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About this guide

This guide provides information about:

• Configuring UNIX™ and Linux for use with the HP D2D Backup System
• Controlling an HP D2D Backup System

Intended audience

This guide is intended for network administrators and users with knowledge of:

• Ethernet networks
• UNIX
• Linux

Related documentation

The following documents [and websites] provide related information:

• HP StorageWorks D2D Backup System user guide, available in 13 languages
• HP StorageWorks D2D Backup System installation poster, available in 4 languages

You can find these documents from the Manuals page of the HP Business Support Center website:

http://www.hp.com/support/manuals

Search on the product name.

Document conventions and symbols

Table 1 Document conventions

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<th>Convention</th>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue text: Table 1</td>
<td>Cross-reference links and e-mail addresses</td>
</tr>
<tr>
<td>Blue, underlined text: <a href="http://www.hp.com">http://www.hp.com</a></td>
<td>website addresses</td>
</tr>
<tr>
<td><strong>Bold text</strong></td>
<td>• Keys that are pressed</td>
</tr>
<tr>
<td></td>
<td>• Text typed into a GUI element, such as a box</td>
</tr>
<tr>
<td></td>
<td>• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes</td>
</tr>
<tr>
<td><em>Italic text</em></td>
<td>Text emphasis</td>
</tr>
</tbody>
</table>

D2D Backup System 7
### Element Convention

<table>
<thead>
<tr>
<th>Convention</th>
<th>Element</th>
</tr>
</thead>
</table>
| Monospace text       | • File and directory names  
|                      | • System output  
|                      | • Code  
|                      | • Commands, their arguments, and argument values  |
| Monospace, italic text| • Code variables  
|                      | • Command variables  |
| Monospace, bold text | Emphasized monospace text  |

⚠️ **WARNING!**  
Indicates that failure to follow directions could result in bodily harm or death.

⚠️ **CAUTION:**  
Indicates that failure to follow directions could result in damage to equipment or data.

💡 **IMPORTANT:**  
Provides clarifying information or specific instructions.

📝 **NOTE:**  
Provides additional information.

💡 **TIP:**  
Provides helpful hints and shortcuts.

---

## HP technical support

For worldwide technical support information, see the HP support website:

[http://www.hp.com/support](http://www.hp.com/support)

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
Detailed questions

Customer self repair

HP customer self repair (CSR) programs allow you to repair your StorageWorks product. If a CSR part needs replacing, HP ships the part directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your HP-authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider. For North America, see the CSR website:

http://www.hp.com/go/selfrepair

Product warranties

For information about HP StorageWorks product warranties, see the warranty information website:

http://www.hp.com/go/storagewarranty

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

http://www.hp.com/go/e-updates

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

HP websites

For additional information, see the following HP websites:

• http://www.hp.com
• http://www.hp.com/go/storage
• http://www.hp.com/go/connect
• http://www.hp.com/go/ebs
• http://www.hp.com/service_locator
• http://www.hp.com/support/manuals
• http://www.hp.com/support/downloads

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To make comments and suggestions about product documentation, please send a message to storagedocs.feedback@hp.com. All submissions become the property of HP.
1 Introduction

Overview

The HP StorageWorks D2D Backup System is a disk-based storage appliance for backing up host network servers or PCs to target devices on the appliance. These devices are configured as either Network-Attached Storage (NAS) or Virtual Tape Library (VTL) targets for backup applications.

The total number of "devices" provided by a D2D appliance is split between VTL and NAS devices. For example: an HP D2D4000 Series device supports the creation of a maximum of 16 devices; an HP D2D4112 device supports the creation of a maximum of 24 devices; an HP D2D2502i device supports the creation of a maximum of 4 devices, an HP D2D2503i device supports the creation of a maximum of 6 devices and an HP D2D2504i device supports the creation of a maximum of 8 devices. These devices may be all VTL, all NAS or any combination of NAS and VTL devices.

NAS targets for backup applications

Support for both CIFS and NFS protocols means that NAS target devices may be created as backup targets for both Windows and UNIX/Linux hosts, and may be used with most backup applications that support backup to disk. NAS targets on an HP D2D Backup System provide network file share access that is optimized for backup to disk. They should not be used for general purpose file storage.

Virtual Tape Library targets for backup applications

The backup target appears to the host as an Ultrium Tape Library and requires a backup application that supports backup to tape. Tape Library emulation type is selected during initial configuration and this determines the number of cartridge slots and embedded tape drives that may be configured for the device. The default configuration for HP D2D2500 Series appliances emulates the HP StorageWorks 1/8 G2 Ultrium Tape Autoloader. The default configuration for HP D2D4000 Series and HP D2D4112 appliances emulates the HP StorageWorks MSL2024 Tape Library. Virtual Tape Libraries provide considerable flexibility for a variety of backup rotation schemes.

Hardware installation

Please refer to the printed poster and the HP StorageWorks D2D Backup System User Guide on the HP StorageWorks CD-ROM for detailed instructions on installing the HP D2D Backup System and optional tape drive. The User Guide also describes how to use the Web Management Interface.

Software requirements

1. Refer to http://www.hp.com/go/connect or http://www.hp.com/go/ebs to find out which versions of UNIX and Linux are supported and which backup applications are supported.

2. Make sure that your operating system is patched with the latest service packs.

3. Upgrade your backup application to the latest version.
Configuration stages

There are two stages to configuration:
• Discover the HP D2D Backup System on the network, give it a name and, if DHCP is not supported, assign network settings
• Create a base configuration to get started

This guide describes how to perform these two stages.
Overview

The HP StorageWorks D2D Backup System must be assigned an IP address before an iSCSI connection or access to the Web Management Interface can be made.

- If the network has a DHCP server, the HP StorageWorks D2D Backup System will be configured automatically with an IP address
- If no DHCP server is available, the HP StorageWorks D2D Backup System must be configured manually using the HP Discovery tool, provided on the HP StorageWorks CD-ROM

Using DHCP to discover the HP D2D Backup System

The IP address and other network settings are assigned automatically when you connect the HP D2D Backup System to the network. You only need to know the serial number of the HP D2D Backup System to complete the installation and create a library configuration. The serial number can be found on a label on the top of the unit.

In the web browser type in: D2D-<serial number>

If you cannot connect to the HP D2D Backup System using the Web Management interface:

- Check that you are using a supported web browser and that Active Scripting or JavaScript is enabled. See the HP StorageWorks D2D Backup System User Guide for more information about recommended web browser settings.
- Check that the network light is on, on the front of the HP StorageWorks D2D Backup System as this indicates an IP address has been configured.
- Try connecting to the HP StorageWorks D2D Backup System using the DHCP assigned IP address instead.

Using the HP Discovery tool

The HP Discovery tool is a java application for configuring HP StorageWorks D2D Backup Systems. The tool can be run from HP StorageWorks CD-ROM by selecting HPdiscovery in the UNIX folder or by launching it from a console as follows:

localhost:~ $ cd /media/cdrom/UNIX/
localhost:~ $ ./HPdiscovery

NOTE:
Java must be installed on the system for the HP Discovery tool to work. Java can be installed using the package manager or by visiting http://java.sun.com
When the HP Discovery tool is run it will find any HP StorageWorks D2D Backup Systems on the local network and list them by name. The name displayed by the HP Discovery tool should match the label on the top of the HP StorageWorks D2D Backup System.

![HP StorageWorks D2D Backup System - Discovery](image)

Select a device below and click configure to setup the device, or click beacon to turn on the LEDs on the device. If no devices are found or to refresh the list click rescan.

<table>
<thead>
<tr>
<th>Host Name</th>
<th>IP Address</th>
<th>Domain Name</th>
<th>DHCP</th>
</tr>
</thead>
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<tr>
<td>D2DB5-C201FC0A3B</td>
<td>192.168.0.12</td>
<td>mydomain.local</td>
<td>✔</td>
</tr>
<tr>
<td>D2DB5-HU1646C83R0</td>
<td>192.168.0.11</td>
<td>mydomain.local</td>
<td>✔</td>
</tr>
</tbody>
</table>

**NOTE:**
If no HP StorageWorks D2D Backup Systems are discovered, ensure that UDP port 8106 is open in any firewalls that are running.

