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Hitachi Freedom Storage™ 5800/Thunder 9200™

Hitachi Path Manager for AIX®

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Document Revision Level

The following source documents were used to produce this 5800/9200 user guide:

Hitachi Path Manager for AIX User's Manual, Revision 7.

DF500 Series Storage Subsystem Hitachi Path Manager for AIX Release Note, Revision 5.

DF350/400 Series Storage Subsystem Hitachi Path Manager for AIX Release Note, Revision 3.

Changes in this Revision

Added “System Parameter Settings” sections for the 9200 and the 5800 in Chapter 2 System Configuration Requirements.

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Preface

The Hitachi Path Manager software resides on an AIX host system that is attached to a Hitachi Disk Array Subsystem. It uses redundant paths between the server and the disk storage to enhance performance and availability. The Hitachi Path Manager provides a failover function, which permits applications to run without interruption when path errors occur. This function does not modify the application software.

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Chapter 1 Introducing the Hitachi Path Manager

The Hitachi Path Manager software, which resides in the host server with the disk device driver for the Hitachi Disk Array Subsystem, uses redundant paths between the host server and disk storage in a Hitachi Disk Array Subsystem to enhance performance and data availability. These connections comprise many different components through which data flows during input and output processes. Redundancy and the ability to switch between these components provides many different paths for the data to travel.

Note: You cannot run Path Manager in an environment where more than one host is attached to the same logical unit (LUN) on a Hitachi Disk Array Subsystem, for example, a multi-host environment.

The Hitachi Path manager provides failover functionality. In most cases, host servers are configured with multiple host adapters and SCSI connections to a Hitachi Disk Array Subsystem that provides internal component redundancy. With dual clusters and multiple host interface adapters, the Hitachi Disk Array Subsystem provides more flexibility in the number of input-output paths that are available. When there is a failure, the Hitachi Path manager reroutes input-output operations from the failed path to the remaining paths. This prevents a bus adapter on the host server, external SCSI cable, or cluster or host interface adapter on the Hitachi Disk Array Subsystem from disrupting data access. In the event of failure in one input-output path, current operations are automatically switched to another input-output path. This automatic switching in the event of failure is called *failover*.

This document includes the following information:

- System Configuration Requirements
- Defining Failover
- Installing Hitachi Path Manager on an AIX Host
- Using Commands
- Path Repair Procedure
- Using HACMP and Hitachi Path Manager

Chapter 2 System Configuration Requirements

The minimum configuration specifications and requirements are listed for the following Hitachi Data Systems disk array subsystems:

- 9200 Disk Array Subsystem
- 5800 Disk Array Subsystem

2.1 9200 Disk Array Subsystem

The following 9200 disk array subsystem information is included in this section:

- Specifications
- Requirements
- Configuration
- System Parameter Settings

2.1.1 Specifications

Table 2.1 9200 Specifications

9200 Specifications		Quantity
Host PC	IBM RS/6000 (see Note 1 below) with AIX Version 4.3.2 or Version 4.3.3 with APAR (FTP) IY04634 and IY05369, U470141, U470126 and U467115 installed (see Notes 2 and 3 below).	1
Host Bus Adapters	IBM FC6207 SCSI Adapter or IBM FC6227 Fibre Channel Adapter (see Note 2 below)	2
Microprogram Version	SCSI: 0503 or later Fibre Channel: 0553 or later (See Note 4 below)	1
Interface Adapter	SCSI or Fibre	2
I/F Cables	SCSI or Fibre	2

The software fits on a single floppy disk. (For specific installation information, see Installing the Hitachi Path Manager on page 19.)

2.1.2 Requirements

Note 1: RS/6000 server characteristics

1. AIX Entry

   RS/6000 - 7012 Model G40, 397

   - 7013 Model 590, 591, 595, 59H, J30, J40, J50

   - 7024 Model E20, E30

   - 7025 Model F30, F40, F50, F80

   - 7026 Model H10, H50, H70, H80, M80

   - 7015 Model R20, R24, R40, R50

   - 7017 Model S70, S7A, S80

2. AIX Enterprise

   R/S 6000 SP - 9076

Note 2: Fibre Channel Adapter requirements:

- RS/6000 server which supports FC6227

- AIX system is installed AIX Version 4.3.3 with APAR U470141, U470126 and U467115

- HBA firmware of HBA is S2F2.23 or later

- HBA Device Driver is 4.3.3.0 for AIX 4.3.3

Note 3: To use HACMP 4.3.1 or HACMP 4.4, you must meet the following requirements:

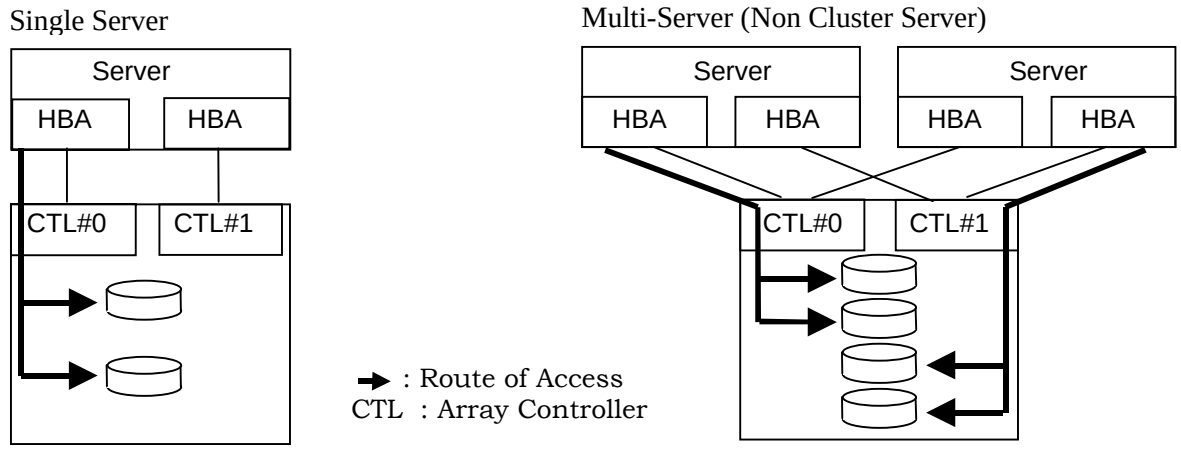
1. For HACMP 4.3.1:
   - AIX system is installed with AIX Version 4.3.3.
   - HACMP 4.3.1 with APAR IY05764 (or later), IY09346 (or later), and IY07392 (or later).
2. For HACMP 4.4:
   - AIX system is installed with AIX Version 4.4.
   - At minimum, applied APAR IY10564 (or later) or IY10563 (or later).
   - At minimum, applied APAR IY11723 (or later), IY11672 (or later), IY11640 (or later), IY11636 (or later), IY11635 (or later) IY11480 (or later), or IY11848 (or later).

Note 4: If you a Fibre Channel environment, configure as follows:

1. When the 9200 disk array subsystem is connected directly to the server, set the **Link Separation Mode**.
2. When you connect to the switch environment with the 9200 disk array subsystem and the server, use Brocade 2800/2050 and set **Fport (P_to_P)**.

2.1.3 Configuration

The system configuration information is as follows:



Note: If you connect the 9200 in the Multi-Server configuration, you must connect each cable per I/O port.

2.1.4 System Parameter Settings

To set the system parameters, refer to the following:

- Dual Type
- Dual Share Mode
- Controller Serial Number (SERIAL NO)
- Host Connection Mode
- Link Separation

2.1.4.1 Dual Type

Set “Dual Active Mode” in the **System Startup Attribute**.

2.1.4.2 Dual Share Mode

Set “Used” in the **Data Share Mode**.

2.1.4.3 Controller Serial Number (SERIAL NO)

Hitachi Path Manager recognizes the controller serial number; it is therefore able to discriminate between multiple systems. Set a voluntary number; the serial number is not a default setting.

Note: If two or more 5800s are connected, set the serial number of each unique system.

2.1.4.4 Host Connection Mode

Set “ON” in the “Report inquiry page 83h” of “Host Connection Mode2” for all controllers/ports.

2.1.4.5 Link Separation

Set “Link Separation”.

