Contents

Preface ................................................................. vii
Intended audience. .................................................. viii
Product version ...................................................... viii
Document revision level ........................................... viii
Changes in this revision ............................................ viii
Referenced documents. ............................................ viii
Document organization ............................................ ix
Document conventions ............................................ ix
Convention for storage capacity values .............. x
Accessing product documentation ......................... xi
Getting help ........................................................... xi
Comments ............................................................... xi

1 Overview ............................................................. 1-1
   Hitachi Compatible PAV .......................................... 1-2
   Base and alias devices .......................................... 1-2
   Hitachi Compatible PAV modes .............................. 1-2
      Hitachi Compatible PAV in dynamic mode. ............ 1-2
      Hitachi Compatible PAV in static mode. .............. 1-3
   Workload Manager .............................................. 1-4
      WLM in goal mode. .......................................... 1-4
      WLM in Compatibility mode ............................ 1-4
   Compatible Hyper PAV ........................................ 1-4
   Flow of I/O requests using Hitachi Compatible PAV ... 1-5
   Flow of I/O requests using Compatible Hyper PAV ... 1-5

2 Requirements and specifications ............................ 2-1
   Requirements .................................................... 2-2
   Notes ................................................................... 2-3
   Functions incompatible with Hitachi Compatible PAV ... 2-3
   IBM CC and Extended Remote Copy (XRC) for Mainframe restrictions ... 2-3
Sharing Hitachi Compatible PAV across multiple sysplexes .......................... 2-3
Preventive Service Planning ................................................................. 2-4

3 Defining devices ................................................................. 3-1
Selecting optimum base/alias device ratio ........................................ 3-2
Defining an LCU ................................................................. 3-2
Defining a base or alias device ...................................................... 3-6
Finding a device eligible for dynamic Hitachi Compatible PAV management . . . 3-10
Address mapping between base and alias devices ............................. 3-15

4 Preparing for Compatible PAV operations ................................. 4-1
Setting the WLM mode ................................................................. 4-2
Enabling Compatible Hyper PAV on z/OS ........................................ 4-3
Enabling Compatible Hyper PAV from z/OS on z/VM ........................ 4-4
Setting the MIH timer value ...................................................... 4-4

5 Performing Hitachi Compatible PAV operations .......................... 5-1
Assigning aliases to base volumes ................................................ 5-2
Removing aliases from base volumes ............................................ 5-4
Reassigning aliases ................................................................. 5-6
Calculating Hitachi Compatible PAV used capacity ............................ 5-7
Refreshing Hitachi Compatible PAV data ........................................ 5-8

6 Verifying and monitoring devices ............................................. 6-1
Verifying base and alias device definition .................................... 6-3
Verifying status of devices per channel path .................................. 6-3
Verifying Compatible Hyper PAV aliases from z/OS ....................... 6-4
Verifying Compatible Hyper PAV aliases from z/OS on z/VM .............. 6-5
Monitoring with MVS commands .................................................. 6-6
DISPLAY command ................................................................. 6-6
DEVSERV PATHS command .......................................................... 6-7
DEVSERV QPAV commands ........................................................ 6-8
DISPLAY IOS HYPERPAV command ............................................. 6-10
GTF I/O tracing ................................................................. 6-10
VM CP commands for z/VM ....................................................... 6-10
QUERY CU command ............................................................... 6-11
QUERY DASD DETAILS command .............................................. 6-11
QUERY PAV command .............................................................. 6-12
QUERY VIRTUAL DASD DETAILS command .................................. 6-12
QUERY VIRTUAL PAV command .................................................. 6-13

7 Troubleshooting ......................................................... 7-1
Troubleshooting ............................................................... 7-2
This document describes and provides instructions for performing Hitachi Compatible PAV operations on the Hitachi Virtual Storage Platform (VSP) storage system.

Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

This preface includes the following information:

- **Intended audience**
- **Product version**
- **Document revision level**
- **Changes in this revision**
- **Referenced documents**
- **Document organization**
- **Document conventions**
- **Convention for storage capacity values**
- **Accessing product documentation**
- **Getting help**
- **Comments**
Intended audience

This document is intended for system administrators, Hitachi Data Systems representatives, and authorized service providers who are involved in installing, configuring, and operating the Hitachi Virtual Storage Platform storage system.

Readers of this document should meet the following requirements:

- You should have a background in data processing and understand RAID storage systems and their basic functions.
- You should be familiar with the Hitachi Virtual Storage Platform storage system, and you should have read the *Hitachi Virtual Storage Platform User and Reference Guide*.
- You should be familiar with the Storage Navigator software for the Hitachi Virtual Storage Platform, and you should have read the *Storage Navigator User Guide*.
- You should be familiar with the IBM Parallel Access Volume (PAV) software on the mainframe host.

Product version

This document revision applies to Hitachi VSP microcode 70-02-5x or later.

Document revision level

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MK-90RD7012-00</td>
<td>October 2010</td>
<td>Initial release.</td>
</tr>
<tr>
<td>MK-90RD7012-01</td>
<td>April 2011</td>
<td>Supersedes and replaces MK-90RD7012-00.</td>
</tr>
<tr>
<td>MK-90RD7012-02</td>
<td>August 2011</td>
<td>Supersedes and replaces MK-90RD7012-01.</td>
</tr>
</tbody>
</table>

Changes in this revision

Changes in this revision include:

- Updating the microcode version in the Preface.
- Updating the procedure To assign aliases to base volumes in the VSP: on page 5-2 in Performing Hitachi Compatible PAV operations on page 5-1.

Referenced documents

Hitachi Virtual Storage Platform documentation:

- *Provisioning Guide for Open Systems*, MK-90RD7022
Document organization

The following table provides an overview of the contents and organization of this document. Click the chapter title in the left column to go to that chapter. The first page of each chapter provides links to the sections in that chapter.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1, Overview</td>
<td>Provides an overview of Hitachi Compatible PAV and Hyper PAV.</td>
</tr>
<tr>
<td>Chapter 2, Requirements and specifications</td>
<td>Describes the requirements and specifications for Hitachi Compatible PAV.</td>
</tr>
<tr>
<td>Chapter 3, Defining devices</td>
<td>Provides information about selecting base and alias device ratios, and provides instructions for defining logical control units (LCUs) and devices using Hardware Configuration Definition (HCD).</td>
</tr>
<tr>
<td>Chapter 4, Preparing for Compatible PAV operations</td>
<td>Provides instructions for preparing to use Hitachi Compatible PAV.</td>
</tr>
<tr>
<td>Chapter 5, Performing Hitachi Compatible PAV operations</td>
<td>Provides instructions for performing PAV operations using Hitachi Compatible PAV on Storage Navigator.</td>
</tr>
<tr>
<td>Chapter 6, Verifying and monitoring devices</td>
<td>Provides instructions for verifying base and alias devices, and describes the commands used to monitor PAV and Hyper PAV activities from the host computer.</td>
</tr>
<tr>
<td>Chapter 7, Troubleshooting</td>
<td>Provides troubleshooting information for Hitachi Compatible PAV.</td>
</tr>
<tr>
<td>Appendix A, Disabling Compatible Hyper PAV</td>
<td>Provides instructions for disabling Hitachi Compatible PAV on the storage system.</td>
</tr>
<tr>
<td>Appendix B, Hitachi Compatible PAV GUI reference</td>
<td>Describes the Storage Navigator windows and dialog boxes for Hitachi Compatible PAV.</td>
</tr>
</tbody>
</table>

Document conventions

This document uses the following typographic conventions:
This document uses the following icons to draw attention to information:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Tip" /></td>
<td>Tip</td>
<td>Provides helpful information, guidelines, or suggestions for performing tasks more effectively.</td>
</tr>
<tr>
<td><img src="image" alt="Note" /></td>
<td>Note</td>
<td>Calls attention to important and/or additional information.</td>
</tr>
<tr>
<td><img src="image" alt="Caution" /></td>
<td>Caution</td>
<td>Warns the user of adverse conditions and/or consequences (e.g., disruptive operations).</td>
</tr>
<tr>
<td><img src="image" alt="WARNING" /></td>
<td>WARNING</td>
<td>Warns the user of severe conditions and/or consequences (e.g., destructive operations).</td>
</tr>
</tbody>
</table>

**Convention for storage capacity values**

Physical storage capacity values (e.g., disk drive capacity) are calculated based on the following values:

