the jukebox and for volumes moved offsite.

If a volume is labeled in a jukebox, the **location** field is automatically set to the name of the jukebox. The field can be manually updated using NetWorker Administration or `mmlocate`.

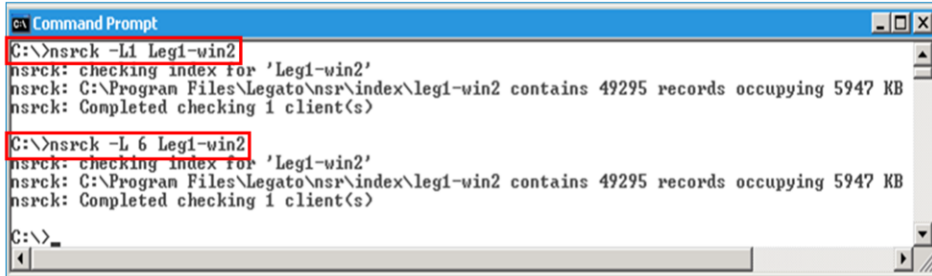
mmlocate syntax:

`mmlocate [-options] [location]`

The *location* argument specifies what to set the location to or which volumes to manage based on location. The default (no options/arguments) lists all volumes and their location values.

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Performing a CFI Consistency Check: nsrck



```
C:\>nsrck -L1 Leg1-win2
nsrck: checking index for 'Leg1-win2'
nsrck: C:\Program Files\Legato\nsr\index\leg1-win2 contains 49295 records occupying 5947 KB
nsrck: Completed checking 1 client(s)

C:\>nsrck -L 6 Leg1-win2
nsrck: checking index for 'Leg1-win2'
nsrck: C:\Program Files\Legato\nsr\index\leg1-win2 contains 49295 records occupying 5947 KB
nsrck: Completed checking 1 client(s)

C:\>_
```

| Level | Description |
|-------|---|
| -L1 | Merge the journal with the index header |
| -L2 | Clean up cancelled saves and rebuild the index header |
| -L3 | Cross-check the client file index with the media database |
| -L4 | Check the key files |
| -L5 | Verify the list of save times against key files |
| -L6 | Rebuild the key files |
| -L7 | Recover the client file index from available backup media |



Use `nsrck` to check, recover, or remove a client file index. `nsrck` also cross-checks the media database with the contents of each CFI. `nsrck -L 3` is automatically invoked by `nsrim` at the end of group backups. Also, each time the NetWorker server starts, it runs `nsrck -L 1`.

nsrck syntax:

```
nsrck [ -L level ] [ -options ] [ clientname ]
```

With no arguments, `nsrck` performs a level 3 check of all CFIs.

The slide shows the seven levels of consistency checking that `nsrck` can perform. Each level incorporates the actions of the lower levels.

Level 7 is different from all other levels in that it is used only for recovery of a CFI. This level is discussed in the module, *Recovering a NetWorker Server*.

Using Scanner to Restore NetWorker Control Data

| Command | Operation |
|--|--|
| <code>scanner device</code> | List all save sets on the volume in the device. |
| <code>scanner -m device</code> | Populate the media database with volume and save set information from the volume. |
| <code>scanner -i device</code> | Populate the media database with volume and save set information. Additionally, populate the CFIs. |
| <code>scanner -i -S ssid \ device</code> | Restrict the operation of the <code>-i</code> option to the specified save set. Multiple <code>-S</code> arguments may be specified. |

While `scanner` is useful for rebuilding NetWorker database information for selected volumes or save sets, recovery of the entire media database or a client file index should be performed using `mmrecov` and `nsrck -L7`, respectively.

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`scanner` can perform numerous functions. Before executing `scanner`, you must load a volume into a NetWorker device. You then provide the pathname of the device as an argument to `scanner`, which is executed on the storage controlling the device.

With no options, `scanner` reads the entire volume and displays a list of save sets found. Information displayed includes save set name, SSID, and date and time of the backup. Additionally any media errors that occur will be reported as well.

The `-m` option causes `scanner` to read the entire volume, creating save set records in the media database for any save sets not currently tracked. If the media database does not have a volume record for the volume being scanned, a volume record is created.

When the `-i` option is used, `scanner` populates the media database with volume and save set information, just like with `-m`, but additionally populates the appropriate client file indexes with file information read from each save set on the volume. This operation can be very time consuming if there are many save sets with lots of files.

When used in combination with the `-i` option, `-S ssid` is used to restrict which save set(s) the operation is performed on. For example, to populate a CFI with the list of files from save sets 1289372 and 1236738, located on a volume in device `\\.\Tape1`, the command would be:

```
scanner -i -S 1289372 -S 1236738 \\.\Tape1
```

To recover the entire media database or an entire CFI, you should use `mmrecov` and `nsrck -L7`, respectively. These are discussed in the module, *Recovering a NetWorker Server*.