2.2 5800 Disk Array Subsystem

The following 5800 disk array subsystem information is included in this section:

- Specifications
- Requirements
- Configuration
- System Parameter Settings

2.2.1 Specifications

Table 2.2 5800 Specifications

5800 Specifications		Quantity
Host PC	IBM RS/6000 (see Note 1 below) with AIX Version 4.3.2 or Version 4.3.3 with APAR (FTP) IY04634 and IY05369 installed (see Note 2 below).	1
Host Bus Adapters	IBM FC6207 SCSI Adapter or IBM FC6227 Fibre Channel Adapter (see Note 2 below)	2
Microprogram Version	Dual Controller System x407/H or later (SCSI) x457/H or later (Fibre) (x = 0: without SNMP, x = 4 with SNMP)	1
Interface Adapter	SCSI or Fibre	2
I/F Cables	SCSI or Fibre	2

The software fits on a single floppy disk. (For specific installation information, see Installing the Hitachi Path Manager on page 19.)

2.2.2 Requirements

Note 1: RS/6000 server characteristics

3. AIX Entry

RS/6000
- 7012 Model G40, 397
- 7013 Model 590, 591, 595, 59H, J30, J40, J50
- 7024 Model E20, E30
- 7025 Model F30, F40, F50, F80
- 7026 Model H10, H50, H70, H80, M80
- 7015 Model R20, R24, R40, R50
- 7017 Model S70, S7A, S80

4. AIX Enterprise

   R/S 6000 SP - 9076

   Note 2: Fibre Channel Adapter requirements:

   - RS/6000 server which supports FC6227

   - AIX system is installed AIX Version 4.3.3 with APAR U470141, U470126 and U467115

   - HBA firmware of HBA is S2F2.23 or later

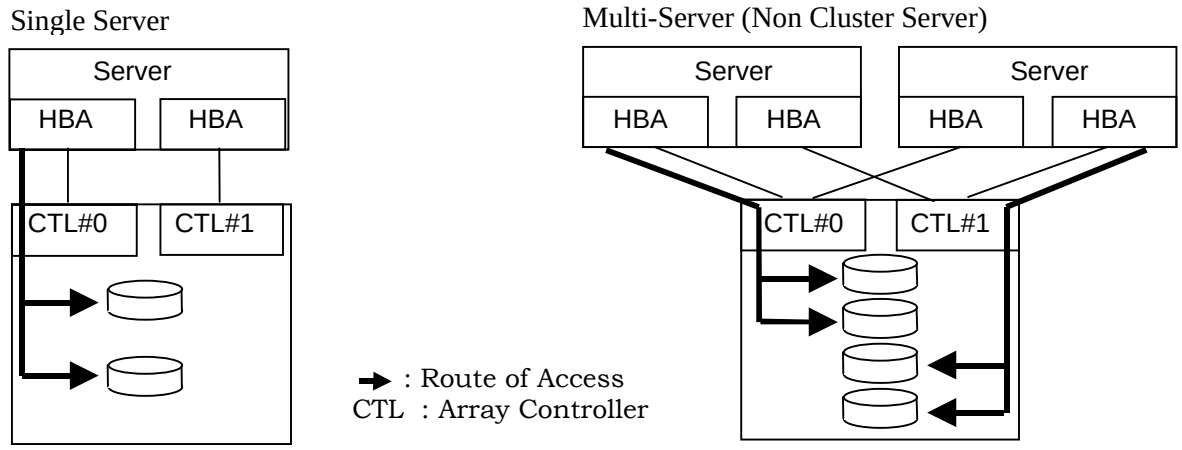
   - HBA Device Driver is 4.3.3.0 for AIX 4.3.3

Limitations:

This version of Hitachi Path Manager cannot be used with HACMP.

2.2.3 Configuration

The system configuration information is as follows:



2.2.4 System Parameter Settings

To set the system parameters, refer to the following:

- Dual Configuration
- Dual Type
- Dual Share Mode
- Controller Serial Number (SERIAL NO)
- Option (OPTION, ENHANCE OPTION)

2.2.4.1 Dual Configuration

Set “DUAL MODE” in **Dual Configuration**.

Panel Display

```
D U A L   C O N F I G
  D U A L   M O D E
```

2.2.4.2 Dual Type

Set “DUAL ACTIVE” in **Dual Type**.

Panel Display

```
D U A L   T Y P E
  D U A L   A C T I V E
```

2.2.4.3 Dual Share Mode

Set “ON” in **Data Share Mode**.

Panel Display

```
D A T A   S H A R E   M O D E
  O N
```

2.2.4.4 Controller Serial Number (SERIAL NO)

Hitachi Path Manager recognizes the controller serial number; it is therefore able to discriminate between multiple systems. Set a voluntary number; the serial number is not a default setting.

Panel Display

```
S E R I A L   N O

                    ? ? ? ?
```

Note: If two or more 5800s are connected, set the serial number of each unique system.

2.2.4.5 Option (OPTION, ENHANCE OPTION)

Set the option code 0000 and the enhance option code 20000000.

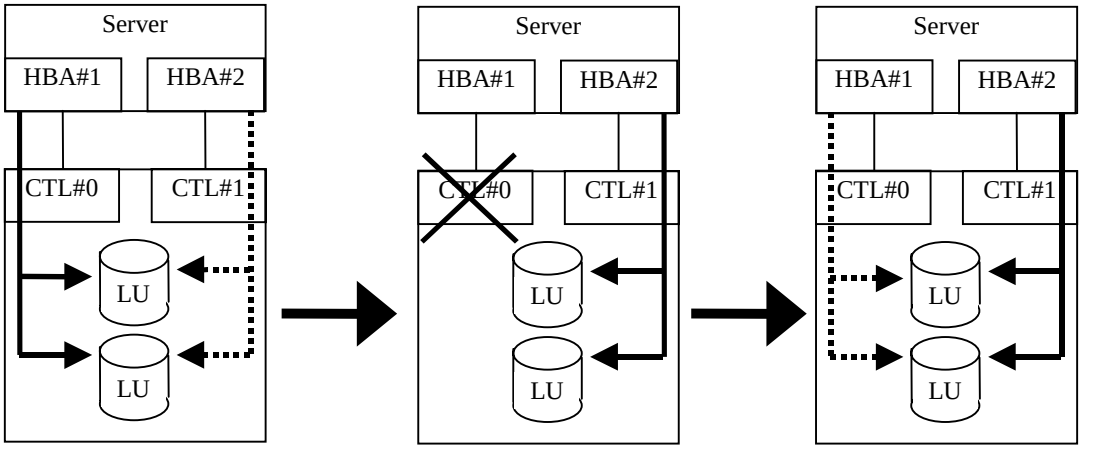
Panel Display

```
O P T I O N

                    0 0 0 0
```

```
E N H A N C E   O P T I O N

              2 0 0 0 0 0 0 0
```

Chapter 3 Defining Failover

This function can be explained in three sections (see the diagram below):



1. Normal (Before malfunction)
2. Path malfunction (Array controller malfunction)
3. After restoration (After the recovery command issue)

HBA : Host Bus Adapter
CTL : Array Controller
LU : Logical Unit

: Active Path
: Standby Path

1. Normal

   This function does not support the Load Balance function. One controller (HBA#1) always manages the I/O operation (Active Path) while the other Standby Path waits for failover action.

2. Path Malfunction

   When one controller (HBA#1) malfunctions, the other controller (HBA#2) accepts the I/O operation. This failover action is executed automatically.

3. After the path which malfunctioned is repaired, you need to execute the command for the recovering path (see Path Repair Procedure on page 43). The repaired path is then available and is now the standby path.

Chapter 4 Installing Hitachi Path Manager on an AIX Host

This chapter provides instructions to install and set up the Hitachi Path Manager on an AIX host system attached to a Hitachi Disk Array Subsystem.