---

To identify the required device

If you have multiple HP StorageWorks D2D Backup Systems on the network you can use the **Beacon** button to help identify the unit that you wish to configure. Select a device in the list and click **Beacon**. The lights on the front of the selected HP StorageWorks D2D Backup System will flash.
To configure the network settings of a device

1. Select the device in the list and click **Configure**.

2. Enter the network details and click **Configure** to send the details to the HP StorageWorks D2D Backup System. The list of available HP StorageWorks D2D Backup System on the network will be displayed again, this time with the updated network settings shown.

3. Make a note of the IP address of the HP StorageWorks D2D Backup System because it will be required during iSCSI configuration.
Overview

This chapter describes how to configure the HP D2D Backup System for use with the following Linux operating systems:

- SuSE Linux Enterprise Server 9 (x86, x64 and IA64)
- SuSE Linux Enterprise Server 10 (x86, x64 and IA64)
- RedHat Advanced Server 4 (x86, x64 and IA64)
- RedHat Advanced Server 5 (x86, x64 and IA64)

**NOTE:**
HP StorageWorks D2D Backup Systems with iSCSI interfaces are only supported with SLES 10 SP1 and RedHat 5 or greater.

Configuring the HP D2D Backup System for iSCSI

How to install the Open-iSCSI module

**SLES 10**

1. Open the Software Management tool from within YaST Control Center.
2. Select and install the `open-iscsi` module.

**RedHat 5**

1. Open the Package Manager tool.
2. Select and install the `iscsi-initiator-utils` package.

How to configure the Open-iSCSI module using the D2Dsetup script

Use the D2Dsetup script to configure the Open-iSCSI module automatically. You must provide the IP address as a parameter to the script.

```
localhost:~ $ D2Dsetup <IP_address>
```

If you wish to configure CHAP authentication, you should also provide the user name and password for the initiator and the target, if required.

```
localhost:~ $ D2Dsetup <Initiator_CHAP_Username> <Initiator_CHAP_Password> <Target_CHAP_Username> <Target_CHAP_Password> <IP_address>
```

The response from the HP D2D Backup System will be similar to the following:
How to configure the Open-iSCSI module manually using the command line

The command line tool for configuring the Open-iSCSI package is iscsiadm. Detailed instructions for iscsiadm can be found in the iscsiadm(8) man documents. The following instructions guide the user through the following steps required to connect a Linux host to an HP StorageWorks D2D Backup System.

- Discover iSCSI target devices on the HP StorageWorks D2D Backup System
- Configure CHAP authentication
- Configure automatic iSCSI logins
- Verify the HP StorageWorks D2D Backup System is connected

1. To discover available iSCSI target devices on an HP StorageWorks D2D Backup System type the following, where x.x.x.x is the IP address of the HP StorageWorks D2D Backup System:

    localhost:~ $ iscsiadm --mode discovery --type sendtargets --portal x.x.x.x | grep x.x.x.x

    The response from the HP StorageWorks D2D Backup System will be two iSCSI Qualified Names (IQN) for each available iSCSI target. For example:

    [7db5cb] x.x.x.x:3260,1 iqn.1986-03.com.hp:storage.d2d.cr204c84d5.500110aa76f68fc6.library1.robotics
    [ebf06d] x.x.x.x:3260,1 iqn.1986-03.com:hp:storage.d2d.cr204c84d5.500110a05ed5497b.library1.drive1

    In the following configuration the parameter <iqn...> should be replaced with the IQN value discovered in this step. Each command will need to be repeated for each IQN discovered.

    NOTE:
    Note: If iscsiadm does not return a list of iSCSI targets, ensure that port 3260 is open in any running firewalls.
2. To optionally configure CHAP authentication you should update the iSCSI Authentication details in the web management GUI, as shown below.

![iSCSI Authentication GUI](image)

Once the HP StorageWorks D2D Backup System has been modified, the operating system should be modified as follows for each available target discovered in step 1:

**NOTE:**

In the following commands, items in parentheses are user-defined strings. Substitute the appropriate information for `<iqn...>`, `<chap_password>` and `<chap_username>`.

```
localhost:~ $ iscsiadm --mode node --targetname <iqn...> --portal x.x.x.x:3260 --op update --name node.session.auth.authmethod --value CHAP
localhost:~ $ iscsiadm --mode node --targetname <iqn...> --portal x.x.x.x:3260 --op update --name node.session.auth.username --value <chap_username>
localhost:~ $ iscsiadm --mode node --targetname <iqn...> --portal x.x.x.x:3260 --op update --name node.session.auth.password --value <chap_password>
If the target is required to logon to the Initiator then the following two commands are also required:

localhost:~ $ iscsiadm --mode node --targetname <iqn...> --portal x.x.x.x:3260 --op update --name node.session.auth.username_in --value <chap_username>
localhost:~ $ iscsiadm --mode node --targetname <iqn...> --portal x.x.x.x:3260 --op update --name node.session.auth.password_in --value <chap_password>
```

3. The iSCSI nodes may be configured to log in automatically on system startup. The configuration settings for each available target are modified as follows:

```
localhost:~ $ iscsiadm --mode node --targetname <iqn...> --portal x.x.x.x:3260 --op update --name node.conn[0].startup --value automatic
```

4. The Linux host must now log in to each iSCSI target device. This is done using the three command, where the IQN value matches those returned by the `iscsiadm` discovery command above:

```
localhost:~ $ iscsiadm --mode node --targetname <iqn...> --portal x.x.x.x:3260 --login
```
5. To enable the iSCSI target devices to remain persistent across system reboots, the open-iscsi service must be configured to run at system startup. This can be done by issuing the following command:

**SLES 10**

```
localhost:~ $ chkconfig open-iscsi on
```

**RedHat 5**

```
localhost:~ $ chkconfig iscsi on
```

6. To verify that this configuration change has been accepted, use the following command:

**SLES 10**

```
localhost:~ $ chkconfig --list open-iscsi
open-iscsi 0:off 1:off 2:off 3:on 4:off 5:on 6:off
```

**RedHat 5**

```
localhost:~ $ chkconfig --list iscsi
iscsi 0:off 1:off 2:off 3:on 4:off 5:on 6:off
```

7. To verify that the Linux machine now has access to the target device, use the following command:

```
localhost:~ $ cat /proc/scsi/scsi
```

The output of this command will be a list of all the configured SCSI devices on the system, including the HP StorageWorks D2D Backup System. An example output would be:

```
Attached devices:
Host: scsi4 Channel: 00 Id: 00 Lun: 00
  Vendor: HP  Model: MSL G3 Series  Rev: pc81
  Type:  Medium Changer  ANSI SCSI revision: 03
Host: scsi5 Channel: 00 Id: 00 Lun: 00
  Vendor: HP  Model: Ultrium 3-SCSI  Rev: pc81
  Type:  Sequential-Access  ANSI SCSI revision: 03
```

### Configuring the HP StorageWorks D2D Backup System for Fibre Channel

For a Switched Fabric Configuration, zone the individual devices to the host concerned using the virtual device WWNs shown on the GUI.
To verify that the Linux machine now has access to the target device, use the following command:

```bash
localhost:~ $ cat /proc/scsi/scsi
```

The output of this command will be a list of all the configured SCSI devices on the system, including the HP StorageWorks D2D Backup System. An example output would be:

```
Attached devices:
Host: scsi4 Channel: 00 Id: 00 Lun: 00
  Vendor: HP  Model: MSL G3 Series  Rev: pc81
  Type: Medium Changer  ANSI SCSI revision: 03
Host: scsi5 Channel: 00 Id: 00 Lun: 00
  Vendor: HP  Model: Ultrium 3-SCSI  Rev: pc81
  Type: Sequential-Access  ANSI SCSI revision: 03
```

**Configuring the HP D2D Backup System for NAS (NFS)**

The D2D Backup System NAS interface should be configured to use NFS as the Access Protocol when backing up data using Linux.

```bash
localhost:~ $ mount 192.168.0.100:/nas/D2DBackupShare /mnt/D2DBackupShare
```

The D2D Backup System supports NFSv3. To explicitly mount the D2D Backup System using NFSv3, the following syntax should be used:

```bash
localhost:~ $ mount -t nfs -o nfsvers=3 x.x.x.x:/<name of share> <local mount>
```
Controlling an HP StorageWorks D2D Backup System using Linux

The HP StorageWorks D2D Backup System appears to the Linux operating system as a 1x8 G2 autoloader and Ultrium tape drive. The robotics within the autoloader can be controlled from the console using a command called MTX. If the MTX utility is not installed, it can be added using the package manager. The complete MTX manual can also be accessed from any Linux console using the command `man mtx`.