<table>
<thead>
<tr>
<th>Physical capacity unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KB</td>
<td>1,000 bytes</td>
</tr>
<tr>
<td>1 MB</td>
<td>1,000² bytes</td>
</tr>
</tbody>
</table>
Logical storage capacity values (e.g., logical device capacity) are calculated based on the following values:

<table>
<thead>
<tr>
<th>Physical capacity unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 GB</td>
<td>1,000^3 bytes</td>
</tr>
<tr>
<td>1 TB</td>
<td>1,000^4 bytes</td>
</tr>
<tr>
<td>1 PB</td>
<td>1,000^5 bytes</td>
</tr>
<tr>
<td>1 EB</td>
<td>1,000^6 bytes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Logical capacity unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KB</td>
<td>1,024 bytes</td>
</tr>
<tr>
<td>1 MB</td>
<td>1,024 KB or 1,024^2 bytes</td>
</tr>
<tr>
<td>1 GB</td>
<td>1,024 MB or 1,024^3 bytes</td>
</tr>
<tr>
<td>1 TB</td>
<td>1,024 GB or 1,024^4 bytes</td>
</tr>
<tr>
<td>1 PB</td>
<td>1,024 TB or 1,024^5 bytes</td>
</tr>
<tr>
<td>1 EB</td>
<td>1,024 PB or 1,024^6 bytes</td>
</tr>
<tr>
<td>1 block</td>
<td>512 bytes</td>
</tr>
</tbody>
</table>

**Accessing product documentation**

The Hitachi Virtual Storage Platform user documentation is available on the Hitachi Data Systems Support Portal: [https://hdssupport.hds.com](https://hdssupport.hds.com). Please check this site for the most current documentation, including important updates that may have been made after the release of the product.

**Getting help**

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to the Hitachi Data Systems Support Portal for contact information: [https://hdssupport.hds.com](https://hdssupport.hds.com)

**Comments**

Please send us your comments on this document: doc.comments@hds.com. Include the document title, number, and revision. Please refer to specific sections and paragraphs whenever possible.

**Thank you!** (All comments become the property of Hitachi Data Systems.)
Overview

This topic provides an overview of Hitachi Compatible PAV.

- Hitachi Compatible PAV
- Base and alias devices
- Hitachi Compatible PAV modes
- Workload Manager
- Compatible Hyper PAV
- Flow of I/O requests using Hitachi Compatible PAV
- Flow of I/O requests using Compatible Hyper PAV
Hitachi Compatible PAV

Compatible PAV runs on the VSP storage system. Compatible PAV enables a single IBM zSeries® or S/390® host computer to issue multiple I/O requests in parallel to a single logical device (LDEV).

For more information on the zSeries and S/390 PAV host software feature, see the following IBM documents:

- DFSMS/MVS Software Support for IBM Enterprise Storage Server, (SC26–7318)
- DS8000 Performance Monitoring and Tuning, (SG24–7146)
- System/390 Command Reference 2105 Models E10, E20, F10, F20, (SC26–7298)

Base and alias devices

The two types of devices used in Compatible PAV operations are base devices and alias devices. The VSP storage system supports up to 256 devices per control unit (CU).

A base device is an LDEV that has a formatted mainframe emulated volume assigned which contains user data.

---

**Caution:** A device that has been used as a journal volume in the Universal Replicator, as a volume used for Cross-OS File Exchange, or as a system disk or migration volume may not be defined as a base device.

An alias device is an unassigned LDEV whose unit address can be used as an alias for a base device. Each alias device must be within the same logical CU image as the base device to which it is assigned. Base and alias devices are defined to the host OS using a combination of HCD/IODF/IOCDS. Base devices are defined to the storage system when the mainframe emulated volumes are defined and installed.

Alias devices are created and installed with the Storage Navigator panels.

Hitachi Compatible PAV modes

Compatible PAV operations may be performed in one of two standard operational modes. When the VSP is operating in IBM 2105 control unit emulation, Dynamic or Static PAV mode can be used. When the VSP is operating in IBM 2107 control unit emulation, Dynamic, Static Compatible PAV, or Compatible Hyper PAV modes can be used.

The Compatible PAV mode is controlled by the Dynamic alias management parameter setting for the IBM Workload Manager® (WLM) and the WLMPAV parameter setting in the HCD file.

Hitachi Compatible PAV in dynamic mode

When Compatible PAV is in dynamic mode, the number of alias devices assigned to each base device may dynamically increase or decrease based on the number of I/O requests to each device. Dynamic mode assists in
balancing workloads on base devices and can optimize the speed of accessing data in the VSP. A dynamic Compatible PAV operation is implemented when the WLM feature for Dynamic alias management setting and the WLMPAV parameter setting in the HCD file are both set to YES.

In the following figure, the x10, x11, and x12 base devices were originally assigned two alias devices each. In this example, as I/O requests converge on the base device x10 (indicated by the large arrow), the number of alias devices for base device x10 increases to four, while the number of alias devices assigned to the base devices x11 and x12 decreases to one each.

Hitachi Compatible PAV in static mode

When Compatible PAV is in static mode, the number of alias devices assigned to each base device does not change, even when the number of I/O requests to each device changes. A static Compatible PAV operation is implemented when the WLM feature for Dynamic alias management setting and the WLMPAV parameter setting in the HCD file are both set to NO.

In the following figure, the x10, x11 and x12 base devices were originally assigned two alias devices each. In this example, as I/O requests converge on the base device x10 (indicated by the large arrow), the number of alias devices for each base device does not change.
Workload Manager

The Workload Manager (WLM) is a software component of the MVS/ESA®, z/OS®, and OS/390® operating systems that enables the host computer to utilize Compatible PAV.

The WLM manages workloads on MVS systems and has two operation modes to support dynamic and static Compatible PAV operations.

WLM in goal mode

The WLM must be in goal mode to support dynamic Compatible PAV operations. The WLM is in goal mode when the Dynamic alias management setting in the WLM Service Coefficient/Service Definition Options dialog box is set to YES. While in goal mode, the WLM manages the system to meet a performance goal.

WLM in Compatibility mode

The WLM must be in compatibility mode to support static Compatible PAV operations. The WLM is in compatibility mode when the Dynamic alias management setting in the WLM Service Coefficient/Service Definition Options dialog box is set to NO. While in compatibility mode, WLM manages the system according to parameters in IPS and ICS (IEAIPSxx and IEAICSxx parmlib members).

Compatible Hyper PAV

The Compatible Hyper PAV feature allows you to assign alias devices to one base device, but have all other base devices in the same CU share these aliases.

When using the Compatible Hyper PAV feature, the number of alias devices assigned to each base device does not need to change, as is required when using Compatible PAV in dynamic mode. With the Compatible Hyper PAV feature, a whole collection of alias devices can be mapped to one single base device in a CU.
You can specify the PAV feature (Compatible PAV or Compatible Hyper PAV) to use for each host computer. Therefore, an alias device may accept I/O requests issued through Compatible PAV or Compatible Hyper PAV.

**Flow of I/O requests using Hitachi Compatible PAV**

Multiple alias devices are assigned to a base device in a CU to enable the base device to handle multiple I/O requests.

In the following figure, three alias devices are each assigned to base devices 1, 2, and 3. As illustrated with the arrows in the figure, I/O requests converge on base device 1 when a host computer accesses the device using Compatible PAV. Since alias devices A, B, and C were assigned to base device 1 in advance of the operation, I/O requests are automatically issued to these alias devices. Similarly, if a host computer accesses base devices 2 and 3, the I/O requests are automatically issued to the alias devices assigned to those two base devices. Base device 4 is not able to process multiple I/O requests since no alias devices are assigned to the device.

**Flow of I/O requests using Compatible Hyper PAV**

Multiple alias devices are assigned to a base device in a CU to enable the base device to handle multiple I/O requests. In Compatible Hyper PAV, alias devices are *pooled* together in a single CU, meaning that all base devices in the CU share alias devices.

In the following figure, three alias devices each are assigned to base devices 1, 2, and 3. As illustrated with the arrows in the figure, I/O requests converge on base device 1 when a host computer accesses the device using Compatible PAV. I/O requests are automatically issued to unused alias devices among the nine alias devices in the CU. Similarly, if a host computer accesses base devices 2, 3, and 4, the I/O requests are automatically issued.
to unused alias devices among the nine alias devices. Base device 4 is able to process multiple I/O requests even though no alias devices are specifically assigned to the device.
Requirements and specifications

This topic contains requirements and specifications.