This section includes the following:

- Configuring Host Adapters for the Hitachi Path Manager
- Configuring the Disk Array Subsystem
- Reviewing Flow Diagrams for Setting/Resetting the Hitachi Path Manager
- Installing the Hitachi Path Manager
- Note After Installing the Hitachi Path Manager
- Configuring the Hitachi Path Manager and Verifying the Configuration
- Creating the File System
- Unconfiguring the Hitachi Path Manager Devices
- Removing the Hitachi Path Manager from an AIX Host System
- Creating Devices Online
- Removing the Disk

4.1 Configuring Host Adapters for the AIX Hitachi Path Manager

Before you install and use the Hitachi Path Manager, you must configure your SCSI adapters. For SCSI adapters that attach boot devices, ensure the BIOS for the adapter is *enabled*. For all other adapters that attach non-boot devices, ensure the BIOS for the adapter is *disabled*.

Note: When the adapter shares the SCSI bus with other adapters, the BIOS must be *disabled*.

4.2 Configuring the Disk Array Subsystem

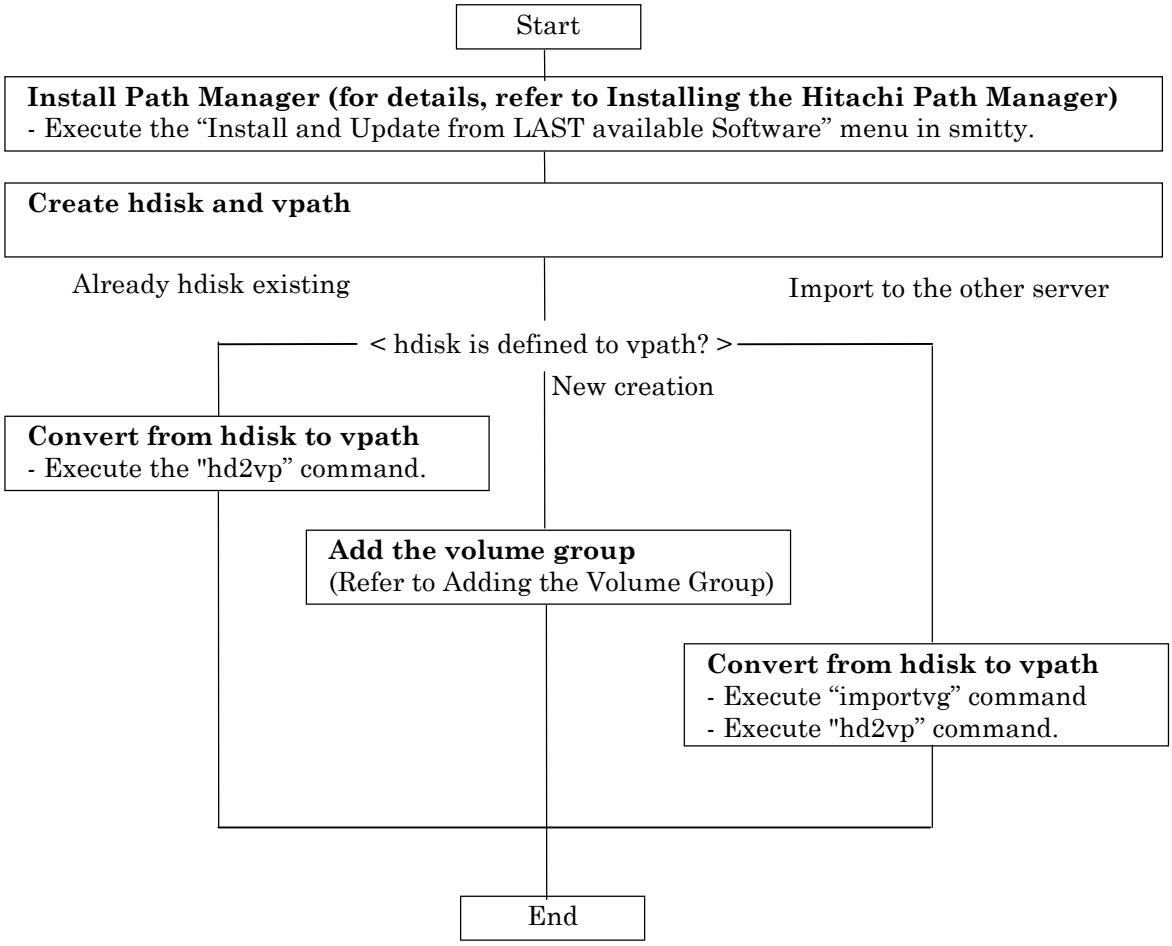
Confirm and set the system parameters (System Configuration Requirements on page 3).

Note: The Hitachi Path Manager LUNs support up to 8 paths each. The disk array subsystem supports up to 64 LUNs.

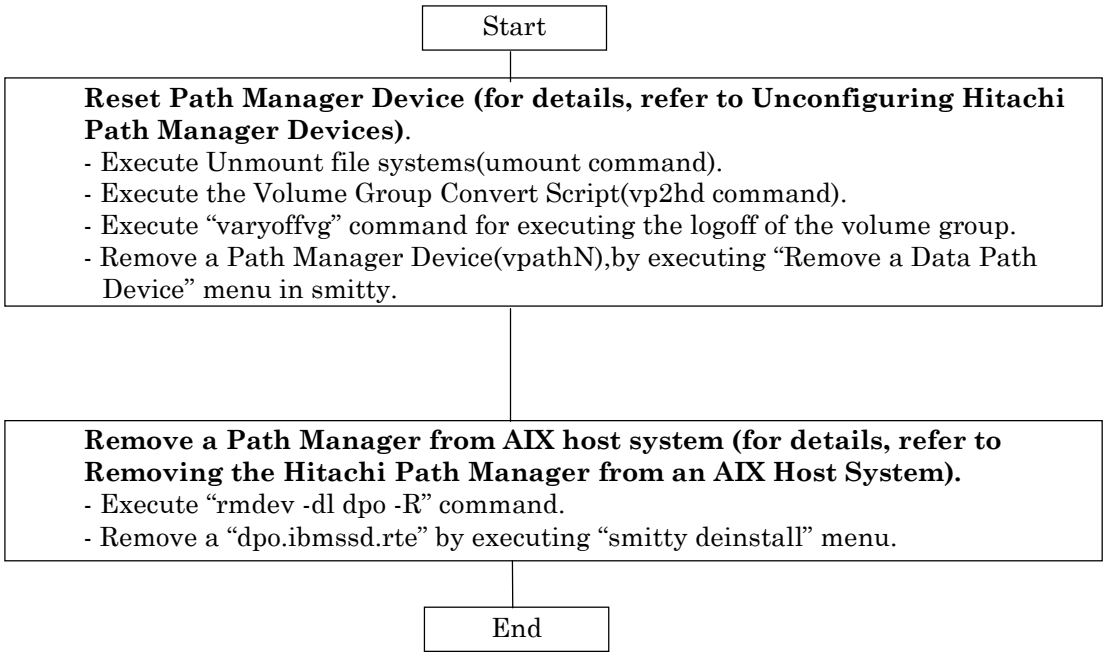
4.3 Reviewing Flow Diagrams for Setting/Resetting the Hitachi Path Manager

The following flow diagrams are included in this section:

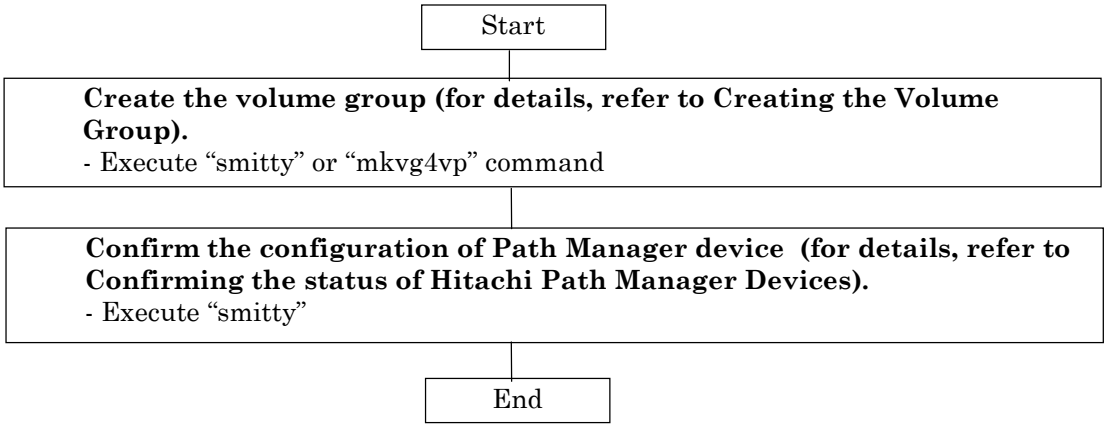
- Installing and Configuring the Hitachi Path Manager
- Removing the Hitachi Path Manager
- Adding the Volume Group
- Creating the Disk for the Hitachi Path Manager