The following examples illustrate how to complete common tasks with the HP StorageWorks D2D Backup System.

- Verify you are controlling the correct library
- Review the media
- Load a cartridge into the tape drive
- Unload a cartridge from the tape drive
- Move a cartridge to the mail slot
- Move a cartridge from the mail slot

### Verify you are controlling the correct library

The robotics of the library will be assigned a generic SCSI device file. To discover the device file assigned, use the following command:

```
localhost:~ $ dmesg | grep -A2 -e "1x8 G2 AUTOLDR" -e "MSL G3 Series"
```

For an MSL 2024 library the output will be similar to this:

```
Vendor: HP        Model: MSL G3 Series Rev: pc81
Type: Medium Changer ANSI SCSI revision: 03
1:0:0:0: Attached scsi generic sg2 type 8
```

In this example the device file that has been assigned is `sg2`. Therefore, the library can be controlled using the device file `/dev/sg2`.

### To verify the device file for the robotics of the library

To verify the correct device file has been determined, the following command should be used:

```
localhost:~ $ mtx -f /dev/sg2 inquiry
```

The output for an MSL 2024 library should be:

```
Product Type: Medium Changer
Vendor ID: 'HP '
Product ID: 'MSL G3 Series '
Revision: 'pc81'
Attached Changer: No
```

### To verify the tape device file for the tape drive

The tape drive(s) of the library will also be assigned a generic SCSI device file(s), along with SCSI tape device file(s). To discover the SCSI tape device file(s) assigned, use the following command:

```
localhost:~ $ dmesg | grep -A 4 "Ultrium"
```

22  Linux (x86, x64 and IA64)
In this example the SCSI tape device file that has been assigned is /dev/st0. To verify the tape device file for the tape drive, the `mt` command should be used:

```
localhost:~ $ mt -f /dev/st0 status
```

The output should be:

```
mt: /dev/st0 : No medium found
```

This indicates that the tape drive files are valid but no media is loaded into the drive.

Reviewing the media in a library

To verify the contents of the media slots within a library, the following command should be used:

```
localhost:~ $ mtx -f /dev/sg2 status
```

The output for a MSL 2024 library with 1 tape drive and 24 cartridges configured would look similar to this:

```
Storage Changer /dev/sg2:1 Drives, 24 Slots
( 1 Import/Export )
Data Transfer Element 0:Empty
Storage Element 1:Full :VolumeTag=72255101
Storage Element 2:Full :VolumeTag=72255102
Storage Element 3:Full :VolumeTag=72255103
Storage Element 4:Full :VolumeTag=72255104
Storage Element 5:Full :VolumeTag=72255105
Storage Element 6:Full :VolumeTag=72255106
Storage Element 7:Full :VolumeTag=72255107
Storage Element 8:Full :VolumeTag=72255108
Storage Element 9:Full :VolumeTag=72255109
Storage Element 10:Full :VolumeTag=72255110A
Storage Element 11:Full :VolumeTag=72255110B
Storage Element 12:Full :VolumeTag=72255110C
Storage Element 13:Full :VolumeTag=72255110D
Storage Element 14:Full :VolumeTag=72255110E
Storage Element 15:Full :VolumeTag=72255110F
Storage Element 16:Full :VolumeTag=722551110
Storage Element 17:Full :VolumeTag=722551111
Storage Element 18:Full :VolumeTag=722551112
Storage Element 19:Full :VolumeTag=722551113
Storage Element 20:Full :VolumeTag=722551114
Storage Element 21:Full :VolumeTag=722551115
Storage Element 22:Full :VolumeTag=722551116
Storage Element 23:Full :VolumeTag=722551117
Storage Element 24:Full :VolumeTag=722551118
Storage element 25 IMPORT/EXPORT:Empty
```

Each data transfer element represents an Ultrium tape drive within the library. Storage elements 1 to 24 represent the 24 configured slots within the library. Storage element 25 represents the import/export slot of the library, also known as the Mail Slot in the HP StorageWorks D2D Backup System Web Management Interface.
Loading a cartridge into a library tape drive

To load a cartridge into the tape drive, the `mtx load` command should be used. For example, to move a cartridge from slot 2 to the first tape drive the command would be:

```
localhost:~ $ mtx -f /dev/sg2 load 2 0
```

Unloading a cartridge from a library tape drive

To unload a cartridge and place it in a storage slot, the `mtx unload` command should be used. For example, to unload a cartridge from the first tape drive and place it in to storage slot 2, the command would be:

```
localhost:~ $ mtx -f /dev/sg2 unload 2 0
```

Moving a cartridge to the library Mail Slot

To move a cartridge to the mail slot for exporting to an attached tape drive, the `mtx transfer` command should be used. For example, to move the cartridge in slot 1 to the mail slot 25, the following command should be used:

```
localhost:~ $ mtx -f /dev/sg2 transfer 1 25
```

Moving a cartridge from the library Mail Slot

To move a cartridge from the mail slot following an import from an attached tape drive, the `mtx transfer` command should be:

```
localhost:~ $ mtx -f /dev/sg2 transfer 25 1
```

Backup and restore files using TAR in Linux

This section describes how to perform a simple backup and recovery of files to an HP StorageWorks D2D Backup System using the console applications; MTX and TAR. In the examples, the autoloader robotics is controlled using generic SCSI device file `sg2` and the autoloader tape drive uses tape device file `st0`. The file to be backed up and restored is the Linux kernel.
Back up the Linux kernel

1. Check to see what media is available.
   
   localhost:~ $ mtx –f /dev/sg2 status

   Storage Changer /dev/sg2:1 Drives, 24 Slots
   ( 1 Import/Export )
   Data Transfer Element 0:Empty
   Storage Element 1:Full :VolumeTag=72255101
   Storage Element 2:Full :VolumeTag=72255102
   Storage Element 3:Full :VolumeTag=72255103
   Storage Element 4:Full :VolumeTag=72255104
   Storage Element 5:Full :VolumeTag=72255105
   Storage Element 6:Full :VolumeTag=72255106
   Storage Element 7:Full :VolumeTag=72255107
   Storage Element 8:Full :VolumeTag=72255108
   Storage Element 9:Full :VolumeTag=72255109
   Storage Element 10:Full :VolumeTag=72255110A
   Storage Element 11:Full :VolumeTag=72255110B
   Storage Element 12:Full :VolumeTag=72255110C
   Storage Element 13:Full :VolumeTag=72255110D
   Storage Element 14:Full :VolumeTag=72255110E
   Storage Element 15:Full :VolumeTag=72255110F
   Storage Element 16:Full :VolumeTag=722551110
   Storage Element 17:Full :VolumeTag=722551111
   Storage Element 18:Full :VolumeTag=722551112
   Storage Element 19:Full :VolumeTag=722551113
   Storage Element 20:Full :VolumeTag=722551114
   Storage Element 21:Full :VolumeTag=722551115
   Storage Element 22:Full :VolumeTag=722551116
   Storage Element 23:Full :VolumeTag=722551117
   Storage Element 24:Full :VolumeTag=722551118
   Storage Element 25 IMPORT/EXPORT:Empty

2. Move the cartridge from slot 1 to the tape drive.
   
   localhost:~ $ mtx –f /dev/sg2 load 1 0

3. Ensure you are in the root directory.
   
   localhost:~ $ cd /

4. Back up the Linux kernel using tar.
   
   localhost:~ $ tar cvf /dev/st2 ./boot/vmlinux*

5. Move the cartridge back to slot 1.
   
   localhost:~ $ mtx –f /dev/sg2 unload 1 0

Restore the Linux kernel

1. Move the cartridge from slot 1 to the first tape drive.
   
   localhost:~ $ mtx –f /dev/sg2 load 1 0

2. Create a temporary folder to restore the backup into.
   
   localhost:~ $ mkdir temp
   localhost:~ $ cd /temp
3. Restore the Linux kernel to the temporary folder.
   `localhost:~ $ tar xvf /dev/st0`

4. Move the cartridge back to slot 1.
   `localhost:~ $ mtx -f /dev/sg2 unload 1 0`

5. Compare the original Linux kernel with the restored Linux kernel.
   `localhost:~ $ cmp /boot/vmlinux* /temp/boot/vmlinux*`
   
   If no differences are found between the two files, no message will be displayed.
Overview

This chapter describes how to configure the HP D2D Backup System for use with the following HP-UX operating systems:

- HP-UX 11i V2 (PA-RISC and IA64)
- HP-UX 11i V3 (PA-RISC and IA64)

**NOTE:**

A block size no larger than 256 KB is strongly recommended when working with HP-UX 11i V2. See “Using large block sizes with HP-UX 11i V2” on page 38.