- Requirements
- Notes
- Functions incompatible with Hitachi Compatible PAV
- IBM CC and Extended Remote Copy (XRC) for Mainframe restrictions
- Sharing Hitachi Compatible PAV across multiple sysplexes
- Preventive Service Planning
## Requirements

The following table lists the requirements for Hitachi Compatible PAV and Compatible Hyper PAV operations.

<table>
<thead>
<tr>
<th>Item</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Software License Keys</strong></td>
<td><strong>Compatible PAV</strong> Workload Manager (WLM)</td>
</tr>
<tr>
<td><strong>Host OS</strong></td>
<td><strong>Compatible Hyper PAV</strong> Workload Manager (WLM)</td>
</tr>
<tr>
<td><strong>Dynamic mode</strong></td>
<td>OS/390 V2R7 (DFSMS/DSF 1.5) with PTF or later</td>
</tr>
<tr>
<td><strong>Static mode</strong></td>
<td>OS/390 V2R7 (DFSMS/DSF 1.5) with PTF or later</td>
</tr>
<tr>
<td><strong>Microcode</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Controller emulation type</strong></td>
<td>I-2105, I-2107</td>
</tr>
<tr>
<td><strong>Device emulation type</strong></td>
<td>3380-3, 3390-1, 3390-2, 3390-3, 3390-3R*, 3390-9, 3390-L, 3390-M, 3390-A</td>
</tr>
<tr>
<td><strong>Channel interface</strong></td>
<td>FICON</td>
</tr>
<tr>
<td><strong>Storage system ID setting</strong></td>
<td>One storage system ID for each set of 256 LDEVs</td>
</tr>
<tr>
<td><strong>Maximum number of aliases</strong></td>
<td>255</td>
</tr>
<tr>
<td><strong>Alias device management</strong></td>
<td>Alias device and its base device must belong to the same logical CU image</td>
</tr>
<tr>
<td><strong>Compatible Storage Navigator functions</strong></td>
<td>Virtual LVI</td>
</tr>
<tr>
<td></td>
<td>Cache Residency Manager for Mainframe</td>
</tr>
<tr>
<td></td>
<td>Volume Migration</td>
</tr>
<tr>
<td></td>
<td>TrueCopy for Mainframe</td>
</tr>
<tr>
<td></td>
<td>ShadowImage for Mainframe</td>
</tr>
<tr>
<td></td>
<td>Hitachi Universal Replicator software for Mainframe</td>
</tr>
<tr>
<td></td>
<td>IBM Concurrent Copy (CC) with restrictions</td>
</tr>
<tr>
<td></td>
<td>Extended Remote Copy (XRC) for Mainframe with restrictions</td>
</tr>
<tr>
<td></td>
<td>PPRC</td>
</tr>
</tbody>
</table>
Notes

**Note:** When you use z/VM, you must use z/OS as a guest OS on z/VM.

**Functions incompatible with Hitachi Compatible PAV**

Devices using Compatible PAV can coexist in the same storage system but cannot be used concurrently with the following functions:

- Open Volume Management
- Cache Residency Manager
- LUN Manager
- ShadowImage
- Hitachi TrueCopy® Remote Replication software
- Universal Replicator

Devices using Cross-OS File Exchange cannot coexist in the same CU with devices using Compatible PAV.

**IBM CC and Extended Remote Copy (XRC) for Mainframe restrictions**

For Concurrent Copy (CC) and Extended Remote Copy (XRC) for Mainframe, the 2105 and 2107 controller emulation types cannot be intermixed with other emulation types within the same storage system.

**Sharing Hitachi Compatible PAV across multiple sysplexes**

Compatible PAV functionality can be shared across multiple sysplexes that are on a single storage system.

When sharing static Compatible PAV, all connected systems must be in static mode. When sharing dynamic Compatible PAV, the following requirements and restrictions apply:

- Only one sysplex should be running in Dynamic Alias Management mode. This *master* sysplex is the only sysplex in the storage system that assigns aliases.
- For all other connected sysplexes, the WLMPAV (HCD) and Dynamic Alias Management (WLM) settings should be set to *No*.

**Note:** If more than one sysplex has the Dynamic Alias Management enabled, unsynchronized alias transition and unpredictable response times may occur.
Preventive Service Planning

If you are using the Compatible PAV feature on 2105 or 2107 device types, you are encouraged to obtain the Preventive Service Planning (PSP) document from IBM to use as a program temporary fix (PTF) source. The title of the document is 2105MVSESA, and it can be downloaded via IBMLINK.

The PSP document identifies all current IBM PTF items applicable for z/OS and OS/390 support of the 2105 or 2107 device types. The VSP storage system does not have any specific PTF requirements beyond what is required by the z/OS and OS/390 operating system to provide minimum support for the 2105 or 2107 device types.
Defining devices

This topic contains information on selecting base and alias device ratios, and procedures for defining LCUs and devices using HCD (hardware configuration definition).

Hitachi Compatible PAV users use the HCD program to define logical control units (LCUs) and Hitachi Compatible PAV devices to the host system.

- Selecting optimum base/alias device ratio
- Defining an LCU
- Defining a base or alias device
- Finding a device eligible for dynamic Hitachi Compatible PAV management
- Address mapping between base and alias devices
Selecting optimum base/alias device ratio

Any unused device address in a CU may be used as an alias for a base device. An optimum base-to-alias device ratio will ensure maximum efficiency in processing I/O requests.

Optimum base/alias device ratio for Hitachi Compatible PAV

A base-to-alias device ratio of 1:3 is recommended. This means, if all 256 devices of a CU were defined to the host system, there would be 64 base devices and 192 alias devices. Three alias devices would be assigned to each base device. The optimum base-to-alias device ratio can vary based on how often a base device is accessed by the host system.

For dynamic Compatible PAV operations, eight to 16 alias devices in each CU generally produces good results.

Poor results may occur for devices that are accessed by multiple host systems. For this type of use case, the Multiple Allegiance (MA) host software may be a better option.

Optimum base/alias device ratio for Compatible Hyper PAV

For Compatible Hyper PAV, eight to 16 alias devices in each CU generally produces good results. No more than three alias devices should be assigned to a single base device.

The number of alias devices assigned to each base device in a CU should be kept as equal as possible. For example, a CU with 10 alias devices could have three aliases each assigned to the first, second and third base device, one alias assigned to the fourth base device, and no alias assignments to the remaining base devices. Alternatively, one alias could be assigned to each of the 10 addresses.

Defining an LCU

Use the Hardware Configuration Definition (HCD) program to define an LCU on a storage system.

Prerequisite

Channel paths must be defined.

To define an LCU on a storage system:

1. From the ISPF/PDF primary options menu, select the HCD option to display the HCD main screen.
2. Verify the name of the Work IODF to be used, and then select option 1 to display the Define, Modify or View Configuration Data screen.

3. Select option 4 to display the Control Unit List screen.
4. Press **F11** on the keyboard to display the Add Control Unit screen.

5. Enter the following information:
6. Select the processor complex that the control unit attaches to, and then press **Enter** to display the next Select Processor / Control Unit screen.

7. Select option 2 and then press **Enter** to display the next Select Processor / Control Unit screen.
Defining a base or alias device

Use the Hardware Configuration Definition (HCD) program to define a base or alias device on an LCU.

To define a base or alias device on an LCU:
1. From the ISPF/PDF primary options menu, select the HCD option to display the HCD main screen.

2. Verify the name of the IODF or IODF.WORK I/O definition file to be used, and then select option 1 to display the Define, Modify, or View Configuration Data screen.
3. Select option 5 to display the I/O Device List screen.

4. Press **PF11** to display the Add Device screen.
5. Enter the following information:
   - Device Number
   - Number of devices
   - Hitachi Compatible PAV device type. Supported base device types are 3380B and 3390B and supported alias device types are 3380A and 3390A.
   - Description of storage system
   - CUs to which the device is connected

   **Note:** The 3380A and 3380B devices are not related to the 3380-3A/B/C multiplatform devices. Similarly, the 3390A and 3390B devices are not related to the 3390-3A/B/C multiplatform devices.

6. Press Enter to display the Device / Processor Definition screen.

7. Select a Processor/System ID combination and then press Enter to display the Define Device / Processor screen.
8. Specify or revise any values and then press **Enter** to display the Define Device to Operating System Configuration screen.

9. Select the OS to connect or disconnect devices and press **Enter** to display the select / disconnect screen.
10. Select option 1 and press Enter to display the Define Device Parameters / Features screen.

