NetApp

About tape drives

ONTAP 9

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About tape drives

Qualified tape drives overview

You must use a qualified tape drive that has been tested and found to work properly on a storage system. You can follow tape aliasing and also enable tape reservations to ensure that only one storage system accesses a tape drive at any particular time.

A qualified tape drive is a tape drive that has been tested and found to work properly on storage systems. You can qualify tape drives for existing ONTAP releases by using the tape configuration file.

Format of the tape configuration file

The tape configuration file format consists of fields such as vendor ID, product ID, and details of compression types for a tape drive. This file also consists of optional fields for enabling the autoload feature of a tape drive and changing the command timeout values of a tape drive.

The following table displays the format of the tape configuration file:

Item	Size	Description
`vendor_id` (string)	up to 8 bytes	The vendor ID as reported by the `SCSI Inquiry` command.
`product_id`(string)	up to 16 bytes	The product ID as reported by the `SCSI Inquiry` command.
`id_match_size`(number)		The number of bytes of the product ID to be used for matching to detect the tape drive to be identified, beginning with the first character of the product ID in the Inquiry data.
`vendor_pretty` (string)	up to 16 bytes	If this parameter is present, it is specified by the string displayed by the command, `storage tape show -device-names`; otherwise, INQ_VENDOR_ID is displayed.
`product_pretty`(string)	up to 16 bytes	If this parameter is present, it is specified by the string displayed by the command, `storage tape show -device-names`; otherwise, INQ_PRODUCT_ID is displayed.

The *vendor_pretty* and *product_pretty* fields are optional, but if one of these fields has a value, the other must also have a value.

The following table explains the description, density code, and compression algorithm for the various compression types, such as `l`, `m`, `h`, and `a`:

Item	Size	Description
`{l	m	h	a}_description=(string)`	up to 24 bytes	The string to print for the nodeshell command, `sysconfig -t`, that describes characteristics of the particular density setting.
`{l	m	h	a}_density=(hex codes)`		The density code to be set in the SCSI mode page block descriptor corresponding to the desired density code for l, m, h, or a.
`{l	m	h	a}_algorithm=(hex codes)`		The compression algorithm to be set in the SCSI Compression Mode Page corresponding to the density code and the desired density characteristic.

The following table describes the optional fields available in the tape configuration file:

Field	Description
`autoload=(Boolean yes/no)`	This field is set to `yes` if the tape drive has an automatic loading feature; that is, after tape cartridge is inserted, the tape drive becomes ready without the need to execute a `SCSI load` (start/stop unit) command. The default for this field is `no`.
`cmd_timeout_0x`	Individual timeout value. You must use this field only if you want to specify a different timeout value from the one being used as a default by the tape driver. The sample file lists the default SCSI command timeout values used by the tape drive. The timeout value can be expressed in minutes (m), seconds (s), or milliseconds (ms). ⓘ You should not change this field.

You can download and view the tape configuration file from the NetApp Support Site.

Example of a tape configuration file format

The tape configuration file format for the HP LTO5 ULTRIUM tape drive is as follows:

`vendor_id="HP"`

```
product_id="Ultrium 5-SCSI"

id_match_size=9

vendor_pretty="Hewlett-Packard"

product_pretty="LTO-5"

l_description="LTO-3(ro)/4 4/800GB"

l_density=0x00

l_algorithm=0x00

m_description="LTO-3(ro)/4 8/1600GB cmp"

m_density=0x00

m_algorithm=0x01

h_description="LTO-5 1600GB"

h_density=0x58

h_algorithm=0x00

a_description="LTO-5 3200GB cmp"

a_density=0x58

a_algorithm=0x01

autoload="yes"
```

Related information

NetApp Tools: Tape Device Configuration Files

How the storage system qualifies a new tape drive dynamically

The storage system qualifies a tape drive dynamically by matching its vendor ID and product ID with the information contained in the tape qualification table.

When you connect a tape drive to the storage system, it looks for a vendor ID and product ID match between the information obtained during tape discovery and the information in the internal tape qualification table. If the storage system discovers a match, it marks the tape drive as qualified and can access the tape drive. If the storage system cannot find a match, the tape drive remains in the unqualified state and is not accessed.

Tape devices overview

Tape devices overview

A tape device is a representation of a tape drive. It is a specific combination of rewind type and compression capability of a tape drive.

A tape device is created for each combination of rewind type and compression capability. Therefore, a tape drive or tape library can have several tape devices associated with it. You must specify a tape device to move, write, or read tapes.

When you install a tape drive or tape library on a storage system, ONTAP creates tape devices associated with the tape drive or tape library.

ONTAP detects tape drives and tape libraries and assigns logical numbers and tape devices to them. ONTAP detects the Fibre Channel, SAS, and parallel SCSI tape drives and libraries when they are connected to the interface ports. ONTAP detects these drives when their interfaces are enabled.

Tape device name format

Each tape device has an associated name that appears in a defined format. The format includes information about the type of device, rewind type, alias, and compression type.