Start
Install Path Manager (for details, refer to Installing the Hitachi Path Manager)
- Execute the “Install and Update from LAST available Software” menu in smitty.
Create hdisk and vpath
Already hdisk existing
Import to the other server
< hdisk is defined to vpath? >
New creation
Convert from hdisk to vpath
- Execute the "hd2vp” command.
Add the volume group
(Refer to Adding the Volume Group)
Convert from hdisk to vpath
- Execute “importvg” command
- Execute "hd2vp” command.
End

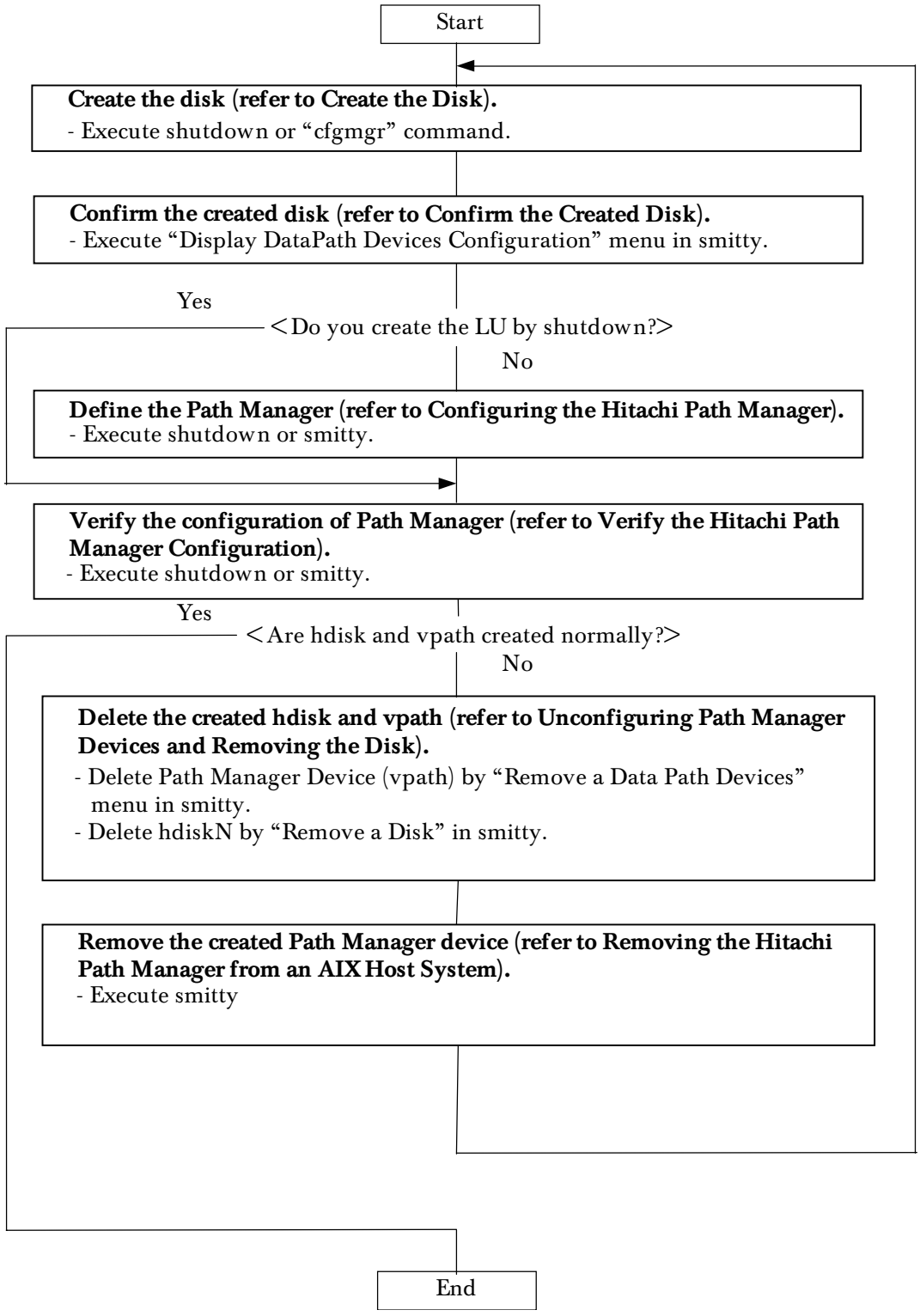
Removing the Hitachi Path Manager



Adding the Volume Group



Creating the Disk for the Hitachi Path Manager



4.4 Installing the Hitachi Path Manager

Note 1: Hitachi Path Manager does not support the boot disk of the Hitachi Disk Array Subsystem. Install the OS and Hitachi Path Manager to the internal disk of the server.

Note 2: You must have root access to install the Path Manager. You must have AIX system administrator knowledge and be familiar with the Software and Management Interface Tool (SMIT).

Note 3: When you re-install the Path Manager in the system that Path Manager is installed, you must uninstall and re-install the Path Manager.

These installation instructions use the Software Management and Interface Tool (SMIT). The Path Manager is released as an install image. The package name is **dpo.ibmssd.rte**.

Perform the following SMIT steps to install the Path Manager device driver and application programs on your system.

Note: Throughout this procedure, **/dev/fd0** is used for the FD. This might be different in your environment.

1. Log in as the root user.
2. Load the FD into the selected drive.
3. From your desktop window, enter **smitty install_update** to go directly to the install panels. The Install and Update Software menu displays.
4. Highlight **Install and Update from LATEST Available Software** and press **Enter**.
5. Press F4 to display the INPUT device / directory for software screen.
6. Select the FD drive that you are using for the installation; for example, ***/dev/fd0***/ and press **Enter**.
7. The Install and Update from LATEST Available Software screen displays.
8. Highlight the **SOFTWARE to install** and press **F4**. The SOFTWARE to install screen displays.
9. Select **dpo.ibmssd** and press **Enter**. The Install and Update from LATEST Available Software screen displays with the name of the software you selected to install.

Note: The fileset name for **dpo.ibmssd** (Path Manager) is **dpo.ibmssd.rte**.

The AIX version level is attached to this fileset name (432 or 433).

10. Check the default option settings to ensure they are what you need.
11. Press Enter to install. SMIT responds with the following message:

```
ARE YOU SURE?
Continuing may delete information you may want to keep.
This is your last chance to stop before continuing.
```

12. Press Enter to continue. This installation might take several minutes.
13. When the installation completes, press **F10** to exit from SMIT. Remove the FD.

End of procedure

4.5 Note After Installing the Hitachi Path Manager

When the Hitachi Path Manager is installed, the device changes from hdisk to vpath; as a result, certain procedures and commands are changed.

Please note the following:

- You must define the PVID to vpath side.
- When you create the volume group, use the **mkvg4vp** (Add a Volume Group with Data Path Devices) command. Specify vpath.
- When you extend the volume group, use the **extendvg4vp** (Add a Data Path Volume Group) command. Specify vpath.
- You must change PVID to vpath before executing the **extendvg4vp** command.
- You must change PVID to hdisk before deleting vpath.
- You must change PVID to vpath before deleting the volume group.