11. Specify or revise any values. The DYNAMIC parameter controls whether Hitachi Compatible PAV is in dynamic or static mode. The WLMPAV parameter controls whether or not the device is supported by Workload Manager (WLM). These parameters are set to Yes by default.

**Finding a device eligible for dynamic Hitachi Compatible PAV management**

The Hardware Configuration Definition (HCD) program is used to view configuration parameters. This information is useful for determining if a specific device is eligible for dynamic Compatible PAV management by WLM.

**To display configuration parameters for a device:**

1. From the ISPF/PDF primary options menu, select the HCD option to display the HCD main screen.
2. Verify the name of the IODF or IODF.WORK I/O definition file to be used, and then select option 1 to display the Define, Modify, or View Configuration Data screen.

3. Select option 5 to display the I/O Device List screen.
4. Select the desired device by entering a slash (/) by the device number (in the preceding figure, device 8101 is selected), and press **Enter** to display the Actions on selected devices screen.

### Actions on selected devices

Select by number or action code and press Enter.

<table>
<thead>
<tr>
<th>Action Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Add like (a)</td>
</tr>
<tr>
<td>1</td>
<td>Change (c)</td>
</tr>
<tr>
<td>2</td>
<td>CSS group change (d)</td>
</tr>
<tr>
<td>3</td>
<td>OS group change (e)</td>
</tr>
<tr>
<td>4</td>
<td>Device type group change (f)</td>
</tr>
<tr>
<td>5</td>
<td>Prime serial number and VOLGEN (g)</td>
</tr>
<tr>
<td>6</td>
<td>Delete (h)</td>
</tr>
<tr>
<td>7</td>
<td>View device definition (i)</td>
</tr>
<tr>
<td>8</td>
<td>View logical CU information (j)</td>
</tr>
<tr>
<td>9</td>
<td>View related CTC connections (k)</td>
</tr>
<tr>
<td>10</td>
<td>View graphically (l)</td>
</tr>
</tbody>
</table>

**F1=Help  F2=Split  F3=Exit  F9=Swap  F12=Cancel**

5. Select option 8 and press **Enter** to display the View Device Definition screen.
6. Review the information for accuracy and then press **Enter** to display the View Device / Processor Definition screen.

7. Select a Processor/System ID combination to display the View Device Candidate List screen.
8. Review the candidate list for this device and then press Enter to display the View Device / OS Configuration Definitions screen.

9. Select an OS to view more details and press Enter to display the View Device Parameter / Feature Definition screen.
10. Verify that the WLMPAV parameter is set to Yes.

**Address mapping between base and alias devices**

The unit address mapping for base and alias devices must be defined to the host operating system and must match the address mapping defined on the Storage Navigator client machine. If the mappings do not match, serious failures can occur during data processing. The following figure shows examples of mappings between base devices and alias devices.

```
(A) x 00-03F:Base  (B) x 00-03F:Base  (C) x 00-07F:Alias  (D) x 00-03F:Alias
x 04-ff:Alias    x 04-ff:Alias    x 04-ff:Base    x 04-ff:Base
x 05-ff:Base    x 05-ff:Base    x 05-ff:Alias    x 05-ff:Alias
x 06-ff:Alias    x 06-ff:Alias

Defining devices 3–15
```
Preparing for Compatible PAV operations

This topic describes the necessary preparations to use Compatible PAV with your system.

- Setting the WLM mode
- Enabling Compatible Hyper PAV on z/OS
- Enabling Compatible Hyper PAV from z/OS on z/VM
- Setting the MIH timer value
Setting the WLM mode

To use dynamic Compatible PAV, the WLM must be set to goal mode. In goal mode, WLM can assign more or fewer aliases to a base device based on the host I/O activity to that device.

To use static Compatible PAV, the WLM must be set to compatibility mode. In compatibility mode, the number of aliases assigned to each base device remains the same regardless of host I/O activity to that device.

To use Compatible Hyper PAV, you do not need to set the WLM operation modes.

To view/modify WLM mode:

1. On the WLM startup screen, press Enter to display the Choose Service Definition screen.

   
   
   
   | Command ==>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>v Choose Service Definition</td>
</tr>
<tr>
<td>Select one of the following options.</td>
</tr>
<tr>
<td>1 1. Read saved definition</td>
</tr>
<tr>
<td>2. Extract definition from WLM couple data set</td>
</tr>
<tr>
<td>3. Create new definition</td>
</tr>
<tr>
<td>F1=Help  F2=Split  F5=KeystHelp</td>
</tr>
<tr>
<td>F3=Swap  F12=Cancel</td>
</tr>
<tr>
<td>ENTER to continue</td>
</tr>
</tbody>
</table>

2. Select option 1 and press Enter to display the WLM primary options screen.

   
   
   
   | Command ==>
   | Definition data set . . : none |
   | Definition name . . . . STANDARD (Required) |
   | Description . . . . . . Standard Definition |
   | Select one of the following options. . . . . 8 1. Policies <- Select option 8. |
   | 2. Workloads |
   | 3. Resource Groups |
   | 4. Service Classes |
   | 5. Classification Groups |
   | 6. Classification Rules |
   | 7. Report Classes |
   | 8. Service Coefficients/Options |
   | 9. Application Environments |
   | 10. Scheduling Environments |
3. Select option 8 to display the Service Coefficient/Service Definition Options screen.

<table>
<thead>
<tr>
<th>Coefficients/Options</th>
<th>Notes</th>
<th>Options</th>
<th>Help</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command ==</td>
<td>Service Coefficient/Service Definition Options</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enter or change the Service Coefficients:

- CPU: 1.0 (0.0–99.9)
- IOC: 0.1 (0.0–99.9)
- MSG: 0.0000 (0.0000–99.9999)
- SRE: 1.0 (0.0–99.9)

Enter or change the service definition options:

- I/O priority management: YES (Yes or No)
- Dynamic alias management: YES (Yes or No)

4. Set the Dynamic alias management field to Yes and WLM is in goal mode. Set the field to No and WLM is in compatibility mode. The default setting is Yes.

5. Set the I/O priority management field. The effect of this field setting depends on the Dynamic alias management setting. As shown in the following table, the setting of both of these fields controls whether the Dynamic Alias Algorithm is in effect.

<table>
<thead>
<tr>
<th>Dynamic Alias Management</th>
<th>I/O Priority Management</th>
<th>Dynamic Alias Algorithm in Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>NO</td>
<td>None (static Compatible PAV only)</td>
</tr>
<tr>
<td>NO</td>
<td>YES</td>
<td>None (static Compatible PAV only)</td>
</tr>
<tr>
<td>YES</td>
<td>NO</td>
<td>Efficiency only</td>
</tr>
<tr>
<td>YES</td>
<td>YES</td>
<td>Both efficiency and goal</td>
</tr>
</tbody>
</table>

6. If dynamic is the desired mode, verify that the DYNAMIC and WLMPAV fields are both set to Yes in the WLM View Device Parameter / Feature Definition screen.

**Enabling Compatible Hyper PAV on z/OS**

To enable Compatible Hyper PAV on the z/OS, issue the following command from the host system console:

```
SETIOS HYPERPAV=YES
```

An example of the command is shown below.

```
SETIOS HYPERPAV=YES
10801:00: HYPERPAV MODE CHANGE INITIATED - CONTROL UNIT CONVERSION WILL COMPLETE ASYNCHRONOUSLY
```
Preparing for Compatible PAV operations

Enabling Compatible Hyper PAV from z/OS on z/VM

To enable Compatible Hyper PAV from the z/OS on z/VM, Compatible Hyper PAV must be enabled on the z/VM and on the z/OS.

To enable Compatible Hyper PAV from z/OS on z/VM:

1. Issue the following command from z/OS system console to all base devices in the corresponding CU to take those base devices offline.
   
   V base_device_number1 base_device_number2,OFFLINE

2. Issue the following commands from z/VM system console to all alias devices that are used for Compatible Hyper PAV in the corresponding CU to enable Compatible Hyper PAV:
   
   DET alias_device_number1-alias_device_number2
   VARY OFFLINE alias_device_number1-alias_device_number2
   SET CU HYPERPAV ssid1-sssid2
   VARY ONLINE alias_device_number1-alias_device_number2
   ATT alias_device_number1-alias_device_number2*

3. Enable Compatible Hyper PAV on the z/OS with the following command from the host system console:
   
   SETIOS HYPERPAV=YES

4. Issue the following command from the system console of z/OS to all base devices in the corresponding CU to make those base devices online:
   
   V base_device_number1-base_device_number2,ONLINE

Setting the MIH timer value

The recommended MIH timer value for Compatible PAV operations is 30 seconds. The MIH timer values are set in MVS/ESA®, z/OS®, or OS/390® at IPL (initial program load) or after IPL.