Configuring the HP D2D Backup System for iSCSI

How to install the iSCSI software initiator

The iSCSI Software Initiator is located at the HP Software Depot.

2. Enter iSCSI Software Initiator in the search box.
3. When the search results show iSCSI Software Initiator, click on Receive for Free.
4. In the Software Specification window, highlight the HP-UX version on which you want to install the HP-UX iSCSI Software Initiator. Then complete the required fields and click on Next >>
5. Look for Download Software, then click on the iSCSI Software Initiator version that you would like to download.
6. In the Document column (next to the Download Software column), click on Installation Instruction to download instructions for using the Software Distributor tool to install the iSCSI Software Initiator.

**NOTE:**

The Software Distributor is used for software installations on HP-UX systems. It also provides an interface for removing software from HP-UX systems.
7. After the system reboots, verify that the installation was successful by issuing the `swlist` command as follows:

```bash
swlist iSCSI-00
```

If the HP-UX iSCSI Software Initiator is installed correctly, the output will be:

**HP-UX 11i V2**

```bash
# Initializing...
# Contacting target "localhost"...
# Target: localhost:
# iSCSI-00 B.11.23.03e HP-UX iSCSI Software Initiator
iSCSI-00.ISCSI-SWD B.11.23.03e HP-UX iSCSI Software Initiator
```

**HP-UX 11i V3**

```bash
# Initializing...
# Contacting target "localhost"...
# Target: localhost:
# iSCSI-00 B.11.31.01 HP-UX iSCSI Software Initiator
iSCSI-00.ISCSI-SWD B.11.31.01 HP-UX iSCSI Software Initiator
```

8. Issue the `ioscan` command as follows:

**HP-UX 11i V2**

```bash
# ioscan -fnC iscsi
```

**HP-UX 11i V3**

```bash
# ioscan -fnNC iscsi
```

If the software is installed correctly, the generated output will look similar to this:

```
Class I H/W Path Driver S/W State H/W Type Description
=======================================================================
iscsi 0 255/0 iscsi CLAIMED VIRTBUS iSCSI Virtual Node
```

---

**How to configure the iSCSI software initiator using the D2Dsetup script**

Use the D2Dsetup script to configure the iSCSI software initiator automatically. You must provide the IP address as a parameter to the script.

```bash
# D2Dsetup <IP_address>
```

If you wish to configure CHAP authentication, you should also provide the user name and password for the initiator and the target, if required.

```bash
# D2Dsetup <Initiator_CHAP_Username> <Initiator_CHAP_Password> <Target_CHAP_Username> <Target_CHAP_Password> <IP_address>
```

The response from the HP D2D Backup System will be similar to the following:

```
HP StorageWorks D2D Backup System Linux and UNIX iSCSI Configuration Tool
Detecting OS...................................done
Checking iSCSI package...............................done
Contacting HP StorageWorks D2D Backup System...done
Discovering available targets......................done
Configuring drivers..............................done
Configuring CHAP authentication..................done
The following library devices are configured:
```
How to manually configure the iSCSI software initiator using the command line

The command line tool for configuring the HP-UX iSCSI software initiator is iscsiutil. Detailed instructions for iscsiutil can be found in the iscsiutil(1M) man documents. The following instructions provide the minimum steps required to connect an HP-UX host to an HP StorageWorks D2D Backup System.

1. Add the path for iscsiutil and other iSCSI executables to the root path:
   ```
   # PATH=$PATH:/opt/iscsi/bin
   ```

2. Find the iSCSI initiator node for the HP-UX host:
   ```
   # iscsiutil -l
   Initiator Name : iqn.1986-03.com.hp:mantis.ef28ceae-7203-11dc-82a4-bf88291ef301
   ```
   This initiator node name is required by the HP StorageWorks D2D Backup System web management interface when manually configuring library devices.

3. To discover available iSCSI target devices on a HP StorageWorks D2D Backup System and add them to iSCSI persistent information type the following, where x.x.x.x is the IP address of the HP StorageWorks D2D Backup System:
   ```
   # iscsiutil -aI x.x.x.x
   ```
   The response will be:
   Target address “x.x.x.x:3260,1” has been successfully added.

4. To display the discovery target that has been configured, type the following:
   ```
   # iscsiutil -pD
   ```
   The output will be similar to this:
   Discovery Target Information
   -----------------------------
   Target # 1
   ------------
   IP Address : x.x.x.x
   iSCSI TCP Port : 3260
   iSCSI Portal Group Tag : 1
   User Configured:
   -----------------
   Authentication Method :
   CHAP Method : CHAP_UNI
   Initiator CHAP Name :
   CHAP Secret :
   Header Digest : None,CRC32C (default)
   Data Digest : None,CRC32C (default)
To discover operational target devices, type the following:

```
# ioscan -H 255
```

The output will be similar to this:

<table>
<thead>
<tr>
<th>H/W Path</th>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>255/0</td>
<td>iscsi</td>
<td>iSCSI Virtual Node</td>
</tr>
<tr>
<td>255/0/0.0</td>
<td>ext_bus</td>
<td>iSCSI-SCSI Protocol Interface</td>
</tr>
<tr>
<td>255/0/0.0</td>
<td>target</td>
<td></td>
</tr>
<tr>
<td>255/0/0.0.0</td>
<td>tape</td>
<td>HP Ultrium 3-SCSI</td>
</tr>
<tr>
<td>255/0/2.0</td>
<td>ext_bus</td>
<td>iSCSI-SCSI Protocol Interface</td>
</tr>
<tr>
<td>255/0/2.0.0</td>
<td>target</td>
<td></td>
</tr>
<tr>
<td>255/0/2.0.0.0</td>
<td>autoch</td>
<td>HP MSL G3 Series</td>
</tr>
</tbody>
</table>
To display operational target devices, type:

```
# iscsiutil -pO
```

The output will be similar to this:

<table>
<thead>
<tr>
<th>Target #</th>
<th>Target Name</th>
<th>Target Alias</th>
<th>No. of Target Addresses</th>
<th>Target Address #</th>
<th>IP Address</th>
<th>iSCSI TCP Port</th>
<th>iSCSI Portal Group Tag</th>
<th>User Configured</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>iqn.1986-03.com.hp:storage.d2d.cr209107ff.500110a6656e596f.library1.driv1</td>
<td>:</td>
<td>1</td>
<td>:</td>
<td>x.x.x.x</td>
<td>3260</td>
<td>1</td>
<td>:</td>
</tr>
<tr>
<td>2</td>
<td>iqn.1986-03.com.hp:storage.d2d.cr209107ff.500110ad6bd1034b.library1.robotics</td>
<td>:</td>
<td>1</td>
<td>:</td>
<td>x.x.x.x</td>
<td>3260</td>
<td>1</td>
<td>:</td>
</tr>
</tbody>
</table>
7. To optionally configure uni-directional CHAP authentication you should update the iSCSI Authentication details in the Web Management Interface, as shown below.

![iSCSI Authentication Interface](image)

**NOTE:**

In the following commands, items in parentheses are user-defined strings. Substitute the appropriate information for `<iqn...>` , `<chap_password>` and `<chap_username>`.