No.	Content	Procedure without Hitachi Path Manager	Procedure with Hitachi Path Manager
1	Create the volume group	Use the **mkvg** command or smitty (Add a Volume Group).	Use the **mkvg4vp** command or smitty (Add a Volume Group Path Device).
2	Extend the volume group	Use the **extendvg** command or smitty (Add a Physical Volume to a Volume Group).	Use the **extendvg4vp** command or smitty (Add a Data Path Volume to a Volume Group).
3	importvg	Use the **importvg vg hdiskN** command or smitty (Import the Volume Group).	1. Use the **importvg vg vpathN** command or smitty (Import the Volume Group). 2. Convert the hdisk to vpath by using **hd2vp** command.
4	Add the disk	Use the **cfgmgr** command or smitty.	1. Create the hdisk of path 0 by using **cfmgr -1 scsiM** (or fscsiM) command. 2. Creat the hdisk of path 1 by using **cfgmgr -1 scsiM** (or fscsiM) command. 3. Create vpath by using smitty (define and configure all devices.
5	Delete the device	Use the **rmdev -d1 hdiskN** command or smitty.	1. Convert the vpath to vpath by using the **vp2hd** command. 2. Varyoff the volume group by using the **varyoff** command. 3. Delete vpath by using the **rmdev -dl vpathN** command or smitty datapath_disk (Delete a device).

4.6 Configuring the Hitachi Path Manager and Verifying the Configuration

This section contains the following procedures:

- Configuring the Hitachi Path Manager
- Verifying the Hitachi Path Manager Configuration

Note: You must have root access to configure the Hitachi Path Manager.

4.6.1 Configuring the Hitachi Path Manager

You can configure the Hitachi Path Manager on an AIX host system in one of two ways.

Note: Before you configure the Hitachi Path Manager, ensure that the disk array subsystem is on and configured currently on the AIX host system, and that the **dpo.ibmssd.rte** software is installed on the AIX host system.

4.6.2 Using Shutdown

Enter **shutdown -rF** to start your AIX host server again. This will take a few minutes.

You can also use SMIT, as described in the following section.

Note: When you are online and you increase the number of devices, use SMIT for setting the Hitachi Path Manager.

4.6.3 Using SMIT

Vary off (deactivate) all active volume groups with the system disks using the **varyoffvg LVM** command.

Note: Before you vary off a volume group, unmount all file systems of that volume group that are mounted.

Follow these steps to configure the Hitachi Path Manager:

Note: If you already have a volume group in your system, you can use the **hd2vp** command to convert to an hdisk device instead of using smitty.

1. Enter **smitty** from your desktop window. The System Manager Interface Tool Menu is displayed.
2. Highlight **Devices** and press **Enter**. The Devices menu is displayed.
3. Highlight **Data Path Devices** and press **Enter**. The Data Path Devices screen is displayed.

4. Highlight **Define and Configure all Data Path Devices** and press **Enter**. Configuration begins.

To return the volume group of disk array subsystem disks to service that you varied off prior to configuring the Path Manager devices, enter the **varyonvg LVM** command. Then, mount the volume group file systems that you previously unmounted.

End of procedure.

4.6.4 Verify the Hitachi Path Manager Configuration

To verify configuration of the Path Manager on an AIX host system, follow the steps below.

1. Enter **smitty** from your desktop window. The System Management Interface Tool Menu is displayed.
2. Highlight **Devices** and press **Enter**. The Devices menu is displayed.
3. Highlight **Data Path Devices** and Press **Enter**. The Data Path Devices screen is displayed.
4. Highlight **Display Data Path Device Configuration** and press **Enter**. A list is displayed, indicating the condition (either ***Defined*** or ***Available***) of all Path Manager pseudo devices, in addition to the multiple paths of each device. If any device is listed as ***Defined***, the configuration was not successful. Check the configuration procedure again.
5. Confirm that both hdisks for adapter 0 and 1 are defined to vpath. If you confirm that the hdisk of adapter 0 for vpath is configured only as example 2,
   a) Verify that the volume group is not active. If the volume group is active, you must varyoff LVM, delete the corresponding vpath device, and reconfigure the vpath device. (Refer to Configuring the Hitachi Path Manager on page 21.)
   b) Verify that the hdisk of adapter 1 exists. If the hdisk of adapter 1 does not exist, you must delete the hdisk of adapter 1 and vpath device, then recreate the hdisk of adapter 1 (refer to Creating Devices Online on page 26) and reconfigure the vpath device (refer to Configuring the Hitachi Path Manager on page 21).
   c) If you confirm that the volume group is not active and the hdisk of adapter 1 exists, delete the vpath device and reconfigure the vpath device (refer to Configuring the Hitachi Path Manager on page 21).

Example 1: Normal

```
vpath0 (Avail pv vg00) 00030023_0006__ =hdisk1 (Avail ) hdisk3 (Abail )
vpath1 (Avail pv vg01) 00030023_0007__ =hdisk2 (Avail ) hdisk4 (Abail )
vpath2 (Avail ) 00030023_0008__ =hdisk5 (Avail pv vg02) hdisk7 (Abail pv vg02)
vpath3 (Avail ) 00030023_0009__ =hdisk6 (Avail pv vg03) hdisk8 (Abail pv vg03)
```

Example 2: Failure to Create

```
vpath0 (Avail pv vg00) 00030023_0006__ =hdisk1 (Avail ) hdisk3 (Abail )
vpath1 (Avail pv vg01) 00030023_0007__ =hdisk2 (Avail ) hdisk4 (Abail )
vpath2 (Avail ) 00030023_0008__ =hdisk5 (Avail pv vg02) hdisk7 (Abail pv vg02)
vpath3 (Avail ) 00030023_0009__ =hdisk6 (Avail pv vg03)<-- hdisk8 of adapter 1 is
                                                           not defined to vpath3
```

4.7 Creating the File System

This section includes the following:

- Creating the Volume Group
- Confirming the Status of the Hitachi Path Manager Devices

4.7.1 Creating the Volume Group

To create the volume group, follow these procedures:

1. Enter **smitty** from your desktop window. The System Manager Interface Tool Menu is displayed.
2. Highlight **System Storage Management (Physical & Logical Storage)** and press **Enter**. The System Storage Management (Physical & Logical Storage) menu is displayed.
3. Highlight **Logical Volume Manager** and press **Enter**. The Logical Volume Manager menu displayed.
4. Highlight **Volume Groups** and press **Enter**. The Volume Groups Menu display is displayed.
5. Highlight **Add Volume Group with Data Path Devices** and press **Enter**. The Add a Volume Group with Data Path Devices menu is displayed.
6. Enter the appropriate volume name (ex. df500gv00) in the VOLUME GROUP name field.
7. Press **F4** in the **PHYSICAL VOLUME names** field**,** select Path Manager Device (vpathN) and press **Enter**.
8. Check the default value in other option.
9. Press **Enter**. Start the process of creating the file system.

```
ARE YOU SURE?
Continuing may delete information you may want to keep.
This is your last chance to stop before continuing.
Press Enter to continue.
Press cancel to return to the application.
```

10. Press **Enter** for continue. Then start the process of creating the volume group.
11. If the following panel is displayed, enter **y** and press **Enter**.

```
The physical volume appears to belong to another volume group.
mkvg: Warning, all data belonging to physical volume vpath0 will be destroyed.
mkvg: Do you wish to continue? y(es) n(o)?
```

12. If you need to mount the other file system, return to the step 6.

End of procedure.

Note: You can use the **mkvg4vp** command instead of using smitty.

4.7.2 Confirming the Status of Path Manager Devices

To verify multiple attached paths of each adapter connected to the disk array subsystem port, follow these steps:

1. Enter **smitty** from your desktop window. The System Management Interface Tool menu is displayed.
2. Highlight **Devices** and press **Enter**. The Devices menu is displayed.
3. Highlight **Data Path Devices** and press **Enter**. The screen is displayed.
4. Highlight **Display Data Path Device Adapter Status** and press **Enter**. The screen displays all attached paths of each adapter.
5. Highlight **Display Data Path Device Status** and press Enter. The information of each device is displayed.

```
vpath0 (Avail pv vg00) 00030023_0006__ =hdisk1 (Avail ) hdisk3 (Avail )
vpath1 (Avail pv vg01) 00030023_0007__ =hdisk2 (Avail ) hdisk4 (Avail )
vpath2 (Avail ) 00030023_0008__ =hdisk5 (Avail pv vg02) hdisk7 (Avail pv vg02)
vpath3 (Avail ) 00030023_0009__ =hdisk6 (Avail pv vg03) hdisk8 (Avail pv vg03)
```

Note: You can use the **lsvpcfg** command instead of using smitty.

End of procedure.