At IPL, use the MIH parameter in the IECIOSxx parmlib member to set or modify the MIH timer value. For the complete syntax of this parameter, see the IBM document MVS Initialization and Tuning Reference (SC28-1752).

After IPL, use the “SETIOS” system command to set or modify the MIH timer value. For the complete syntax of this command, see the IBM document MVS System Commands (GC28-1781).
Performing Hitachi Compatible PAV operations

This topic describes performing Hitachi Compatible PAV operations on the storage system using the GUI.

- Assigning aliases to base volumes
- Removing aliases from base volumes
- Reassigning aliases
- Calculating Hitachi Compatible PAV used capacity
- Refreshing Hitachi Compatible PAV data
Assigning aliases to base volumes

Up to 255 aliases can be assigned to one base device. If the number of selected free volumes is larger than the number of selected base volumes, the Hitachi Compatible PAV function attempts to allocate the free volumes equally to the base volumes. For example, if six free volumes and two base volumes are selected, three free volumes (aliases) are allocated to each base volume.

If you only use Compatible Hyper PAV to issue I/O requests to a CU, first decide the number of aliases that are necessary for the CU, and then assign the aliases to arbitrary base volumes. The assigned aliases function as aliases for all base volumes in that CU. In this case, assign three or less alias devices for each base device.

Click **Apply** to assign aliases to more than one CU that is used by the host. The host performance may be degraded if you click **Apply** to assign aliases simultaneously to more than one CU.

**Prerequisites**

- Compatible PAV option or Compatible Hyper PAV option is enabled in Storage Navigator
- You must have Storage Administrator (Provisioning) role to perform this task.
- Base devices are defined in the storage system

**To assign aliases to base volumes in the VSP:**

1. In the Storage Navigator main window, select **Actions > Mainframe Connection > Compatible PAV**.

2. Click to change to Modify mode.

3. In the Compatible PAV window (shown in the following figure), select the LDKC which includes the CU image to be modified from the LDKC list.
4. From the CU list, select the CU image which contains the desired base volumes.

Base volumes are displayed in **Base Volume List**.

No volumes are displayed if the selected CU image only contains devices to which aliases cannot be assigned, such as 3390-V type devices or journal volumes. In these cases, select another CU image.

5. Select one or more base volumes in the **Base Volume List**. Press Ctrl and click to select multiple base volumes, press Shift + click to select a series of base volumes, or click **Select All** to select all base volumes in the CU image.

6. Select one or more free volumes in the **Free Volume List**. Press Ctrl and click to select multiple free volumes, press Shift + click to select a series of free volumes, or click **Select All** to select all free volumes in the CU image.

7. Click **Add** to assign the selected free volume(s) to the selected base volume(s). The assignments appear in the **Alias Volume List** shown in the following figure.
Performing Hitachi Compatible PAV operations

8. Confirm the alias volume(s) assigned to the selected base volume(s) in the **Alias Volume List**.

9. Click **Apply** to apply the current alias assignments in the **Alias Volume List**.

Removing aliases from base volumes

Alias volumes may be removed from base volumes using the Compatible PAV window.

**Prerequisite**

- No I/O operations are currently being performed on base devices. Removing alias devices while I/O operations are occurring can cause a serious failure.
- You must have Storage Administrator (Provisioning) role to perform this task.

**To remove aliases from base volumes:**

1. In the Storage Navigator main window, select **Actions** > **Mainframe Connection** > **Compatible PAV**.

2. Click ![ ] to change to Modify mode.

3. In the **Compatible PAV** window (shown in the following figure), select the LDKC which includes the CU image to be modified from the **LDKC** list.
4. From the **CU** list, select the CU image which contains the aliases to be removed.

Base volumes are displayed in the **Base Volume List**.

No volumes are displayed if the selected CU image only contains devices to which aliases cannot be assigned, such as 3390-V type devices or journal volumes. In these cases, select another CU image.

5. Select one or more base volumes in the **Base Volume List**. Press **Ctrl** and click to select multiple base volumes, press **Shift** and click to select a series of base volumes, or click **Select All** to select all base volumes in the CU image. Alias volumes for each selected base volume(s) appear in the **Alias Volume List** as shown in the following figure.
Performing Hitachi Compatible PAV operations

6. Select one or more alias volumes to remove in the **Alias Volume List**. Press **Ctrl** and click to select multiple alias volumes, Press **Shift** and click to select a series of alias volumes, or click **Select All** to select all alias volumes in the CU image.

7. Once one or more alias volumes are selected, click **Delete** to remove the selected alias volume(s) from the selected base volume(s) and move these alias volumes back to the **Free Volume List**.

8. Click **Apply** to apply the changes.

**Reassigning aliases**

Alias volumes may be reassigned to a different base volume in the same or different CU image using the Compatible PAV window.

**Prerequisites**

- Before an alias is reassigned, the user must confirm that the number of requests to the base device that the alias is moved from is less than 50 IOPS. This performance information is acquired using RMF (Resource Measurement Facility Report Analysis) or other available tools. If the alias is reassigned when there are more than 50 IOPS to the base device, the process performance may decline in the worst cases.

- You must have Storage Administrator (Provisioning) role to perform this task.

**To reassign aliases to a different base volume:**

1. In the Storage Navigator main window, select **Actions > Mainframe Connection > Compatible PAV**.
2. Click to change to Modify mode.

3. In the Compatible PAV window, select the LDKC that includes the CU image to be modified from the LDKC list.

4. From the CU list, select the CU image that contains the aliases to be reassigned.

5. Select the base volume(s) in the Base Volume List. Press Ctrl and click to select multiple base volumes, press Shift and click to select a series of base volumes, or click Select All to select all base volumes in the CU image. Alias volumes for each selected base volume(s) appear in the Alias Volume List.

6. Select one or more alias volumes to remove in the Alias Volume List. Press Ctrl and click to select multiple alias volumes, press Shift and click to select a series of alias volumes, or click Select All to select all alias volumes in the CU image.

7. When one or more alias volumes are selected, click Delete to remove the selected alias volume(s) from the selected base volume(s) and move these alias volumes back to the Free Volume List.

8. Select different base volume(s). These base volumes can be in the same CU image. Or the CU image can be changed by using the LDKC and CU lists.

9. When one or more new base volumes are selected in the Base Volume List and one or more free volumes are selected in the Free Volume List, click Add to assign the selected free volume(s) to the selected base volume(s). The assignments appear in the Alias Volume List.

10. Confirm the alias volume(s) assigned to the selected base volume(s) in the Alias Volume List.

11. Click Apply to apply the changes.

**Calculating Hitachi Compatible PAV used capacity**

After each Compatible PAV operation, the Compatible PAV Used Capacity value is recalculated. These operations include:

- Assigning aliases to a new base volume and clicking Apply
- Canceling all aliases in the corresponding CU and clicking Apply

**Note:** A base volume with no assigned aliases does not contribute the total used capacity value.

- Uninstalling base volumes using the LVI/LUN (VLL) or Universal Volume Manager software
- Assigning aliases to a new base volume by Dynamic Compatible PAV or Compatible Hyper PAV function

The used capacity is the sum of the capacities of base volumes which meet at least one of the following conditions:

- Base volumes to which alias volumes are or were assigned through Storage Navigator
• Base volumes which are accessed by alias volumes using Dynamic Compatible PAV or Compatible Hyper PAV

The calculation of the used capacity can be time-consuming as it takes three minutes for each CU to calculate this value. If all 255 CUs have volumes, it can take up to 13 hours to calculate and display the updated used capacity. During calculation, the latest value for the used capacity is unavailable. All volumes defined to storage system are calculated. After the calculation has finished, the brackets disappear and the latest value of the used capacity is displayed.

**Refreshing Hitachi Compatible PAV data**

To access the latest data following Compatible PAV calculations or operations, open the Compatible PAV window and select **File > Refresh.**
Verifying and monitoring devices

This topic describes the procedures for verifying base and alias devices on the system, and the syntax and description of the commands used to monitor Hitachi Compatible PAV activities from the host computer.