The format of a tape device name is as follows:

`rewind_type st alias_number compression_type`

`rewind_type` is the rewind type.

The following list describes the various rewind type values:

- **r**

  ONTAP rewinds the tape after it finishes writing the tape file.

- **nr**

  ONTAP does not rewind the tape after it finishes writing the tape file. You must use this rewind type when you want to write multiple tape files on the same tape.

- **ur**

  This is the unload/reload rewind type. When you use this rewind type, the tape library unloads the tape when it reaches the end of a tape file, and then loads the next tape, if there is one.

  You must use this rewind type only under the following circumstances:

  - The tape drive associated with this device is in a tape library or is in a medium changer that is in the library mode.
  - The tape drive associated with this device is attached to a storage system.
  - Sufficient tapes for the operation that you are performing are available in the library tape sequence defined for this tape drive.

> ℹ️ If you record a tape using a no-rewind device, you must rewind the tape before you read it.

`st` is the standard designation for a tape drive.

`alias_number` is the alias that ONTAP assigns to the tape drive. When ONTAP detects a new tape drive, ONTAP assigns an alias to the tape drive.

`compression_type` is a drive-specific code for the density of data on the tape and the type of compression.

The following list describes the various values for `compression_type`:

* **a**

  Highest compression

* **h**

  High compression

* **m**

  Medium compression

* **l**

  Low compression

Examples

`nrst0a` specifies a no-rewind device on tape drive 0 using the highest compression.

Example of a listing of tape devices

The following example shows the tape devices associated with HP Ultrium 2-SCSI:

```
        Tape drive (fc202_6:2.126L1)  HP       Ultrium 2-SCSI
    rst0l  -  rewind device,          format is: HP (200GB)
    nrst0l -  no rewind device,       format is: HP (200GB)
    urst0l -  unload/reload device,   format is: HP (200GB)
    rst0m  -  rewind device,          format is: HP (200GB)
    nrst0m -  no rewind device,       format is: HP (200GB)
    urst0m -  unload/reload device,   format is: HP (200GB)
    rst0h  -  rewind device,          format is: HP (200GB)
    nrst0h -  no rewind device,       format is: HP (200GB)
    urst0h -  unload/reload device,   format is: HP (200GB)
    rst0a  -  rewind device,          format is: HP (400GB w/comp)
    nrst0a -  no rewind device,       format is: HP (400GB w/comp)
    urst0a -  unload/reload device,   format is: HP (400GB w/comp)
```

The following list describes the abbreviations in the preceding example:

- GB—Gigabytes; this is the capacity of the tape.
- w/comp—With compression; this shows the tape capacity with compression.

Supported number of simultaneous tape devices

ONTAP supports a maximum of 64 simultaneous tape drive connections, 16 medium changers, and 16 bridge or router devices for each storage system (per node) in any mix of Fibre Channel, SCSI, or SAS attachments.

Tape drives or medium changers can be devices in physical or virtual tape libraries or stand-alone devices.

> ⓘ Although a storage system can detect 64 tape drive connections, the maximum number of backup and restore sessions that can be performed simultaneously depends upon the scalability limits of the backup engine.

Related information

Scalability limits for dump backup and restore sessions

Tape aliasing

Tape aliasing overview

Aliasing simplifies the process of device identification. Aliasing binds a physical path name (PPN) or a serial number (SN) of a tape or a medium changer to a persistent, but modifiable alias name.

The following table describes how tape aliasing enables you to ensure that a tape drive (or tape library or medium changer) is always associated with a single alias name:

Scenario	Reassigning of the alias
When the system reboots	The tape drive is automatically reassigned its previous alias.
When a tape device moves to another port	The alias can be adjusted to point to the new address.
When more than one system uses a particular tape device	The user can set the alias to be the same for all the systems.

> ⓘ When you upgrade from Data ONTAP 8.1.x to Data ONTAP 8.2.x, the tape alias feature of Data ONTAP 8.2.x modifies the existing tape alias names. In such a case you might have to update the tape alias names in the backup application.

Assigning tape aliases provides a correspondence between the logical names of backup devices (for example, st0 or mc1) and a name permanently assigned to a port, a tape drive, or a medium changer.

> ⓘ st0 and st00 are different logical names.

$\textcircled{\scriptsize i}$ Logical names and serial numbers are used only to access a device. After the device is accessed, it returns all error messages by using the physical path name.

There are two types of names available for aliasing: physical path name and serial number.

What physical path names are

Physical path names (PPNs) are the numerical address sequences that ONTAP assigns to tape drives and tape libraries based on the SCSI-2/3 adapter or switch (specific location) they are connected to the storage system. PPNs are also known as electrical names.

PPNs of direct-attached devices use the following format: `host_adapter. device_id_lun`

$\textcircled{\scriptsize i}$ The LUN value is displayed only for tape and medium changer devices whose LUN values are not zero; that is, if the LUN value is zero the `lun` part of the PPN is not displayed.