4.8 Unconfiguring the Hitachi Path Manager Devices

Before you unconfigure the Hitachi Path Manager devices, unmount all the file systems from the volume groups on the Hitachi Path Manager devices. Then, run the **vp2hd** volume group conversion script to convert the volume group from the Hitachi Path Manager device (**vpathN**) to the disk array subsystem physical devices (hdisks).

Using the **varyoffvg LVM** command, execute the varyoff of all active volume groups on the disk device.

Using the Software Management Interface Tool (SMIT), you can unconfigure the Path Manager devices two ways. Either you can configure without deleting the device information from the Object Database Management (ODM) database, or you can delete device information from the ODM database. If you unconfigure without deleting the device information, the device remains in the **Defined** condition. Using SMIT, you can return it to an **Available** condition.

If you delete the device information from the Hitachi Path Manager database, that device is removed from the system. To return it, follow the procedure described in section “Configuring the Hitachi Path Manager”.

Follow these steps to unconfigure Hitachi Path Manager devices:

1. Enter **smitty** from your desktop window. The System Management Interface Tool menu is displayed.
2. Highlight **Devices** and press **Enter**. The screen is displayed.
3. Highlight **Data Path Devices** and press **Enter**. The screen is displayed.

4. Highlight **Remove a Data Path Device** and press **Enter**. A list of all Path Manager devices and their conditions (either ***Defined*** or ***Available***) is displayed.
5. Select the device that you want to unconfigure. Select whether or not you want to delete the device information from the Path Manager database.
6. Press **Enter**. The device is unconfigured to the condition that you selected.

Note: To remove all devices from your system and deinstall the Hitachi Path Manager software, all Hitachi Path Manager devices must be removed from your host system. Select **No** on the KEEP definition in database field. You can then remove the Hitachi Path Manager software from your AIX host system.

End of procedure.

4.9 Removing the Hitachi Path Manager from an AIX Host System

Before you remove (deinstall) the Path Manager from your AIX host system, you need to delete all path manager devices from the Host system (see Unconfiguring the Hitachi Path Manager Devices on page 24).

Then, follow the steps below to remove (deinstall) the Hitachi Path Manager.

1. Enter **rmdev -dl dpo -R** from your desktop window.
2. Enter **smitty deinstall** from your desktop window to go directly to the Remove Installed Software panel. The screen is displayed.
3. Enter **dpo.ibmssd.rte** in the SOFTWARE name field.
4. Press the **Tab** key in the **PREVIEW Only?** field to toggle between Yes and No. Select **No** to remove the software package from your AIX host system.

Note: If you select **Yes**, the deinstall process stops at this point and previews what you are removing (deinstalling). The results of your deinstall pre-check are displayed without removing the software. If the condition for any Hitachi Path Manager device is either ***Available*** or ***Defined***, this deinstall will fail. If you fail to deinstall, you will need to retry this deinstallation.

5. Select **No** for the remaining fields on this screen.
6. Press **Enter**. SMIT responds with the following message:

```
ARE YOU SURE?
Continuing may delete information you may want to keep.
This is your last chance to stop before continuing.
```

7. Press **Enter** to begin the deinstall process. This might take a few minutes.
8. When the deinstall process completes, the Path Manager software package is removed from your system.

End of procedure.

4.10 Creating Devices Online

This section contains the following:

- Creating the Disk
- Confirming the Disk is Created

4.10.1 Creating the Disk

To create disks online, use one of the following two procedures:

- Automatic
- Command Line

4.10.1.1 Automatic

To create disks automatically:

1. Re-boot the AIX host server by using the **shutdown -rF** command. (This process takes a few minutes.)

   Note: In this procedure, the Path Manager device (vpathN) is also created automatically.

2. Confirm that the disk is created normally. (Refer to Confirming the Disk is Created on page 27.)
3. Verify the Hitachi Path Manager configuration. (Refer to Verify the Hitachi Path Manager Configuration on page 22.)

4.10.1.2 Command Line

Note: In this procedure, vpaths are not created automatically.

To create disks from the command line:

1. Enter the **datapath query adapter** command from your desktop window. The list of defined adapters is displayed.

```
# datapath query adapter
Active adapter :2
Adpt# Adapter Name State   Mode     Select Errors Paths Active

0  fscsi2       NORMAL  ACTIVE    36098      0     4      4
0  fscsi2       NORMAL  ACTIVE    36098      0     4      4
```

2. Create the disk with the adapter name **adapter 0**.

```
# cfgmgr -l fscsi2
```

3. Create the disk with the adapter name **adapter 1**.

```
# cfgmgr -l fscsi1
```

End of procedure.

4.10.2 Confirming the Disk is Created

To confirm the disk is created, follow these procedures:

1. Enter **smitty** from your desktop window. The System Management Interface Tool menu is displayed.
2. Highlight **Devices** and press **Enter**. The Device Menu is displayed.
3. Highlight **Disk** and press **Enter**. The disk menu is displayed.
4. Highlight **List All Defined Disks**, and press **Enter**. The list of currently defined disks is displayed. Confirm that the following information is correct:
   - The hdisks of adapters 0 and 1 are created for the newly created Lus.
   - If you increased the LUs, verify that the order of adapter addresses for the increased hdisks agree with the order of adapter addresses for the existing hdisks.

If the order of the adapters is different, execute the following:

- Delete the created hdisk and vpath.
- Re-create the hdisk for the increased LU (see Creating the Disk on page 26)

Example: Adding Two LUs

```
hdisk0 Available 10-80-00-4,0 16 Bit SCSI Disk Drive
hdisk1 Available 1P-80-00-0,0 Other SCSI Disk Drive
hdisk2 Available 1P-80-00-0,1 Other SCSI Disk Drive
hdisk3 Available 10-80-00-1,0 Other SCSI Disk Drive
hdisk4 Available 10-80-00-1,1 Other SCSI Disk Drive
vpath0 Available              Data Path Optimizer Pseudo Device Driver
vpath0 Available              Data Path Optimizer Pseudo Device Driver
hdisk5 Available 1P-80-00-0,0 Other SCSI Disk Drive
hdisk6 Available 1P-80-00-0,1 Other SCSI Disk Drive
hdisk7 Available 10-80-00-1,0 Other SCSI Disk Drive
hdisk8 Available 10-80-00-1,1 Other SCSI Disk Drive
vpath2 Available              Data Path Optimizer Pseudo Device Driver
vpath3 Available              Data Path Optimizer Pseudo Device Driver
```

Note: When you create the disk manually, vpath is not created.

End of procedure.

When you have configured the Hitachi Path Manager for the created device, execute the procedure in Configuring the Hitachi Path Manager and Verifying the Configuration on page 21.

4.11 Removing the Disk

To remove the disk, follow these procedures:

1. Enter **smitty** on disk top windows. The System Administrator menu is displayed.
2. Highlight **Device** menu, and press **Enter**. The Device menu is displayed.
3. Highlight **Disk** menu, and press **Enter**. The Disk menu is displayed.
4. Highlight **Remove a Disk** and press **Enter**. The list of current defined disks is displayed.
5. Highlight the disk you wish to remove and press **Enter**.
6. Press **Enter**. The following panel is displayed.

```
ARE YOU SURE?
Continuing may delete information you may want to keep.
This is your last chance to stop before continuing.
```

7. Press **Enter**. The system executes the disk removal.

End of procedure.

Chapter 5 Using Commands

The Hitachi Path Manager provides commands which enable you to display the status of adapters that are used to access managed devices, or to display the status of devices that the device driver manages. You can also set individual path conditions either to online or offline, or set all paths that are connected to an adapter or bus either to online or offline. This chapter describes these commands.

Note: No graphic user interface (GUI) is used with this product. Use the command line to enter these commands.

This section includes the following:

- Command Syntax Conventions
- Administration Commands
- Volume Group Management Commands

5.1 Command Syntax Conventions

The following syntax conventions are used for the Hitachi Path Manager commands:

- Use the word **datapath** to begin all Hitachi Path Manager commands.
- Use the word **query** to display information.
- Use the word **set** to change the state of the datapath.
- All commands apply to either an **adapter** or a **device**. This will be the last word in the command.

Note: You must log on as an Administrator user to use these commands.

5.2 Administration Commands

Table 5.1 provides a list of the Administration Commands, a brief description, and where to go in this chapter for more information.