Once the HP StorageWorks D2D Backup System has been modified, the operating system should be modified as follows:

```bash
# iscsiutil --t authmethod CHAP None
# iscsiutil --u --H CHAP_UNI
# iscsiutil --u --N <chap_username> --T <iqn...> --I x.x.x.x
# iscsiutil --u --W <chap_password> --T <iqn...> --I x.x.x.x
```

8. If CHAP authentication has been enabled, rediscover operational target devices by typing the following:

```bash
# ioscan --H 255
```

The output will be similar to this:

<table>
<thead>
<tr>
<th>H/W Path</th>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>255/0</td>
<td>iscsi</td>
<td>iSCSI Virtual Node</td>
</tr>
<tr>
<td>255/0/0.0</td>
<td>ext_bus</td>
<td>iSCSI-SCSI Protocol Interface</td>
</tr>
<tr>
<td>255/0/0.0.0</td>
<td>target</td>
<td></td>
</tr>
<tr>
<td>255/0/0.0.0.0</td>
<td>tape</td>
<td>HP Ultrim 3-SCSI</td>
</tr>
<tr>
<td>255/0/2.0</td>
<td>ext_bus</td>
<td>iSCSI-SCSI Protocol Interface</td>
</tr>
<tr>
<td>255/0/2.0.0</td>
<td>target</td>
<td></td>
</tr>
<tr>
<td>255/0/2.0.0.0</td>
<td>autoch</td>
<td>HP MSL G3 Series</td>
</tr>
</tbody>
</table>
9. If the device type shown above is UNKNOWN instead of TAPE or AUTOCH then you must configure the stape and schgr modules for the HP-UX kernel. This can be done as follows:

**HP-UX 11i V2**

```
# kcmodule -B stape=static schgr=static
* The automatic 'backup' configuration has been updated.
Module           State    Cause  
schgr  (now)    static      best  
      (next boot)  static    explicit
stape  (now)    static      best  
      (next boot)  static    explicit
```

**HP-UX 11i V3**

```
# kcmodule -h -B stape=static estape=static schgr=static eschgr=static
* The automatic 'backup' configuration has been updated.
Module           State    Cause  
schgr  (now)    static      best  
      (next boot)  static    explicit
stape  (now)    static      best  
      (next boot)  static    explicit
eschgr (now)    static      best  
      (next boot)  static    explicit
estape (now)    static      best  
      (next boot)  static    explicit
```

10. To create device files for the target devices, type the following:

```
# insf -H 255
```
11. To display the device files associated with the operational target devices, type:

```
# ioscan -fnH 255
```

<table>
<thead>
<tr>
<th>Class I H/W Path</th>
<th>Driver S/W</th>
<th>State</th>
<th>H/W Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>iscsi 0 255/0</td>
<td>iscsi</td>
<td>CLAIMED</td>
<td>VIRTBUS</td>
<td>iSCSI Virtual Node</td>
</tr>
<tr>
<td>ext_bus 8 255/0/0.0</td>
<td>iscsial</td>
<td>CLAIMED</td>
<td>INTERFACE</td>
<td>iSCSI-SCSI Protocol Interface</td>
</tr>
<tr>
<td>target 10 255/0/0.0.0</td>
<td>tgt</td>
<td>CLAIMED</td>
<td>DEVICE</td>
<td>HP Ultrium 3-SCSI</td>
</tr>
<tr>
<td>/dev/rmt/c8t0d0BEST</td>
<td>/dev/rmt/c8t0d0BESTn</td>
<td>/dev/rmt/c8t0d0BESTb</td>
<td>/dev/rmt/c8t0d0BESTnb</td>
<td></td>
</tr>
<tr>
<td>ext_bus 9 255/0/2.0</td>
<td>iscsial</td>
<td>CLAIMED</td>
<td>INTERFACE</td>
<td>iSCSI-SCSI Protocol Interface</td>
</tr>
<tr>
<td>target 11 255/0/2.0.0</td>
<td>tgt</td>
<td>CLAIMED</td>
<td>DEVICE</td>
<td>HP MSL G3 Series</td>
</tr>
<tr>
<td>/dev/rac/c9t0d0</td>
<td>/dev/rac/c9t0d0n</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this example the tape drives device files are:

- AT&T, best density available
  - /dev/rmt/1m
  - /dev/rmt/1mb
  - /dev/rmt/1mn
  - /dev/rmt/1mnb
- Berkeley, best density available
  - /dev/rmt/c8t0d0BEST
  - /dev/rmt/c8t0d0BESTn
  - /dev/rmt/c8t0d0BESTb
  - /dev/rmt/c8t0d0BESTnb
- AT&T, no rewind, best density available
  - /dev/rmt/c8t0d0BEST
  - /dev/rmt/c8t0d0BESTn
  - /dev/rmt/c8t0d0BESTb
  - /dev/rmt/c8t0d0BESTnb
- Berkeley, no rewind, best density available

And the autochanger device file is:

```
/dev/rac/c9t0d0
```

Configuring the HP StorageWorks D2D Backup System for Fibre Channel

For a Switched Fabric Configuration, zone the individual devices to the host concerned using the virtual device WWNs shown on the GUI.
Output needs checking.

1. To discover operational target devices, type the following:

   ```
   # ioscan
   ```

   The output will be similar to this:

<table>
<thead>
<tr>
<th>H/W Path</th>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/5</td>
<td>ba</td>
<td>Local PCI-X Bus Adapter (783)</td>
</tr>
<tr>
<td>0/5/1/0</td>
<td>fc</td>
<td>HP AB379-60001 4Gb Dual Port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PCI/PCI-X Fibre Channel Adapter (FC Port 1)</td>
</tr>
<tr>
<td>0/5/1/0/0.166</td>
<td>fcp</td>
<td>FCP Domain</td>
</tr>
<tr>
<td>0/5/1/0.166.0.255.0</td>
<td>t_bus</td>
<td>FCP Device Interface</td>
</tr>
<tr>
<td>0/5/1/0.166.0.255.0.1</td>
<td>target</td>
<td></td>
</tr>
<tr>
<td>0/5/1/0.166.0.255.0.1.0</td>
<td>autoch</td>
<td>HP MSL G3 Series</td>
</tr>
<tr>
<td>0/5/1/0.166.0.255.0.2</td>
<td>target</td>
<td></td>
</tr>
<tr>
<td>0/5/1/0.166.0.255.0.2.0</td>
<td>tape</td>
<td>HP Ultrium 3-SCSI</td>
</tr>
</tbody>
</table>
2. If the device type shown above is UNKNOWN instead of TAPE or AUTOCH then you must configure the stape and schgr modules for the HP-UX kernel. This can be done as follows:

**HP-UX 11i V2**

```bash
# kcmodule -B stape=static schgr=static
*The automatic 'backup' configuration has been updated.
Module     State   Cause
schgr (now) static    best
         (next boot) static  explicit
stape (now) static    best
         (next boot) static  explicit
```

**HP-UX 11i V3**

```bash
# kcmodule -h -B stape=static estape=static schgr=static eschgr=static
* The automatic 'backup' configuration has been updated.
Module     State   Cause
schgr (now) static    best
         (next boot) static  explicit
stape (now) static    best
         (next boot) static  explicit
eschgr (now) static    best
         (next boot) static  explicit
estape (now) static    best
         (next boot) static  explicit
```

3. To create device files for the target devices, type the following:

```bash
# insf
```
4. To display the device files associated with the operational target devices, type:

```
# ioscan -fn
```

<table>
<thead>
<tr>
<th>Class</th>
<th>I</th>
<th>H/W Path</th>
<th>Driver</th>
<th>S/W State</th>
<th>H/W Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ba</td>
<td>4</td>
<td>0/5</td>
<td>lba</td>
<td>CLAIMED</td>
<td>BUS_NEXUS</td>
<td>Local PCI-X Bus Adapter (783)</td>
</tr>
<tr>
<td>fc</td>
<td>5</td>
<td>0/5/1/0</td>
<td>fcd</td>
<td>CLAIMED</td>
<td>INTERFACE</td>
<td>HP AB379-60001 4Gb Dual Port PCI/PCI-X Fibre Channel Adapter (FC Port 1)</td>
</tr>
<tr>
<td>fcp</td>
<td>11</td>
<td>0/5/1/0.166</td>
<td>fcd_fcp</td>
<td>CLAIMED</td>
<td>INTERFACE</td>
<td>FCP Domain</td>
</tr>
<tr>
<td>ext_bus</td>
<td>33</td>
<td>0/5/1/0.166.0.255.0</td>
<td>fcd_vbus</td>
<td>CLAIMED</td>
<td>INTERFACE</td>
<td>FCP Device Interface</td>
</tr>
<tr>
<td>target</td>
<td>8</td>
<td>0/5/1/0.166.0.255.0.1</td>
<td>tgt</td>
<td>CLAIMED</td>
<td>DEVICE</td>
<td>HP AB379-6001 4Gb Dual Port PCI/PCI-X Fibre Channel Adapter (FC Port 1)</td>
</tr>
<tr>
<td>autoch</td>
<td>1</td>
<td>0/5/1/0.166.0.255.0.1.0</td>
<td>schgr</td>
<td>CLAIMED</td>
<td>DEVICE</td>
<td>HP AB379-6001 4Gb Dual Port PCI/PCI-X Fibre Channel Adapter (FC Port 1)</td>
</tr>
<tr>
<td>target</td>
<td>9</td>
<td>0/5/1/0.166.0.255.0.2</td>
<td>tgt</td>
<td>CLAIMED</td>
<td>DEVICE</td>
<td>HP AB379-6001 4Gb Dual Port PCI/PCI-X Fibre Channel Adapter (FC Port 1)</td>
</tr>
<tr>
<td>tape</td>
<td>23</td>
<td>0/5/1/0.166.0.255.0.2.0</td>
<td>stape</td>
<td>CLAIMED</td>
<td>DEVICE</td>
<td>HP AB379-6001 4Gb Dual Port PCI/PCI-X Fibre Channel Adapter (FC Port 1)</td>
</tr>
</tbody>
</table>