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scanner Examples

I don't need this save set anymore.

```
C:\>mminfo -v -q "name=c:\NUTemp , level=incr"
time                size ssid          fl  lvl name
11PM.001            4 B 2496202421      cb  incr C:\NUTemp
11PM.001            7 KB 1909089493       cb  incr C:\NUTemp
11PM.001.RO         4 B 2496202421      cb  incr C:\NUTemp
11PM.001.RO         7 KB 1909089493       cb  incr C:\NUTemp
11PM.001.RO         4 B 1976109659      cb  incr C:\NUTemp
11PM.001.RO         7 KB 1909089493       cb  incr C:\NUTemp

C:\>nsrmm -d -S 2496202421
Delete file and media index entries for save set 2496202421

C:\>mminfo -v -q "name=c:\NUTemp , level=incr"
time                size ssid          fl  lvl name
11PM.001            4 B 1976109659      cb  incr C:\NUTemp
11PM.001            7 KB 1909089493       cb  incr C:\NUTemp
11PM.001.RO         4 B 2496202421      cb  incr C:\NUTemp
11PM.001.RO         7 KB 1909089493       cb  incr C:\NUTemp

C:\>nsrmm
adv_file disk 11PM.001.RO mounted on c:\Adv_File
adv_file disk 11PM.001 mounted on c:\Adv_File, write enabled
LTO Ultrium tape DF02401 mounted on rd-Leg1-sun2/dev/rat/4cbn, write enabled
LTO Ultrium tape DF02401 mounted on rd-Leg1-sun2/dev/rat/5cbn, write enabled
(nothing) mounted on LTO Ultrium tape \\.Tape1

C:\>scanner -m -S 2496202421 c:\Adv_File
8936:scanner: using c:\Adv_File as the device name
8939:scanner: adv_file disk 11PM.001 on c:\Adv_File
8939:scanner: adv_file disk 11PM.001 already exists in the media index
8945:scanner: ssid 2496202421: scan complete
8786:scanner: ssid 2496202421: 1 KB, 0 file(s)

C:\>mminfo -v -q "name=c:\NUTemp , level=incr"
time                size ssid          fl  lvl name
11PM.001            4 B 2496202421      cr  incr C:\NUTemp
11PM.001            7 KB 1909089493       cb  incr C:\NUTemp
11PM.001.RO         4 B 2496202421      cr  incr C:\NUTemp
11PM.001.RO         7 KB 1909089493       cb  incr C:\NUTemp
11PM.001.RO         4 B 1976109659      cb  incr C:\NUTemp
11PM.001.RO         7 KB 1909089493       cb  incr C:\NUTemp

C:\>scanner -i -S 2496202421 c:\Adv_File
8936:scanner: scanning adv_file disk 11PM.001 on c:\Adv_File
8939:scanner: adv_file disk 11PM.001 already exists in the media index
8945:scanner: ssid 2496202421: scan complete
8786:scanner: ssid 2496202421: 1 KB, 0 file(s)

C:\>mminfo -v -q "name=c:\NUTemp , level=incr"
time                size ssid          fl  lvl name
11PM.001            4 B 2496202421      cb  incr C:\NUTemp
11PM.001            7 KB 1909089493       cb  incr C:\NUTemp
11PM.001.RO         4 B 2496202421      cb  incr C:\NUTemp
11PM.001.RO         7 KB 1909089493       cb  incr C:\NUTemp
11PM.001.RO         4 B 1976109659      cb  incr C:\NUTemp
11PM.001.RO         7 KB 1909089493       cb  incr C:\NUTemp
```

ARGHHH! I deleted the wrong one!!!

Where is the volume I need for recovery?

Whoops! I think it also needs to be browsable.

That looks good.

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The following scenario is presented in the slide:

1. A recent full backup of a save set is not needed because the data was corrupted before the backup took place. It was written to a file device and needs to be deleted to free up space. `mminfo` is used to determine the SSID of the save set.
2. `nsrmm` is used to delete the save set record. Unfortunately, the administrator specifies the wrong SSID. `mminfo` is executed again just to verify that the save set is indeed gone. It is now necessary to rebuild the deleted save set record.
3. `nsrmm`, with no arguments, is used to locate the volume containing the save set. From the output, it is determined that the volume is already loaded in device `C:\Adv_File`. If the volume were in an autochanger, `nsrjb` would be used instead of `nsrmm`.
4. `scanner` is used to recreate the media database save set record. The output is redirected because when the `-m` option is used, `scanner` oddly enough generates a recover stream that is not needed in this situation.
5. The administrator runs `mminfo` to see if the save set is once again being tracked and discovers that although the save set record is back, the save set is not browsable. The save set needs to be returned to its original status, which was browsable.
6. `scanner` is executed again, but with the `-i` option. Lastly, `mminfo` is used to verify that the save set information is completely and properly restored.

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Lab Exercise 7-2: NetWorker Databases - Part 2



In this lab you will manipulate save sets and volume details in the Media database.

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In this lab, you will:

- Manipulate save sets
- Manipulate volumes

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Module 7: NetWorker Database Management

Lesson 3 Summary

During this lesson the following topics were covered:

- Using nsrmm and NetWorker Administration to manage save set and volume records
- Performing a CFI consistency check
- Using scanner to restore NetWorker control data



This lesson covered managing save set and volume records, performing a CFI consistency check, and restoring NetWorker control data with scanner.

Module 7: Summary

Key points covered in this module:

- The function and content of the media database and a client file index (CFI)
- The volume selection process when performing a backup
- How to query and manage CFI's and the media database using the NetWorker administration GUI
- How to query and manage CFI's and the media database using NetWorker command-line utilities



This module covered the management of the media database and client file indexes.