Table 5.1 Administration Commands

Command	Description	Page Number
Datapath query adapter	Displays information about adapters.	30
Datapath query device	Displays information about devices	32
Datapath set adapter	Sets all device paths that are attached to an adapter.	35
Datapath set device	Sets the path of a device.	36

5.2.1 Datapath Query Adapter

The **datapath query adapter** command displays information about a single adapter or all adapters. After the AIX server completes startup, use this command to confirm that Hitachi Path Manager can use all the paths.

5.2.1.1 Syntax

datapath query adapter [*adapter_number*]

5.2.1.2 Parameters

adapter_number

The adapter number for which you want information displayed. If you do not enter an adapter number, information about all adapters is displayed.

5.2.1.3 Examples

datapath query adapter

This example might provide the following output:

```
Active Adapters :2

Adpt#     Adapter Name     State     Mode     Select     Errors     Paths     Active
0         scsi2            NORMAL    ACTIVE    36098       0         4          4
1         scsi3            DEGRAD    ACTIVE     2124       6         4          2
```

The following table defines the terms used in the previous example:

Term	Definition
Adpt #	The number of the adapter.
Adapter Name	The name of the adapter.
State	The condition of the named adapter. It can be either: **NORMAL** Adapter is in use. **DEGRADED** One or more paths are not functioning. **FAILED** The adapter is no longer being used by the Hitachi Path Manager.
Mode	The mode of the named adapter. It is either **ACTIVE** or **OFFLINE**.
Select	The number of times this adapter was selected for input or output.
Errors	The number of errors on a path that is attached to this adapter.
Paths	The number of paths that are attached to this adapter.
Active	The number of functional paths that are attached to this adapter. The number of functional paths is equal to the number of paths minus any that are failed or offline.

5.2.2 Datapath Query Device

The **datapath query device** command displays information about a single device or all devices. If you do not enter a device number, information about all devices is displayed. After the AIX server completes startup, use this command to confirm that Hitachi Path Manager can use all the devices.

5.2.2.1 Syntax

datapath query device [*device_number*]

5.2.2.2 Parameters

device_number

The device number for which you want information displayed. If you do not enter a device number, information about all devices is displayed.

5.2.2.3 Examples

Datapath query device

This example might provide the following output:

```
Total Devices : 4


  Dev#:    0 Device Name:   Vpath0 TYPE: OPEN-3    SERIAL: 3 0006

==============================================
    Path#   Adapter/Hard Disk   State      Mode
                                                  Select    Errors
        0       fscsi0/hdisk1    OPEN    NORMAL      43         0
        1       fscsi1/hdisk5    DEAD    NORMAL
                                                      43         3

  Dev#:    1 Device Name:   Vpath1 TYPE: OPEN-3    SERIAL: 3 0007

==============================================
    Path#   Adapter/Hard Disk   State      Mode
                                                  Select    Errors
        0       fscsi0/hdisk2    OPEN    NORMAL   21943         0
        1       fscsi1/hdisk6    DEAD    NORMAL
                                                    22056         7

  Dev#:    2 Device Name:   Vpath2 TYPE: OPEN-3    SERIAL: 3 0008

==============================================
    Path#   Adapter/Hard Disk   State      Mode
                                                  Select    Errors
        0       fscsi0/hdisk3    OPEN    NORMAL      31         0
        1       fscsi1/hdisk7    DEAD    NORMAL
                                                      43         3
  Dev#:    3 Device Name:   Vpath3 TYPE: OPEN-3    SERIAL: 3 0009
==============================================
    Path#   Adapter/Hard Disk   State      Mode   Select    Errors
        0       fscsi0/hdisk4    OPEN    NORMAL     1210         0
        1       fscsi1/hdisk8    DEAD    NORMAL      210        20
```

The following table defines the terms in the previous example:

Term	Definition
Dev#	The number of this device.
Name	The name of this device.
Type	The device product ID from Inquiry data.
Serial	The logical unit (LUN) serial number for this device.
Path#	The path number.
State	The condition of the named device. **OPEN** Path is in use. **CLOSE** Path is not being used. **DEAD** Path is no longer being used. It was either removed by the Hitachi Path Manager due to errors, or manually removed using the datapath command.
Mode	The mode of the named device. It is either **NORMAL** or **OFFLINE**.
Select	The number of times this path was selected for input or output.
Errors	The number of errors on a path that is attached to this device. This number may be counted up when the device driver detects the error without recording the error log, such as raw read over the end of data.

The following table shows the relationship between state and mode.

State	Mode	Contents
CLOSE	NORMAL	Path is not being used.
OPEN	NORMAL	Path is in use.
DEAD	NORMAL	Path is not longer being used. It was removed by Path Manager due to I/O errors.
DEAD	OFFLINE	Path is no longer being used. It was manually removed using the **datapath** command.

5.2.3 Datapath Set Adapter

The **datapath set adapter** command sets all device paths that are attached to an adapter either to online or offline.

Note: This command will not remove the last path to a device.

5.2.3.1 Syntax

datapath set adapter *adapter_number* {online|offline}

5.2.3.2 Parameters

adapter_number

The adapter number that you want to change.

online

Set adapter online.

offline

Set adapter offline.

5.2.3.3 Examples

```
datapath set adapter 0 online
```

5.2.4 Datapath Set Device

The **datapath set device** command sets the path of a device either to online or offline.

5.2.4.1 Syntax

datapath set device *device_number* **path** *path_number* {online|offline}

5.2.4.2 Parameters

device_number

The device number that you want to change.

path_number

The path number that you want to change.

online

Set path online.

offline

Remove the path from service.

Note: You cannot remove the last path to a device from service. This prevents data access failure.

5.2.4.3 Examples

```
datapath set device 0 path 0 online
```

5.3 Volume Group Management Commands

Table 5.2 provides a list of the Volume Group Management Commands, a brief description, and where to go in this chapter for more information.

Table 5.2 Volume Group Management Commands

Command	Description	Page Number
mkvg4vp	Creates the volume group for vpath devices.	37
hd2vp	Converts the volume group from hdisk to vpath.	38
vp2hd	Converts the volume group from vpath to hdisk.	38
lsvpcfg	Displays the configuration of vpath and hdisk.	39
extendvg4vp	Adds the physical volume vpath to the volume group.	40
dpovgfix	Clears the ODM and reconfigures the PVID of volumes to vpath.	41

5.3.1 mkvg4vp

The **mkvg4vp** command creates the volume group for vpath devices.

This command calls the **mkvg** command.

Note: When you configure the volume group for hdisk, you need to convert the volume group from hdisk to vpath. If the volume group remains defined to an hdisk, the Hitachi Path Manager will not function.

5.3.1.1 Syntax

mkvg4vp [*flags*] *vpath-device ….*

5.3.1.2 Parameters

flags

This parameter is the same as the flags of the **mkvg** command. Refer to the definition of the **mkvg** command.

vpath-device

This is the vpath device name that you want to add to the volume group.

5.3.2 hd2vp

The **hd2vp** command converts the volume group from hdisk to vpath.

Note: When you configure the volume group for hdisk, you need to convert the volume group from hdisk to vpath. If the volume group remains hdisk, the Hitachi Path Manager will not function.

5.3.2.1 Syntax

hd2vp *vg-name*

5.3.2.2 Parameters

vg-name

This is the hdisk that you want to change.

5.3.3 vp2hd

The **vp2hd** command converts the volume group from vpath to hdisk.

Note: The vpath is a pseudo device by Hitachi Path Manager. Before you uninstall the Hithachi Path Manager, you need to change to hdisk.

5.3.3.1 Syntax

vp2hd *vg-name*

5.3.3.2 Parameters

vg-name

This is the vpath that you want to change.

5.3.4 lsvpcfg

The **lsvpcfg** command displays the configuration of vpath and hdisk.

5.3.4.1 Syntax

```
lsvpcfg
```

5.3.4.2 Parameters

vpath-device

This is the vpath device that you want to display. If you do not enter a vpath device name, information about all devices is displayed.