- Verifying base and alias device definition
- Verifying status of devices per channel path
- Verifying Compatible Hyper PAV aliases from z/OS
- Verifying Compatible Hyper PAV aliases from z/OS on z/VM
- Monitoring with MVS commands
  - DISPLAY command
  - DEVSERV PATHS command
  - DEVSERV QPAV commands
  - DISPLAY IOS HYPERPAV command
  - GTF I/O tracing
  - VM CP commands for z/VM
  - QUERY CU command
  - QUERY DASD DETAILS command
  - QUERY PAV command
- QUERY VIRTUAL DASD DETAILS command
- QUERY VIRTUAL PAV command
Verifying base and alias device definition

After you have defined the mapping between base and alias devices to the host operating system, you must verify that the host recognizes the devices as specified.

To verify that the host system recognizes the settings for the base and alias devices:

1. Run the MVS DEVSERV QPAV command to display information about the base device and corresponding alias addresses. Use the following syntax for this command.

   ```
   DS QPAV,device_unit_ID,VOLUME
   ```

   The following figures show sample outputs of this command. First on a Compatible PAV device, and then on a Compatible Hyper PAV device.

```
DS QPAV, D222, VOLUME
1EE4591 08:20:32 DEVSERV QPAVS 591
HOST                  SUBSYSTEM
Configuration          Configuration
UNIT                   UNIT
NUM UA TYPE STATUS SSD ADDR TYPE
D222 22 BASE 0102 22 BASE
D2FE FF ALIAS-D222 0102 FE ALIAS-22
D2FF FF ALIAS-D222 0102 FF ALIAS-22
***3 DEVICE(S) MET THE SELECTION CRITERIA
```

```
DS QP, 5000, VOL
1EE4591 22.20.19 DEVSERV QPAVS 726
HOST                  SUBSYSTEM
Configuration          Configuration
UNIT                   UNIT
NUM UA TYPE STATUS SSD ADDR TYPE
0500 00 BASE-H 5150 00 BASE
***1 DEVICE(S) MET THE SELECTION CRITERIA
```

**Note:** The relationship between base and alias devices is not fixed for the OS using Compatible Hyper PAV. Therefore, only the information about base devices is displayed.

2. Verify that the information displayed by the DEVSERV QPAV command matches the base and alias device definitions specified on the Storage Navigator client machine.

**Note:** After dynamic Compatible PAV operations are performed, mismatches occur because the host system can change the number of aliases assigned to each base device. This type of mismatch will not cause any problems.

Verifying status of devices per channel path

After verifying the definition of devices, the status of these devices must be verified for each channel path (CHP).
To verify the status of the devices by CHP ID:

1. Run the MVS Display Matrix command for each CHP ID connected to the storage system. Use the following syntax for this command.

\[ D \text{ M=CHP}(CHP\_ID) \]

The following figure shows a sample output of this command.

![Sample output of the Display Matrix command](image)

2. Verify that the information displayed by the Display Matrix command matches the device status that was defined when the generation definition was made. If the information is incorrect, the devices must be redefined to the host.

Verifying Compatible Hyper PAV aliases from z/OS

When you restart a VSP storage system while using Compatible Hyper PAV, you must verify that the correct aliases are assisted to a CU.

To verify Compatible Hyper PAV aliases on a z/OS host:

1. On the host computer, enable the Compatible Hyper PAV option.

2. Issue the DEVSERV QPAV command from the host to verify that the displayed aliases are those assigned for Compatible Hyper PAV. See DEVSERV QPAV commands on page 6-8 for proper syntax and an example of this command.

If the correct aliases for Compatible Hyper PAV do not appear after running the DEVSERV QPAV command, and if the host only accesses the corresponding VSP, disable the Compatible Hyper PAV option on the host computer, and then enable the option again. Proceed to step 3.
If the host accesses other storage systems that use Compatible Hyper PAV, issue the following commands from the host to all base devices in the corresponding CU.

V base_device_number1-base_device_number2,OFFLINE
CF CHP(channel_path1-channel_path2),OFFLINE
CF CHP(channel_path1-channel_path2),ONLINE
V base_device_number1-base_device_number2,ONLINE

If Cross-OS File Exchange is being used on the host computer, issue the following commands.

V Cross_OS_File_Exchange_Volume_1-
Cross_OS_File_Exchange_Volume_2,OFFLINE
V Cross_OS_File_Exchange_Volume_1-
Cross_OS_File_Exchange_Volume_2,ONLINE

3. After performing one of the preceding actions, reissue the DEVSERV QPAV command and check for the alias devices in the returned results.

**Verifying Compatible Hyper PAV aliases from z/OS on z/VM**

When you restart a VSP storage system while using Compatible Hyper PAV, you must verify that the correct aliases are sustained to a CU.

To verify Compatible Hyper PAV aliases on a z/OS system (which is a guest OS on z/VM):

1. Enable the **Compatible Hyper PAV** option on the z/VM and on the z/OS.

2. Issue the QUERY PAV command from z/VM to verify that the displayed aliases are those assigned for Compatible Hyper PAV. See [QUERY PAV command on page 6-12](#) for proper syntax and an example of this command.

3. Issue the DEVSERV QPAV command from z/OS to verify that the displayed aliases are those assigned for Compatible Hyper PAV. See [DEVSERV QPAV commands on page 6-8](#) for proper syntax and an example of this command.

4. If the correct aliases for Compatible Hyper PAV do not appear after running the QUERY PAV and DEVSERV QPAV commands, and if the host only accesses the corresponding VSP, disable the **Compatible Hyper PAV** option on the host computer, and then enable the option again. Skip to step 5.

If the host accesses other storage systems that use Compatible Hyper PAV, perform the following procedure:

a. Issue the following command from z/OS which is used as a guest OS on z/VM to all base devices in the corresponding CU.

V base_device_number1-base_device_number2,OFFLINE

b. Issue the following commands from z/VM to all base devices and alias devices used for Compatible Hyper PAV in the corresponding CU.
c. Issue the following command from z/OS to all base devices in the corresponding CU.

```
V base_device_number1 - base_device_number2,ONLINE
```

d. Issue the following command from z/OS to all channel paths configured on the corresponding CU. This command must be issued for each channel path.

```
V PATH(base_device_number1-base_device_number2, channel_path),ONLINE
```

5. Reissue the DEVSERV QPAV command and check for the alias devices in the returned results.

**Monitoring with MVS commands**

MVS commands can be used to monitor the Compatible PAV activities on the VSP from z/OS. For the complete syntax of MVS commands, see the IBM document *OS/390 MVS System Commands (GC28–1781)*.

**DISPLAY command**

The MVS DISPLAY command displays path information and alias count for the specified base device. Use the following syntax for this command.

```
D M=DEV(device_unit_ID)
```

The following figure shows a sample output of this command for a Compatible PAV base device with five aliases.
The following figure shows a sample output of this command for a Compatible Hyper PAV base device with 16 aliases.

```
D M=DEV(5000)
  IEE1744I 261F, SBF61F, PPRC PAIR FULL DUPLEX, SSID=09F6, CCA=1F
  IEE1744I 22.30.30 DISPLAY M 748
  DEVICE 5000 STATUS=ONLINE
  CHP 48 4C
  ENTRY LINK ADDRESS 31 34
  DEST LINK ADDRESS 16 15
  PATH ONLINE Y Y
  CHP PHYSICALLY ONLINE Y Y
  PATH OPERATIONAL Y Y
  MANAGED N N
  MAXIMUM MANAGED CHPID(S) ALLOWED: 0
  ND = 002/05.  .HTC.02.00000.00112245
  DEVICE NED = 2105.  .HTC.02.00100.00112245
  PAV BASE AND ALIASES 6
```

**DEVSERV PATHS command**

The MVS DEVSERV PATHS command displays the status of the specified base device. Use the following syntax for this command.

**DS P,device_unit_ID**

The following figure shows a sample output of this command.

```
DS 5, 8300
  IEE459I 15.43.32 DEVSERV PATHS 755
  UNIT DTYP D M NT VOLSER CHPID=PATH STATUS
  CTYPTYPE SSID CFM TC DFW PIN DC-STATE CCA DDC ALT CU-TYP
  8306, 33005, 0, 006, PAR300, 63< 4D=+ 6A# 6S=*
  2105 8300 Y YY. YL. N SIMPLEX 00 00 2105
  ****************************************** SYMBOL DEFINITIONS ******************************************
  0 = ONLINE  + = PATH AVAILABLE
  < = PHYSICALLY UNAVAILABLE
```
DEVSERV QPAV commands

The MVS DEVSERV QPAV commands can be used for the following functions.

