HP StorageWorks

Using IBM AIX Native MPIO with HP Enterprise Virtual Array storage systems

application notes

About this document

This section describes the following topics:

Application notes information

These application notes describe the following major topics:

Intended audience

This document is intended for customers who are using IBM AIX Native MPIO with an HP StorageWorks 4000/6000/8000 Enterprise Virtual Array (EVA4000/6000/8000) storage system.

Accessing future product updates

HP strongly recommends that customers sign up online using the Subscriber's choice web site: http://www.hp.com/go/e-updates.

Subscribing to this service provides you with e-mail updates on the latest product enhancements, newest versions of drivers, and firmware documentation updates, as well as instant access to numerous other product resources.

After signing up, you can quickly locate your products by selecting **Business support** and then **Storage** under Product Category.

Other documentation

A complete library of related documentation is available on the following HP web site: http://h18006.www1.hp.com/storage/saninfrastructure.html

MPIO overview

Multi-Path IO is the storage multi-pathing solution part of the AIX base O,S starting with AIX 5.2 and AIX 5.3. Storage-specific functionality can be added to the basic MPIO framework by providing a vendor-specific path control module (PCM). The install package of the EVA MPIO solution (devices.fcp.disk.HP.hsv.mpio.rte) provides among other management utilities, the AIX Object Database Manager (ODM) device attributes required to define the EVA disk array devices as MPIO capable and to instruct the MPIO driver to utilize the default PCM provided by IBM.

New features

This version provides support for:

- EVA XL AA (HSV200 HSV210)
- High Availability Cluster Multiprocessing (HACMP) when using enhanced concurrent volume groups in the cluster
- ODM fileset 1.0.1.0

Supported hardware and software

Table 1 Supported hardware and software

Component	Hardware/Software
Operating system	IBM AIX 5.2 TL08 SP2 or later IBM AIX 5.3 TL04 SP2
Native IBM host bus adapters (HBAs)	FC5716 FC6228 FC6239 FC1957 FC1977
Storage system	EVA4000/6000/8000 running VCS 5.0 or later

📝 IMPORTANT:

IBM AIX 5.2 requires the following minimum fileset versions:
- `devices.common.IBM.mpio.rte` 5.2.0.87
- `devices.fcp.disk.rte`5.2.0.86

IBM AIX 5.3 requires the following minimum fileset versions:
- `devices.common.IBM.mpio.rte` 5.3.0.42
- `devices.fcp.disk.rte 5.3.0.42`

For information about supported coexisting storage systems, see the *HP StorageWorks SAN design reference guide* on the following HP web site:http://h18002.www1.hp.com/products/storageworks/san/documentation.html

Preparing for installation

To prepare your IBM AIX system for MPIO installation:

1. Set up the EVA disks and SAN configuration for multipathing. For details, see the *HP StorageWorks SAN design reference guide* on the following HP web site:

   http://h18002.www1.hp.com/products/storageworks/san/documentation.html

2. Ensure that the Vdisks are presented to the system with host type **IBM AIX**.

3. Ensure that all I/O paths to a set of LUNs are connected to the same type of HBA.

4. Verify that no AntemetA solution software is installed. Check for the Antemeta filesets below and remove them before continuing with this installation:

   - `devices.fcp.hdi.pdisk.rte`
   - `devices.fcp.hdi.hsv100.rte`
   - `devices.fcp.hdi.hsv110.rte`
   - `devices.fcp.hdi.hsv200.rte`
   - `devices.fcp.hdi.hsv210.rte`

5. Verify that your system has the required patches installed.

6. Download the `devices.fcp.disk.HP.hsv.mpio.1.0.1.0.tar` file from the following HP web site:

   http://h18006.www1.hp.com/products/sanworks/multipathoptions/index.html

Installing the ODM fileset

The ODM fileset installation routine verifies ODM definitions and checks fileset prerequisites. You can use the System Management Interface Tool (SMIT) to install the update or you can install it manually.