For example, the PPN 8.6 indicates that the host adapter number is 8, the device ID is 6, and the logical unit number (LUN) is 0.

SAS tape devices are also direct-attached devices. For example, the PPN 5c.4 indicates that in a storage system, the SAS HBA is connected in slot 5, SAS tape is connected to port C of the SAS HBA, and the device ID is 4.

PPNs of Fibre Channel switch-attached devices use the following format: `switch:port_id. device_id_lun`

For example, the PPN MY_SWITCH:5.3L2 indicates that the tape drive connected to port 5 of a switch called MY_SWITCH is set with device ID 3 and has the LUN 2.

The LUN (logical unit number) is determined by the drive. Fibre Channel, SCSI tape drives and libraries, and disks have PPNs.

PPNs of tape drives and libraries do not change unless the name of the switch changes, the tape drive or library moves, or the tape drive or library is reconfigured. PPNs remain unchanged after reboot. For example, if a tape drive named MY_SWITCH:5.3L2 is removed and a new tape drive with the same device ID and LUN is connected to port 5 of the switch MY_SWITCH, the new tape drive would be accessible by using MY_SWITCH:5.3L2.

What serial numbers are

A serial number (SN) is a unique identifier for a tape drive or a medium changer. ONTAP generates aliases based on SN instead of the WWN.

Since the SN is a unique identifier for a tape drive or a medium changer, the alias remains the same regardless of the multiple connection paths to the tape drive or medium changer. This helps storage systems to track the same tape drive or medium changer in a tape library configuration.

The SN of a tape drive or a medium changer does not change even if you rename the Fibre Channel switch to which the tape drive or medium changer is connected. However, in a tape library if you replace an existing tape drive with a new one, then ONTAP generates new aliases because the SN of the tape drive changes. Also, if you move an existing tape drive to a new slot in a tape library or remap the tape drive's LUN, ONTAP

generates a new alias for that tape drive.

> ⓘ You must update the backup applications with the newly generated aliases.

The SN of a tape device uses the following format: `SN[xxxxxxxxxx]L[X]`

`x` is an alphanumeric character and `Lx` is the LUN of the tape device. If the LUN is 0, the `Lx` part of the string is not displayed.

Each SN consists of up to 32 characters; the format for the SN is not case-sensitive.

Considerations when configuring multipath tape access

You can configure two paths from the storage system to access the tape drives in a tape library. If one path fails, the storage system can use the other paths to access the tape drives without having to immediately repair the failed path. This ensures that tape operations can be restarted.

You must consider the following when configuring multipath tape access from your storage system:

- In tape libraries that support LUN mapping, for multipath access to a LUN group, LUN mapping must be symmetrical on each path.

  Tape drives and media changers are assigned to LUN groups (set of LUNs that share the same initiator path set) in a tape library. All tape drives of a LUN group must be available for backup and restore operations on all multiple paths.

- A maximum of two paths can be configured from the storage system to access the tape drives in a tape library.

- Multipath tape access supports load balancing. Load balancing is disabled by default.

In the following example, the storage system accesses LUN group 0 through two initiator paths: 0b and 0d. In both these paths, the LUN group has the same LUN number, 0, and LUN count, 5. The storage system accesses LUN group 1 through only one initiator path, 3d.

```
STSW-3070-2_cluster::> storage tape library config show

Node                          LUN Group   LUN Count  Library Name  Library
Target Port  Initiator
----------------------- ----------- ---------- -------------
-------------------- -----
STSW-3070-2_cluster-01        0        5           IBM 3573-TL_1
510a09800000412d      0b

0d
                              1        2           IBM 3573-TL_2
50050763124b4d6f      3d

3 entries were displayed
```

For more information, see the man pages.

How you add tape drives and libraries to storage systems

You can add tape drives and libraries to storage system dynamically (without taking the storage system offline).

When you add a new medium changer, the storage system detects its presence and adds it to the configuration. If the medium changer is already referenced in the alias information, no new logical names are created. If the library is not referenced, the storage system creates a new alias for the medium changer.

In a tape library configuration, you must configure a tape drive or medium changer on LUN 0 of a target port for ONTAP to discover all medium changers and tape drives on that target port.

What tape reservations are

Multiple storage systems can share access to tape drives, medium changers, bridges, or tape libraries. Tape reservations ensure that only one storage system accesses a device at any particular time by enabling either the SCSI Reserve/Release mechanism or SCSI Persistent Reservations for all tape drives, medium changers, bridges, and tape libraries.

(i) All the systems that share devices in a library, whether switches are involved or not, must use the same reservation method.

The SCSI Reserve/Release mechanism for reserving devices works well under normal conditions. However, during interface error recovery procedures, reservations can be lost. If this occurs, initiators other than the reserved owner can access the device.

Reservations made with SCSI Persistent Reservations are not affected by error recovery mechanisms, such as loop reset or target reset; however, not all devices implement SCSI Persistent Reservations correctly.