- Display the status of Compatible PAV base devices. Use the following syntax for this command.
  
  \[
  \text{DS QP,} device\_unit\_ID,4
  \]
  
  The following figure shows a sample output of this command.

```
DS QP,8300,4
1EE959I 15.50.16 DEVSERV QPAVS 013
HOST
CONFIGURATION SUBSYSTEM
------------- ------------
UNIT UNIT UA
NOM. UA TYPE STATUS SSID ADDR. TYPE
---- ---- ----- ------ ---- -----------------------
8300 00 BASE 8300 00 BASE
8301 01 BASE 8300 01 BASE
8302 02 BASE 8300 02 BASE
8303 03 BASE 8300 03 BASE
*** 4 DEVICE(S) MET THE SELECTION CRITERIA
```

- Display the status of a Compatible Hyper PAV base device and its alias devices. Use the following syntax for this command.

  \[
  \text{DS QP,} device\_unit\_ID,HPAV
  \]

The following figure shows a sample output of this command.

```
DS QP,5000,HPAV
1EE959I 22.38.45 DEVSERV QPAVS 844
HOST
CONFIGURATION SUBSYSTEM
------------- ------------
UNIT UNIT UA
NOM. UA TYPE STATUS SSID ADDR. TYPE
---- ---- ----- ------ ---- -----------------------
05000 00 BASE-H 5150 00 BASE
05040 40 ALIAS-H 5150 40
05041 41 ALIAS-H 5150 41
05042 42 ALIAS-H 5150 42
05043 43 ALIAS-H 5150 43
05044 44 ALIAS-H 5150 44
05045 45 ALIAS-H 5150 45
05046 46 ALIAS-H 5150 46
05047 47 ALIAS-H 5150 47
05048 48 ALIAS-H 5150 48
05049 49 ALIAS-H 5150 49
05050 4A ALIAS-H 5150 4A
05048 4B ALIAS-H 5150 4B
05048 4C ALIAS-H 5150 4C
05048 4D ALIAS-H 5150 4D
05048 4E ALIAS-H 5150 4E
05048 4F ALIAS-H 5150 4F
*** 16 DEVICE(S) IN HYPERPAV ALIAS POOL
```

- Display the status of an entire SSID. Use the following syntax for this command.

  \[
  \text{DS QP,SSID=}device\_unit\_ID
  \]

The following figure shows a sample output of this command.
Display the status of the host and subsystem configuration. Use the following syntax for this command.

\`DS QP,device_unit_ID,VOLUME\`

The following figure shows a sample output of this command.
DISPLAY IOS HYPERPAV command

The MVS DISPLAY IOS HYPERPAV command displays the current HYPERPAV enablement status. Use the following syntax for this command.

D IOS, HYPERPAV

The following figure shows a sample output of this command.

GTF I/O tracing

Compatible PAV is compatible with GTF I/O tracing. When a device number is specified for a GTF I/O tracing operation, GTF determines if the device is a Compatible PAV base device and automatically includes the alias addresses currently assigned to the base device. For more information on GTF I/O tracing, see the IBM document OS/390 MVS Diagnosis: Tools and Service Aids (SY28-1085).

VM CP commands for z/VM

VM CP commands can be used to monitor the Compatible PAV activities on the VSP from z/VM.

The following syntax conventions are used for VM CP commands.

- **BOLD AND CAPITALIZED** characters—indicate characters that must be entered.
- lowercase characters—indicate characters that can be omitted.
- *italic* characters—indicate a type of operand. An arbitrary value can be entered.
- brackets ([ ])—indicate an operand that can be omitted.
• braces ({} )—indicate that one operand must be selected from the list of operands enclosed by the braces. Operands enclosed within the braces are delimited by vertical bars (|).

**QUERY CU command**

The **QUERY CU** command displays information about DASD CU. Use the following syntax for this command.

```
Q CU [DASD] {ssid | ssid1 | ssid2} {ALiases | DEVi ces | PAVMode}
```

The following figure shows a sample output of this command.

```
q cu dasd b600 al
DASD CU B600 ALIASES:
AO00 AO01 AO02 AO03 AO04 AO05 AO06 AO07
AO08 AO09 AO0A AO0B AO0C AO0D AO0E AO0F
AO40 AO41 AO42 AO43 AO44 AO45 AO46 AO47
AO48 AO49 AO4A AO4B AO4C AO4D AO4E AO4F
AO50 AO51 AO52 AO53 AO54 AO55 AO56 AO57
AO58 AO59 AO5A AO5B AO5C AO5D AO5E AO5F
AO60 AO61 AO62 AO63 AO64 AO65 AO66 AO67
AO68 AO69 AO6A AO6B AO6C AO6D AO6E AO6F
AO70 AO71 AO72 AO73 AO74 AO75 AO76 AO77
AO78 AO79 AO7A AO7B AO7C AO7D AO7E AO7F
AO80 AO81 AO82 AO83 AO84 AO85 AO86 AO87
AO88 AO89 AO8A AO8B AO8C AO8D AO8E AO8F
AO90 AO91 AO92 AO93 AO94 AO95 AO96 AO97
AO98 AO99 AO9A AO9B AO9C AO9D AO9E AO9F
AOA0 A0A1 A0A2 A0A3 A0A4 A0A5 A0A6 A0A7
AOA8 A0A9 A0AA A0AB A0AC A0AD A0AE A0AF
A0B0 A0B1 A0B2 A0B3 A0B4 A0B5 A0B6 A0B7
A0B8 A0B9 A0BA A0BB A0BC A0BD A0BE A0BF
A0C0 A0C1 A0C2 A0C3 A0C4 A0C5 A0C6 A0C7
A0C8 A0C9 A0CA A0CC A0CD A0CE A0CF
A0D0 A0D1 A0D2 A0D3 A0D4 A0D5 A0D6 A0D7
A0D8 A0D9 A0DA A0DB A0DC A0DE A0DF
A0E0 A0E1 A0E2 A0E3 A0E4 A0E5 A0E6 A0E7
A0E8 A0E9 A0EA A0EB A0EC A0ED A0EE A0EF
A0F0 A0F1 A0F2 A0F3 A0F4 A0F5 A0F6 A0F7
A0F8 A0F9 A0FA A0FB A0FC A0FD A0FE A0FF
```

**Note:** The QUERY CU command may only be executed on the OS that is used directly by the host computer. Any attempt to execute the QUERY CU command on the z/VM that is operated as a guest OS on the other z/VM is rejected.

**QUERY DASD DETAILS command**

The **QUERY DASD DETAILS** command displays information about DASD (RDEV). Use the following syntax for this command.

```
Query DAsd DETAILS {rdev | rdev1 | rdev2}
```
The following figure shows a sample output of this command.

```
q dasd details a000
A000 CUTYPE = 2167-ES, DEVTYPE = 3390-0A, VLSER = CM0000, CYLS = 3339
CACHE DETAILS: CACHE NYS CFW DFW PINNED CONCVPY
   -SUBSYSTEM  Y  Y  Y -  N  N
   -DEVICE     Y - -  Y  N  N
DEVICE DETAILS: CCA = 00, DCC = --
DUPEXY DETAILS: --
HYPERPAV DETAILS: BASE VOLUME IN POOL 0
CU DETAILS: SSID = B600, CUNUM = A000
```

**Caution:** The QUERY DASD DETAILS command cannot be used for a 3380 DASD.

### QUERY PAV command

The QUERY PAV command displays the list of Hitachi Compatible PAV or Compatible Hyper PAV devices (including information on those devices) that are managed by the corresponding storage system. Use the following syntax for this command.

```
Query PAV {rdev | rdev1 | rdev2 | ALL}
```

The following figure shows a sample output of this command.

```
q pav a000
Device A000 is a base HyperParallel Access Volume device in Pool 0
```

### QUERY VIRTUAL DASD DETAILS command

The QUERY VIRTUAL DASD DETAILS command displays information about all DASDs that can be accessed by z/VM. Use the following syntax for this command.

```
Query Virtual DASD [DETAILS]
```

The following figure shows a sample output of this command.

```
Q V DASD details

DASD 1000 3390 CM0000 R/V  3339 CYL ON DASD A100 SUBCHANNEL = 005E
HYPERPAVBASE(0)
DASD 3000 3390 R/V  1 CYL ON DASD A100 SUBCHANNEL = 005F
HYPERPAVBASE(A0CO,0)
DASD A001 ON DASD A001 R/W CM001 SUBCHANNEL = 005E
DEVCTL HYPERPAVBASE(0)
```

**Caution:** The DETAILS operand is only valid for dedicated DASD and mini-disk DASD.
QUERY VIRTUAL PAV command

The QUERY VIRTUAL PAV command displays the status of all Hitachi Compatible PAV and Compatible Hyper PAV devices that can be accessed by z/VM. Use the following syntax for this command.

```
Query Virtual PAV {vdev | vdev1 | vdev2 | ALL}
```

The following figure shows a sample output of this command.

```
<BASE>
q v pav 1000
HYPERPAV BASE 1000 ON A000 CM8000 ASSIGNED A00C POOL 0

<ALIAS>
q v pav 3800
HYPERPAV ALIAS 3800 ASSIGNED A00C POOL 0
```
This topic provides troubleshooting information.