In this example the tape drives device files are:

- `/dev/rmt/1m` AT&T, best density available
- `/dev/rmt/1mb` Berkeley, best density available
- `/dev/rmt/1mn` AT&T, no rewind, best density available
- `/dev/rmt/1mnb` Berkeley, no rewind, best density available
- `/dev/rmt/c33t2d0BEST` AT&T, best density available
- `/dev/rmt/c33t2d0BESTb` Berkeley, best density available
- `/dev/rmt/c33t2d0BESTn` AT&T, best density available
- `/dev/rmt/c33t2d0BESTnb` Berkeley, no rewind, best density available

And the autochanger device file is:

```
/dev/rac/c33t1d0
```

**Configuring the HP D2D Backup System for NAS (NFS)**

The D2D Backup System NAS interface should be configured to use NFS as the Access Protocol when backing up data using HP-UX.

![Share Permissions](image)

The NFS share can then be mounted in HP-UX using the mount command. For example:

```
# mount 192.168.0.100:/nas/D2DBackupShare /mnt/D2DBackupShare
```
The D2D Backup System supports NFSv3. To explicitly mount the D2D Backup System using NFSv3, the following syntax should be used:

```
# mount -t nfs -o nfsvers=3 x.x.x.x:/<name of share> <local mount>
```

Controlling an HP StorageWorks D2D Backup System using HP-UX

The HP StorageWorks D2D Backup System appears to the HP-UX operating system as a changer device and Ultrium tape drive. The changer device represents the robotics within the library and can be controlled from the console using a command called `MC`. The complete MC manual can also be accessed using the command `man mc`.

The following examples illustrate how to complete common tasks with the HP StorageWorks D2D Backup System.

- Review the media
- Load a cartridge into the tape drive
- Unload a cartridge from the tape drive
- Move a cartridge to the mail slot
- Move a cartridge from the mail slot

Using large block sizes with HP-UX 11i V2

A block size no larger than 256 KB (262144 bytes) is strongly recommended when working with HP-UX 11i V2 and tape or VTL devices. Backup applications should be configured to work with I/O block sizes that are no larger than 256 KB. Please check your application documentation to find out how to check or configure block sizes used for transfers to and from tape or VTL devices.

Block sizes no larger than 256 KB (262144 bytes) are recommended with HP-UX 11i V2 because, by default, the HP-UX `stape` driver processes a block size larger than 256 KB by subdividing it into 256 KB blocks for writing to tape (giving a net effect of 256 KB I/O transfers). During restore, `stape` attempts to reconstruct the original block size that was larger than 256 KB with the 256 KB blocks from tape. This subdivision and subsequent reconstruction process of block sizes larger than 256 KB adds unnecessary complexity and risk to tape positioning and restore operations and offers no net gain in terms of increased block size. It should, therefore, be avoided.

Reviewing the media in a library

To verify the contents of the media slots within a library, the following command should be used:

```
# mc -p /dev/rac/c9t0d0 -rDSI
```

```
DT_slot_1 EMPTY
ST_slot_1:Full 72255101
ST_slot_2:Full 72255102
ST_slot_3:Full 72255103
ST_slot_4:Full 72255104
ST_slot_5:Full 72255105
ST_slot_6:Full 72255106
ST_slot_7:Full 72255107
ST_slot_8:Full 72255108
ST_slot_9:Full 72255109
ST_slot_10:Full 72255110A
ST_slot_11:Full 72255110B
```
The DT_slot_1 represent Ultrium tape drives within the library. The ST_slots_1 to 24 represent the 24 configured slots within the library. The IE_slot_1 represents the import/export slot of the library, also known as the Mail Slot in the HP StorageWorks D2D Backup System Web Management Interface.

Loading a cartridge into a library tape drive

To load a cartridge into the tape drive, the `mc -s -d` command should be used. For example, to move a cartridge from slot 2 to the drive the command would be:

```
# mc -p /dev/rac/c9t0d0 -s S2 -d D1
```

Unloading a cartridge from a library tape drive

To unload a cartridge from the first tape drive and return it to storage slot 2, the command should be:

```
# mc -p /dev/rac/c9t0d0 -s D1 -d S2
```

Moving a cartridge to the library Mail Slot

To move a cartridge from storage slot 3 to the mail slot for exporting to an attached tape drive, the command will be:

```
# mc -p /dev/rac/c9t0d0 -s S3 -d I1
```

Moving a cartridge from the library Mail Slot

To move a cartridge from the Import/Export slot to Storage slot 4, following an import from an attached tape drive, the command will be:

```
# mc -p /dev/rac/c9t0d0 -s I1 -d S4
```

Backup and restore files using TAR in HP-UX

This section describes how to perform a simple backup and recovery of files to an HP StorageWorks D2D Backup System using the console applications; `mc` and `TAR`. In the examples, the library robotics is controlled using generic SCSI device file `/dev/rac/c9t0d0` and the autoloader tape drive uses tape device file `/dev/rmt/1mnb`. The file to be backed up and restored is the HP-UX kernel.
Back up the HP-UX kernel

1. Check to see what media is available.
   
   ```bash
   # mc -p /dev/rac/c9t0d0 -r DSI
   DT_slot_1: EMPTY
   ST_slot_1: Full 72255101
   ST_slot_2: Full 72255102
   ST_slot_3: Full 72255103
   ST_slot_4: Full 72255104
   ST_slot_5: Full 72255105
   ST_slot_6: Full 72255106
   ST_slot_7: Full 72255107
   ST_slot_8: Full 72255108
   ST_slot_9: Full 72255109
   ST_slot_10: Full 72255110A
   ST_slot_11: Full 72255110B
   ST_slot_12: Full 72255110C
   ST_slot_13: Full 72255110D
   ST_slot_14: Full 72255110E
   ST_slot_15: Full 72255110F
   ST_slot_16: Full 722551110
   ST_slot_17: Full 722551111
   ST_slot_18: Full 722551112
   ST_slot_19: Full 722551113
   ST_slot_20: Full 722551114
   ST_slot_21: Full 722551115
   ST_slot_22: Full 722551116
   ST_slot_23: Full 722551117
   ST_slot_24: Full 722551118
   IE_slot_25: Empty
   ```

2. Move the cartridge from slot 1 to the first tape drive.
   
   ```bash
   # mc -p /dev/rac/c9t0d0 -s S1 -d D1
   ```

3. Ensure you are in the root directory.
   
   ```bash
   # cd /
   ```

4. Back up the HP-UX kernel using tar.
   
   ```bash
   # tar cvf /dev/rmt/1mnb ./stand/vmunix
   ```

5. Move the cartridge back to slot 1.
   
   ```bash
   # mc -p /dev/rac/c9t0d0 -s D1 -d S1
   ```

Restore the HP-UX kernel

1. Move the cartridge from slot 1 to the first tape drive.
   
   ```bash
   # mc -p /dev/rac/c9t0d0 -s S1 -d D1
   ```

2. Create a temporary folder to restore the backup into.
   
   ```bash
   # mkdir temp
   # cd /temp
   ```

3. Restore the HP-UX kernel to the temporary folder.
   
   ```bash
   # tar xvf /dev/rmt/1mnb
   ```
4. Move the cartridge back to slot 1.
   # mc -p /dev/rac/c9t0d0 -s D1 -d S1

5. Compare the original HP-UX kernel with the restored HP-UX kernel.
   # cmp /stand/vmunix /temp/stand/vmunix
   If no differences are found between the two files, no message will be displayed.
5 Solaris (x86 and SPARC)

Overview

This chapter describes how to configure the HP D2D Backup System for use with the following Solaris operating systems:

- Solaris 9 (SPARC)
- Solaris 10 (x86 and SPARC)

NOTE:

HP StorageWorks D2D Backup Systems with iSCSI interfaces are only supported with Solaris 10u4 or greater.