5.3.4.3 Examples

```
lsvpcfg
```

```
vpath0 (Avail pv vg00) 0030023_0006__=hdisk1 (Avail ) hdisk9 (Aavail )
vpath1 (Avail pv vg01) 0030023_0007__=hdisk2 (Avail ) hdisk10 (Aavail )
vpath2 (Avail pv vg02) 0030023_0008__=hdisk3 (Avail ) hdisk11 (Aavail )
vpath3 (Avail pv vg03) 0030023_0009__=hdisk4 (Avail ) hdisk12 (Aavail )
vpath4 (Avail pv vg04) 0030023_0010__=hdisk5 (Avail ) hdisk13 (Aavail )
```

```
lsvpcfg vpath3
```

```
vpath3 (Avail pv vg03) 0030023_0009__=hdisk4 (Avail ) hdisk12 (Aavail )
```

5.3.5 extendvg4vp

The **extendvg4vp** command adds the vpath volume to the volume group.

This command calls the **extendvg** command.

Note: The **extendvg4vp** command is not able to be executed to extend Volume Group during mounting filesystems. Please unmount filesystems before executing the **extendvg4vp** command.

5.3.5.1 Syntax

extendvg4vp [*-f*] *vg-name vpath-device ….*

5.3.5.2 Parameters

-f

Refer to the definition of the **extendvg** command.

vg-name

This is the volume group that you want to add to the vpath device.

vpath-device

This is the vpath device that you want to add to the volume group.

5.3.6 dpovgfix

The **dpovfix** command clears the ODM and reconfigures the PVID of the volume to vpath.

5.3.6.1 Syntax

dpovgfix *vg-name*

5.3.6.2 Parameters

vg-name

This is the path that you need to reconfigure the definition.

5.3.6.3

When the PVID of vg01 is defined to vpath3, hdisk6 and hdisk8, use this command.

PVID is defined to vpath3.

```
# lspvcfg
vpath0 (Avail pv vg00) 0030023_0006__ =hdisk1 (Avail ) hdisk3 (Abail )
vpath1 (Avail pv vg00) 0030023_0007__ =hdisk2 (Avail ) hdisk4 (Abail )
vpath2 (Avail pv vg01) 0030023_0008__ =hdisk5 (Avail ) hdisk7 (Abail )
vpath3 (Avail pv vg01) 0030023_0009__ =hdisk6 (Avail ) pv vg01) hdisk8 (Abail pv vg01)

#dpovgfix vg01

#lspvcfg
vpath0 (Avail pv vg00) 0030023_0006__ =hdisk1 (Avail ) hdisk3 (Abail )
vpath1 (Avail pv vg00) 0030023_0007__ =hdisk2 (Avail ) hdisk4 (Abail )
vpath2 (Avail pv vg00) 0030023_0008__ =hdisk5 (Avail ) hdisk7 (Abail )
vpath3 (Avail pv vg00) 0030023_0009__ =hdisk6 (Avail ) hdisk8 (Abail )
```

Chapter 6 Path Repair Procedure

When one path has malfunctioned, failover action is executed automatically. But, after you repair the path, you need to execute the following procedure to recover the failed path.

1. Repair the failed path using the appropriate manual for the 5800 or 9200 disk array subsystem.
2. After repairing, you need to change the status of all paths from offline to online by using the **datapath set adapter** command. (Refer to Datapath Set Adapter on page 35.)

   We recommend that you execute this command immediately after the recovery operation; if the surviving path experienced a failure prior to recovery of the repaired path the system will be severely impacted or will experience an outage.
3. Confirm the state of adapter by using **datapath query adapter** command. (Refer to Datapath Query Adapter on page 30.)
4. Use the following procedure when the “Fail-over only” version of Hitachi Path Manager is used. After a path is repaired it will serve as a standby path in the event the functioning path fails. To verify the repaired path is functioning properly, use the following procedure. This procedure should be performed during the next available maintenance outage to avoid inducing a production outage.
   d) Change the status of the active path from online to offline by issuing the **datapath set adapter** command. (Refer to Datapath Set Adapter on page 35.) This will force I/O to the repaired path.
   e) Confirm that the repaired path is functioning properly by issuing the **datapath query adapter** command. (Refer to Datapath Query Adapter on page 30.) Check the SELECT column of the output of the datapath query adapter command. The SELECT column represents the number of times the path has serviced an I/O. If the repaired path continues to malfunction, the STATE column will display DEGRADE or FAILED status. Repair the failure and retry this step.
   f) After the path has been successfully repaired and verified, the user can elect to use the datapath set adapter command to change the repaired path from online to offline to serve as the standby path, or, allow the repaired path to function as the primary path.

Chapter 7 Using HACMP and Hitachi Path Manager

This section includes the following:

- Preliminary Modifications
- Using Concurrent Mode
- Using Non-Concurrent Mode
- Common Contents

7.1 Preliminary Modifications

If you run Hitachi Path Manager under HACMP, note the following:

Note 1: Refer to the HACMP manual if you have detailed questions.

Note 2: After you apply the necessary APAR (see Chapter 2: System Configuration Requirements), modify the following lines in each file. You do not need to modify these lines if the version of each file is later than the following: Dataset cluster.base.server.events 4.3.1.7 over(cl_disk_available : 1.2.5.18, cl_raid_vg : 1.3.1.9, convaryonvg : 1.8) for HACMP 4.3.1 or cluster.base.server.events 4.4.0.4 over(cl_disk_available : 1.2.5.18, cl_raid_vg : 1.3.1.9, convaryonvg : 1.8) for HACMP 4.3.1.

/usr/sbin/cluster/events/utils/cl_disk_available file

1.

Before	`VHD=$(lsvpcfg | grep -w $disk | awk '{print $6}')`
After	`VHD=$(lsvpcfg | grep -w $disk | awk '{print $7}')`

2.

Before	`HD=$(lsvpcfg | grep -w $VP | awk '{print $6, $9}')`
After	`HD=$(lsvpcfg | grep -w $VP | awk '{print $7, $10}')`

/usr/sbin/cluster/events/utils/cl_raid_vg file

1.

Before	`VP_HD=$(lsvpcfg | grep -w $HD | awk '{print $6}')`
After	`VP_HD=$(lsvpcfg | grep -w $HD | awk '{print $7}')`

2.

Before	`VP_HD=$(lsvpcfg | grep -w $DISK | awk '{print $6}')`
After	`VP_HD=$(lsvpcfg | grep -w $DISK | awk '{print $7}')`

/usr/sbin/cluster/events/utils/convaryonvg file

Before	`VP_HD=$(lsvpcfg | grep -w $VP_DV | awk '{print $6}' | sed s,^,/dev/,)`
After	`VP_HD=$(lsvpcfg | grep -w $VP_DV | awk '{print $7}' | sed s,^,/dev/,)`

7.2 Using Concurrent Mode

For concurrent mode, please note:

1. At the HACMP setup, add **osdisk** to the following:
   /usr/sbin/cluster/diag/clconraid.dat
2. When the **hd2vp** command is executed, change the VG to an active state by using the **varyonvg -u** command under HACMP. After this operation, change the VG to an inactive state by using the **varyoffvg** command.
   a) varyonvg -u vg00
   b) **hd2vp vg00**
   c) **varyoffvg vg00**

7.3 Using Non-Concurrent Mode

For non-concurrent mode, please note:

1. Use Hitachi Path Manager on all servers that share data under HACMP.
2. In the setup, DO NOT set the server to change during path failover.
3. DO NOT access a vpath device from the non-HACMP server. If you access it from a non-HACMP server, the data of the vpath device will be destroyed.

7.4 Common Contents

For common contents, please note:

1. When you import the VG by using the **importvg** command, specify vpath not hdisk. In this process, since PVID is defined to hdisk, start the HACMP after changing the definition of PVID to vpath by using the **hd2vp** command.
   a) importvg vg00 vpath0
   b) **hd2vp vg00**
2. Path failure during HACMP operation can be recovered during HACMP operation. However, if the path failed before HACMP started, it cannot recover during HACMP operation. Use the following recovery procedure:
   a) Confirm that HACMP operation has terminated. (If HACMP is active, terminate operation.)
   b) **varyonvg -u vg00**
   c) **datapath set adater N online**
   d) **aryoffvg vg00**

3. If the increased LU is recognized by the cluster, execute the following procedure:
   a) Stop the cluster server using SMIT.
   b) Restart the cluster server using SMIT.