Installing the ODM fileset manually

To install the ODM fileset manually, copy the .tar file into a separate dirctory and expand it to create a TOC file, and then use the IBM AIX `installp` utility or `SMIT` to complete the installation.

The following example shows a manual installation:

```
# mkdir /tmp/hsv
# cp devices.fcp.disk.HP.hsv.mpio.1.0.1.0.tar  /tmp/hsv
# cd /tmp/hsv
# tar xvf devices.fcp.disk.HP.hsv.mpio.1.0.1.0.tar
```

The fileset: devices.fcp.disk.HP.hsv.mpio.1.0.1.0.bff is extracted.

```
# inutoc $PWD
# installp -acd . -einstallp.log ALL
```

Recommendations

To ensure proper operation, HP recommends that you take the following action:

- Add a path to the HSV utilities in the `/opt/hphsv/bin` directory.

  ```
  # PATH=$PATH:/opt/hphsv/bin
  ```

- Check the HBA error recovery policy (`fc_err_recov`) and make sure it is set to `fast_fail`.

  ```
  # lsattr -El fscsi0
  attach       switch        How this adapter is CONNECTED          False
  dyntrk       no            Dynamic Tracking of FC Devices         True
  fc_err_recov delayed_fail  FC Fabric Event Error RECOVERY Policy  True
  scsi_id      0x7b0500      Adapter SCSI ID                        False
  sw_fc_class  3             FC Class for Fabric                    True

  # chdev -a fc_err_recov=fast_fail -l fscsi0
  fscsi0 changed

  # lsattr -El fscsi0
  attach       switch        How this adapter is CONNECTED          False
  dyntrk       no            Dynamic Tracking of FC Devices         True
  fc_err_recov fast_fail     FC Fabric Event Error RECOVERY Policy  True
  scsi_id      0x7b0500      Adapter SCSI ID                        False
  sw_fc_class  3             FC Class for Fabric                    True
  ```

- Enter the following commands in the order shown to scan for new devices:

  ```
  # cfgmgr
  ```

  ```
  # lshsv
  ```

  ```
  # lspath
  ```

Removing the ODM fileset

To remove the ODM fileset:

1. Remove HSV disk definitions using one of the following commands:

   - Enter # `rmhsv -d`
   - Enter # `rmdev -d -l hdiskn` for each hdisk definition.
   - Enter # `rmdev -dR -l fscsin` to remove all hdisk devices from the Fibre Channel instance and to remove the Fibre Channel driver.

   IMPORTANT:

   You must remove all HSV devices from the system in order to remove the ODM fileset successfully.

2. Remove the ODM fileset using the IBM AIX `installp` utility:

   ```
   # installp -u devices.fcp.disk.HP.hsv.mpio.rte
   ```

EVA disk attributes

IBM AIX native commands lists the default values for the EVA disk attributes in AIX. These values ensure correct operation of your EVA storage system. Some attributes are allowed to be changed, including: queue_depth, reserver_policy (no_reserve), and path priority.

IBM AIX native commands

This section describes the IBM AIX commands that you use to operate MPIO devices.

Table 2 IBM AIX native commands

Attribute	Default value	Description	Notes
`PR_key_value`	N/A	Sets the key value for persistent reservations	Persistent reservations are not supported.
`algorithm`	fail_over	Sets the load balancing algorithm to fail_over. All I/O uses a single path. The remaining paths are in standby mode.	The value round_robin is not supported.
`hcheck_in-terval`	60	Sets the path health feature to check each device every 60 seconds. All devices are checked, but not precisely at the same time. hcheck_mode nonactive Specifies the I/O paths monitored by the path health checking feature: • **nonactive**—Checks all I/O paths for Failed status, and checks standby paths for Used/Opened devices • **failed**—Checks failed I/O paths • **enabled**—Checks paths that are enabled and opened	Paths that are not opened, are not monitored.
`queue_depth`	8	Sets the queue depth	
`re-serve_pol-icy`	Single path	Sets the reserve policy to standard SCSI-2 reservations.	Persistent reservations are not supported.
`rw_timeout`	60	Sets the read/write timeout to 60 seconds.	
`path priority`	1	Specifies the priority of each I/O path. A priority of 1 specifies a primary path and a priority 2 describes a secondary path. This attribute determines which I/O path is selected first and if a path fails which path is selected next. Multiple paths can have the same priority. If all paths have the same priority, the path selection is based on when each path was configured. This requires the attribute algorithm to be fail_over.	Using this attribute static LUN-based load balancing can be implemented.