Configuring the HP D2D Backup System for iSCSI

How to enable the iSCSI software initiator

1. Enable the iSCSI services using the command:

   # svcadm -v enable iscsi_initiator
   svc:/network/iscsi_initiator:default enabled

2. Verify the iSCSI services are running:

   # svcs -a | grep iscsi_initiator
   Online 10:10:28 svc: /network/iscsi_initiator:default

How to configure the iSCSI software initiator using the D2Dsetup script

Use the D2Dsetup script to configure the iSCSI software initiator automatically. You must provide the IP address as a parameter to the script.

# D2Dsetup <IP_address>

If you wish to configure CHAP authentication, you should also provide the user name and password for the initiator and the target, if required.

# D2Dsetup <Initiator_CHAP_Username> <Initiator_CHAP_Password> 
<Target_CHAP_Username> <Target_CHAP_Password> <IP_address>

The response from the HP D2D Backup System will be similar to the following:

HP StorageWorks D2D Backup System Linux and UNIX iSCSI Configuration Tool
Detecting OS.................................done
Checking iSCSI package......................done
Contacting HP StorageWorks D2D Backup System...done
Discovering available targets...............done
Configuring persistent logins..................done
Configuring drivers............................done
Configuring CHAP authentication...............done
The following library devices are configured:
Target: iqn.1986-03.com.hp:storage.d2d.cr2070143b.500110a125810bbf.library1.robotics
Alias: D2D.CR2070143B.Library1.Robotics
TPGT: 1
ISID: 4000002a0000
Connections: 1
LUN: 0
Vendor: HP
  Product: 1x8 G2 AUTOLDR
  OS Device Name:
Target: iqn.1986-03.com.hp:storage.d2d.cr2070143b.500110a250017b86.library1.drive
Alias: D2D.CR2070143B.Library1.Driveldrive
TPGT: 1
ISID: 4000002a0000
Connections: 1
LUN: 0
Vendor: HP
  Product: Ultrium 3-SCSI
  OS Device Name: /dev/rmt/1

How to manually configure the iSCSI software initiator using the command line

The command line tool for configuring the iSCSI is `iscsiadm`. Detailed instructions for `iscsiadm` can be found in the `iscsiadm man` documents. The following instructions provide the minimum steps to connect a Solaris host to an HP StorageWorks D2D Backup System.

1. Find the iSCSI initiator node for the Solaris host:

   ```
   # iscsiadm list initiator-node
   Initiator node name: iqn.1986-03.com.sun:01:00144f1d9196.4715d8a3
   Initiator node alias: -
   Login Parameters (Default/Configured):
   Header Digest: NONE/-
   Data Digest: NONE/-
   Authentication Type: NONE
   RADIUS Server: NONE
   RADIUS access: unknown
   Configured Sessions: 1
   
   In this example the initiator node name is iqn.1986-03.com.sun:01:00144f1d9196.4715d8a3 This initiator node name is required by the HP StorageWorks D2D Backup System web management interface when manually configuring library devices.
   ```
2. Configure the Solaris host to discover available iSCSI targets as follows, where \texttt{x.x.x.x} is the IP address of the HP StorageWorks D2D Backup System:

\begin{verbatim}
# iscsiadm add discovery-address x.x.x.x:3260
# iscsiadm list discovery-address
Discovery Address: x.x.x.x:3260
# iscsiadm modify discovery -t enable
# iscsiadm list discovery
Discovery:
  Static: disabled
  Send Targets: enabled
  iSNS: disabled
\end{verbatim}

3. List the configured iSCSI target devices as follows:

\begin{verbatim}
# iscsiadm list target
Target: iqn.1986-03.com.hp:storage.d2d.cr203f18f4.01a9754150ae013a.library1.robotics
  Alias: D2D.CR203F18F4.Library1.Robotics
  TPGT: 1
  ISID: 4000002a0000
  Connections: 1
Target: iqn.1986-03.com.hp:storage.d2d.cr203f18f4.7e0cdac23ab4eab1.library1.drive1
  Alias: D2D.CR203F18F4.Library1.Drive1
  TPGT: 1
  ISID: 4000002a0000
  Connections: 1
\end{verbatim}

In this example the two target iSCSI Qualified Names are:

- \texttt{iqn.1986-03.com.hp:storage.d2d.cr203f18f4.01a9754150ae013a.library1.robotics}
- \texttt{iqn.1986-03.com.hp:storage.d2d.cr203f18f4.7e0cdac23ab4eab1.library1.drive1}

\textbf{NOTE:}

In the following commands, items in parentheses are user-defined strings. Substitute the appropriate information for \texttt{<iqn...>,<chap_password> and <chap_username>}. 
4. To optionally configure CHAP authentication you should update the iSCSI Authentication details in the web management GUI, as shown below.

Once the HP StorageWorks D2D Backup System has been modified, the operating system should be modified as follows:

```bash
# iscsiadm modify initiator-node --authentication CHAP
# iscsiadm modify initiator-node --CHAP-name <chap_username>
# iscsiadm modify initiator-node --CHAP-secret

Enter the CHAP password when prompted.

If bi-directional CHAP authentication is required, also perform the following steps:

```bash
# iscsiadm modify target-param --bi-directional-authentication enable <iqn...>
# iscsiadm modify target-param --authentication CHAP <iqn...>
# iscsiadm modify target-param --CHAP-name <chap_username>
# iscsiadm modify target-param --CHAP-secret <iqn...>

Enter the CHAP password when prompted.

5. To configure the iSCSI target devices as static devices, use the following commands:

```bash
# iscsiadm add static-config <iqn...>,x.x.x.x
# iscsiadm modify discovery -s enable
# iscsiadm list discovery
Discovery:
   Static: enabled
   Send Targets: enabled
   iSNS: disabled

6. To verify the static configuration, use the following commands:

```bash
# iscsiadm list static-config
Static Configuration Target: iqn.1986-03.com.hp:storage.d2d.cr203f18f4.01a9754150ae013a.library1.robotics,x.x.x.x:3260
Static Configuration Target: iqn.1986-03.com.hp:storage.d2d.cr203f18f4.7e0cdac23ab4eab1.library1.drive,x.x.x.x:3260
# iscsiadm list target
Target: iqn.1986-03.com.hp:storage.d2d.cr203f18f4.7e0cdac23ab4eab1.library1.drive1
   Alias: -
   ISID: 4000002a0000
   Connections: 1
Target: iqn.1986-03.com.hp:storage.d2d.cr203f18f4.01a9754150ae013a.library1.robotics
   Alias: -
   ISID: 4000002a0000
   Connections: 1
```
7. To create generic devices drivers for the iSCSI target devices, using the following commands:

```
# update_drv -ai '"scsiclass,08"' sgen
# devfsadm -i iscsi
```

8. To verify devices files for the iSCSI target device have been created, use these commands:

```
# ls -l /dev/scsi/changer
lrwxrwxrwx 1 root root 139 Jan 2 09:51 c3t1d0 -> ../..devices/iscsi/medium-changer@0000iqn.1986-03.com.hp%3Astorage.d2d.cr203f18f4.19f71d0c4c694ca8.library1.robotics0001,0:changer
```

Here you can see device file c3t1d0 has been created for the changer element.

```
# ls -l /dev/rmt/*cb
lrwxrwxrwx 1 root root 116 Apr 18 14:51 /dev/rmt/2cb -> ../../devices/iscsi/tape@0000iqn.1986-03.com.hp%3Astorage.d2d.cr203f18f4.01a9754150ae013a.library1.drive10001,0:cb
```

Configuring the HP StorageWorks D2D Backup System for Fibre Channel

For a Switched Fabric Configuration, zone the individual devices to the host concerned using the virtual device WWNs shown on the GUI.

```
1. To create generic devices drivers for the iSCSI target devices, using the following commands:

```
# update_drv -ai '"scsiclass,08"' sgen
# cfgadm -al
```
```
2. To verify devices files for the iSCSI target device have been created, use these commands:

```bash
lrwxrwxrwx  1 root  root 87 Apr 21 16:33 
c2t500110AE1443192Ed0 -> ../../../devices/pci@7c0/pci@0/pci@9/SUNW,qlc@0/
fp@0,0/sGEN@w500110ae1443192e,0:changer
```

Here you can see device file c2t500110AE1443192Ed0 has been created for the changer element.

```bash
# ls -l /dev/rmt/*cb
lrwxrwxrwx  1 root  root 77 Apr 21 16:33 
/dev/rmt/2cb -> ../../devices/pci@7c0/pci@0/pci@9/SUNW,qlc@0/st@w500110a057bb1b32,0:cb
```

**Configuring the HP D2D Backup System for NAS (NFS)**

The D2D Backup System NAS interface should be configured to use NFS as the Access Protocol when backing up data using Solaris.

![NFS Share Configuration](image)

The NFS share can then be mounted in Solaris using the mount command. For example:

```bash
# mount -F nfs -o vers=3 192.168.0.100:/nas/D2DBackupShare /mnt/D2DBackupShare
```

The D2D Backup System supports NFSv3. To explicitly mount the D2D Backup System using NFSv3, the following syntax should be used:

```bash
# mount -F nfs -o vers=3 x.x.x.x:/<name of share> <local mount>
```

**Controlling an HP StorageWorks D2D Backup System using Solaris**

The HP StorageWorks D2D Backup System appears to the Solaris operating system as a changer device and Ultrium tape drive. The changer device represents the robotics within the library and can be controlled from the console using a command called `mtx`. `mtx` is not installed with Solaris by default but it can be downloaded and installed from sourceforge.net.

The following examples illustrate how to complete common tasks with the HP StorageWorks D2D Backup System.

- Verify you are controlling the correct library
- Review the media
- Load a cartridge into the tape drive
- Unload a cartridge from the tape drive
- Move a cartridge to the mail slot
- Move a cartridge from the mail slot
Verify you are controlling the correct library

The robotics of the library will be assigned a SCSI device file. To discover the device file assigned, use the following command:

```
# ls /dev/scsi/changer
```

The response will the name of the device file. e.g. c3t1d0. Therefore, the library can be controlled using the device file `/dev/scsi/changer/c3t1d0`.

To verify the device file for the robotics of the library

To verify the correct device file has been determined, the following command should be used:

```
# mtx -f /dev/scsi/changer/c3t1d0 inquiry
```

The output for an MSL 2024 library should be:

- Product Type: Medium Changer
- Vendor ID: 'HP'
- Product ID: 'MSL G3 Series'
- Revision: 'pc81'
- Attached Changer: No

To verify the tape device file for the tape drive

The tape drive(s) of the library will be assigned SCSI tape device files. To discover the SCSI tape device files assigned, use the following command:

```
ls /dev/rmt/*/cb
```

The output will be a list of device files for each configured tape drive. e.g. `/dev/rmt/2cb`.

In this example the SCSI tape device file that has been assigned is `2cb`. To verify the tape device file for the tape drive, the `MT` command should be used:

```
# mt -f /dev/rmt/2cb status
```

The output should be:

```
HP Ultrium LTO 3 tape drive:
sense key(0x6)= Unit Attention residual= 0 retries= 0
file no= 0  block no= 0
```

This indicates that the tape drive files are valid but no media is loaded into the drive.

Reviewing the media in a library

To verify the contents of the media slots within a library, the following command should be used:

```
# mtx -f /dev/scsi/changer/c3t1d0 status
```

The output for a MSL 2024 library with 1 tape drive and 24 cartridges configured would look similar to this:

```
Storage Changer /dev/scsi/changer/c3t1d0:1 Drives, 24 Slots
( 1 Import/Export )
Data Transfer Element 0:Empty
Storage Element 1:Full :VolumeTag=72255101
Storage Element 2:Full :VolumeTag=72255102
```
Each data transfer element represents an Ultrium tape drive within the library. Storage elements 1 to 24 represent the 24 configured slots within the library. Storage element 25 represents the import/export slot of the library, also known as the Mail Slot in the HP StorageWorks D2D Backup System Web Management Interface.

**Loading a cartridge into a library tape drive**

To load a cartridge into the tape drive, the `mtx load` command should be used. For example, to move a cartridge from slot 2 to the first tape drive the command would be:

```
# mtx –f /dev/scsi/changer/c3t1d0 load 2 0
```

**Unloading a cartridge from a library tape drive**

To unload a cartridge and place it in a storage slot, the `mtx unload` command should be used. For example, to unload a cartridge from the first tape drive and place it in to storage slot 2, the command would be:

```
# mtx –f /dev/scsi/changer/c3t1d0 unload 2 0
```

**Backup and restore files using TAR**

This section describes how to perform a simple backup and recovery of files to an HP StorageWorks D2D Backup System using the console applications; `MTX` and `TAR`. In the examples, the autoloader robotics is controlled using SCSI device file `/dev/scsi/changer/c3t1d0` and the library drive uses tape device file `/dev/rmt/2cb`. The file to be backed up and restored is the kernel.
Back up the kernel

1. Check to see what media is available.
   
   ```bash
   # mtx -f /dev/scsi/changer/c3t1d0 status
   
   Storage Changer /dev/scsi/changer/c3t1d0:1 Drives, 24 Slots
   (1 Import/Export)
   Data Transfer Element 0:Empty
   Storage Element 1:Full :VolumeTag=72255101
   Storage Element 2:Full :VolumeTag=72255102
   Storage Element 3:Full :VolumeTag=72255103
   Storage Element 4:Full :VolumeTag=72255104
   Storage Element 5:Full :VolumeTag=72255105
   Storage Element 6:Full :VolumeTag=72255106
   Storage Element 7:Full :VolumeTag=72255107
   Storage Element 8:Full :VolumeTag=72255108
   Storage Element 9:Full :VolumeTag=72255109
   Storage Element 10:Full :VolumeTag=72255110A
   Storage Element 11:Full :VolumeTag=72255110B
   Storage Element 12:Full :VolumeTag=72255110C
   Storage Element 13:Full :VolumeTag=72255110D
   Storage Element 14:Full :VolumeTag=72255110E
   Storage Element 15:Full :VolumeTag=72255110F
   Storage Element 16:Full :VolumeTag=722551110
   Storage Element 17:Full :VolumeTag=722551111
   Storage Element 18:Full :VolumeTag=722551112
   Storage Element 19:Full :VolumeTag=722551113
   Storage Element 20:Full :VolumeTag=722551114
   Storage Element 21:Full :VolumeTag=722551115
   Storage Element 22:Full :VolumeTag=722551116
   Storage Element 23:Full :VolumeTag=722551117
   Storage Element 24:Full :VolumeTag=722551118
   Storage Element 25 IMPORT/EXPORT:Empty
   ```

2. Move the cartridge from slot 1 to the tape drive.

   ```bash
   # mtx -f /dev/scsi/changer/c3t1d0 load 1 0
   ```

3. Ensure you are in the root directory.

   ```bash
   # cd /
   ```

4. Back up the kernel using tar.

   ```bash
   # tar cvf /dev/rmt/2cb ./platform/`arch -k`/kernel/sparcv9/unix
   ```

5. Move the cartridge back to slot 1.

   ```bash
   # mtx -f /dev/scsi/changer/c3t1d0 unload 1 0
   ```

Restore the kernel

1. Move the cartridge from slot 1 to the first tape drive.

   ```bash
   # mtx -f /dev/scsi/changer/c3t1d0 load 1 0
   ```

2. Create a temporary folder to restore the backup into.

   ```bash
   # mkdir temp
   # cd /temp
   ```
3. Restore the kernel to the temporary folder.
   
   # tar xvf /dev/rmt/2cb

4. Move the cartridge back to slot 1.
   
   # mtx -f /dev/scsi/changer/c3t1d0 unload 1 0

5. Compare the original kernel with the restored kernel.
   
   # cmp /platform/`arch -k`/kernel/sparcv9/unix /temp/platform/`arch -k`/kernel/sparcv9/unix

   If no differences are found between the two files, no message will be displayed.