lspath

The command displays all devices on the MPIO paths and the state of each path. See the man page for details

Syntax: `lspath`

> **NOTE:**
> Changes in path availability are not reported immediately if the path is inactive. An attempted I/O on the path updates its status.

chpath

The `chpath` command restores a repaired path to Enabled status. See the man page for details.

Syntax: `chpath -l hdiskn -p parent_fscsi_driver [-w wwn,lunid] -s enable`

HP AIX MPIO utilities

This section describes the utilities included in the ODM fileset.

lshba

The `lshba` utility displays information about the HBA, including the World Wide Name, HBA model, firmware version, and slot.

Syntax: `lshba`

lshsv

The `lshsv` utility displays information about the EVA disks and I/O paths.

```
lshsv [-h] [-p] [-d|-e|-f|-m] [-l hdisk#]
-l hdisk#      List hdisk# only
-p             List path details
-d|-e|-f|-m    Status Disabled|Enabled|Failed|Missing

or

lshsv -s
-s    List array summary
```
When entered without optional parameters, the `lshsv` command displays a list of all EVA disks.

lshsv –h

The `lshsv -h` command displays a list of optional parameters.

```
lshsv [-h] [-p] [-d|-e|-f|-m] [-l hdisk#]
-l hdisk#      List hdisk# only
-p             List path details
-d|-e|-f|-m    Status Disabled|Enabled|Failed|Missing

or

lshsv -s
-s    List array summary
```

lshsv –p

The `lshsv -p` command displays a list of all I/O paths to the EVA disks.

lshsv –p –l hdiskn

The `lshsv -p -l hdiskn` command displays a list of all I/O paths to the specified disk. For example, to see a list of the I/O paths connected to hdisk3, enter:

```
lshsv -p -l hdisk3
```

lshsv -s

lshsv –s lists a summary of all EVA disk arrays connected to the system.

hsvpaths

The `hsvpaths` command provides a summary of the HSV I/O paths.

Syntax: `hsvpaths`

rmhsv -d

The `rmhsv -d` command uncofigures and undefines (deletes) all EVA disk devices..

Syntax: `rmhsv -d`

Path health checking feature

The path health checking feature monitors the status of I/O paths. If an active path fails or is disconnected, an attempted I/O causes an automatic failover to a standby path.

> **NOTE:**
>
> If a nonactive path fails, a link error is written to the `errpt` log.

When connectivity is restored to a failed path with health checking enabled, the path status changes automatically from Failed to Enabled and the path becomes available.

> **NOTE:**
>
> Path checking does not monitor paths to devices that are not opened. As a result, if a non-opened device is disconnected, it may be reported as Enabled.

Static LUN Based load balancing

Starting with MPIO 1.0.1.0, the path attribute "priority" has been introduced to specify a priority for each path to specific LUN. MPIO will select failover or fail back, according to the settings of this path attribute. A priority of 1 specifies a primary path and a value of 2 specifies a secondary path. Several paths can have the same priority. If several paths do have the same priority, MPIO will select the path which was configured first. If primary paths are available, MPIO will always utilize one of these paths first. If no primary path is available, a secondary path will be used instead. Because the MPIO algorith "fail_over" is being used, there is only one path active per LUN at a time. By defining a different primary path for each LUN, a static LUN-based load balancing will be achieved distributing the I/O load of all LUNs across the set of I/O paths. Combined with host based striping (partition-based striping of AIX) the total I/O load is distributed evenly across all I/O paths and the load balancing becomes very effective. If all paths have the priority 1, it indicates that no load balancing is being used.