Troubleshooting
Troubleshooting

For troubleshooting information on Storage Navigator, see the *Hitachi Storage Navigator User Guide*. For a complete list of Storage Navigator error codes, see the *Hitachi Storage Navigator Messages*. 
Disabling Compatible Hyper PAV

This topic describes the procedures for disabling Compatible Hyper PAV on the storage system.

- Disabling Compatible Hyper PAV from z/OS
- Disabling Compatible Hyper PAV from z/OS when multiple storage systems are used
- Disabling Compatible Hyper PAV from z/OS on z/VM
Disabling Compatible Hyper PAV from z/OS

Prerequisites

- All alias devices must be removed
- You must have Storage Administrator (Provisioning) role to perform this task

To disable Compatible Hyper PAV from z/OS:

1. Issue the following commands to all base devices in the corresponding CU:
   
   ```
   V base_device_number1-base_device_number2,OFFLINE
   CF CHP(channel_path1-channel_path2),OFFLINE
   ```

2. Issue the following command from the host system console to disable the Compatible Hyper PAV option on the host computer.
   
   ```
   SETIOS HYPERPAV=NO
   ```

3. Uninstall Compatible Hyper PAV on Storage Navigator.

4. Issue the following DEVSERV command from the z/OS to an arbitrary device per CU:
   
   ```
   DS QD,device_ID,VALIDATE
   ```

5. Issue the DEVSERV QPAV command from the host to verify that the aliases assigned for Compatible Hyper PAV are released. See DEVSERV QPAV commands on page 6-8 for proper syntax and an example of this command.

Disabling Compatible Hyper PAV from z/OS when multiple storage systems are used

This procedure is used when Compatible Hyper PAV and Cross-OS File Exchange are still used on other storage systems which are accessed from the corresponding host.

To disable Compatible Hyper PAV from the target storage system only:

1. Issue the following commands to all base devices in the corresponding CU.
   
   ```
   V base_device_number1-base_device_number2,OFFLINE
   CF CHP(channel_path1-channel_path2),OFFLINE
   ```

2. Uninstall Compatible Hyper PAV on Storage Navigator.

3. Issue the following commands to all base devices in the corresponding CU.
   
   ```
   CF CHP(channel_path1-channel_path2),ONLINE
   V base_device_number1-base_device_number2,ONLINE
   ```
4. Issue the DEVSERV QPAV command from the host to verify that the aliases assigned for Compatible Hyper PAV are released. See DEVSERV QPAV commands on page 6-8 for proper syntax and an example of this command.

Disabling Compatible Hyper PAV from z/OS on z/VM

Prerequisites

- All alias devices must be removed
- You must have permission to modify the storage system

To disable Compatible Hyper PAV from z/OS on z/VM:

1. From z/OS on z/VM, issue the following commands to all base devices in the corresponding CU.
   
   \texttt{V base\_device\_number1-base\_device\_number2,OFFLINE}
   
   \texttt{CF\ CHP(channel\_path1-channel\_path2),OFFLINE}

2. Issue the following command from the host system console to disable the Compatible Hyper PAV option on the host computer.
   
   \texttt{SETIOS HYPERPAV=NO}

3. Issue the following commands from z/VM system console to all alias devices that are used for Compatible Hyper PAV in the corresponding CU:
   
   \texttt{DET alias\_device\_number1-alias\_device\_number2}
   
   \texttt{VARY OFFLINE alias\_device\_number1-alias\_device\_number2}
   
   \texttt{SET CU PAV ssid1-ssid2}
   
   \texttt{VARY ONLINE alias\_device\_number1-alias\_device\_number2}
   
   \texttt{ATT alias\_device\_number1-alias\_device\_number2*}
   
   An asterisk (*) is required at the end of the ATT command.

4. Uninstall Compatible Hyper PAV on Storage Navigator.

5. Issue the following DEVSERV command from the z/OS to an arbitrary device per CU:
   
   \texttt{DS QD,device\_ID,VALIDATE}

6. Issue the QUERY PAV command from z/VM to verify that the aliases assigned for Compatible Hyper PAV are released. See QUERY PAV command on page 6-12 for proper syntax and an example of this command.

7. Issue the DEVSERV QPAV command from the z/OS to verify that the aliases assigned for Compatible Hyper PAV are released. See DEVSERV QPAV commands on page 6-8 for proper syntax and an example of this command.
Hitachi Compatible PAV GUI reference

This topic describes the fields and options available in the Hitachi Compatible PAV window.

- Hitachi Compatible PAV window
Hitachi Compatible PAV window

Use the Hitachi Compatible PAV window to assign alias devices to base devices.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDKC</td>
<td>Selects the LDKC that contains the desired CU(s) and LDEV(s).</td>
</tr>
<tr>
<td>CU</td>
<td>Selects the logical CU image that contains the desired LDEV(s). The volume lists on the Compatible PAV window display only the LDEVs for the selected CU image. CU numbers are included in the currently selected LDKC. To indicate the CU numbers included in another LDKC, select the LDKC that includes the chosen CU number in the LDKC list.</td>
</tr>
<tr>
<td>Compatible PAV Used Capacity</td>
<td>Indicates the capacity currently being used by base volumes. The value in the parentheses indicates the total available capacity (in terabytes) in the storage system for Compatible PAV. Unlimited indicates that the available capacity is unlimited. If you are using a temporary key or the emergency key, --- is displayed. If the used capacity is enclosed in brackets (&lt; &gt;), the calculation has not been completed.</td>
</tr>
<tr>
<td>Base Volume List</td>
<td>Displays the LDEVs that are currently in use in the selected CU image. See Base Volume List on page B-3 for a description of all fields.</td>
</tr>
<tr>
<td>Alias Volume List</td>
<td>Displays the alias device(s) assigned to the selected base device(s). See Alias Volume List on page B-3 for a description of all fields.</td>
</tr>
<tr>
<td>Free Volume List</td>
<td>Displays the LDEVs of unused volumes in the selected CU. See Free Volume List on page B-4 for a description of all fields.</td>
</tr>
</tbody>
</table>
Base Volume List

The Base Volume List box displays the LDEVs that are currently in use in the selected CU image. Each of these LDEVs can be a Compatible PAV base device. When you assign and cancel aliases for base devices, you select the base devices from this list box. The following table describes the items in the Base Volume List box.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Volume</td>
<td>Displays the LDKC number, CU number, and LDEV number of the base volume. For the volume used for Compatible PAV, an asterisk (*) is attached next to the LDEV number (for example, 00:00:00 <em>). The capacity of the volumes attached asterisks (</em>) is an object for calculation of used capacity.</td>
</tr>
<tr>
<td>Alias Count</td>
<td>Displays the number of aliases currently assigned to the base volume in the disk storage system. The number of aliases set in the base volume by the user is also displayed in the parentheses.</td>
</tr>
<tr>
<td>Selected</td>
<td>Displays the number of selected base volumes and the total number of base volumes in the selected CU image. For example, 2/73 indicates that two base volumes are selected out of a total of 73 base volumes in the selected CU image.</td>
</tr>
<tr>
<td>Select All</td>
<td>Selects all volumes in the Base Volume List box.</td>
</tr>
</tbody>
</table>

Alias Volume List

The Alias Volume List box displays the alias device(s) assigned to the selected base device(s). To view all alias devices for the selected CU image, you must select all of the base devices. When you cancel aliases for base devices, you select the alias devices from this list. The following table describes the items in the Base Volume List box.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alias Volume</td>
<td>Displays the LDKC, CU, and LDEV numbers of the alias volume.</td>
</tr>
<tr>
<td>Current Base</td>
<td>Displays the LDKC, CU, and LDEV numbers of the base volume currently assigned to the alias volume in the disk storage system.</td>
</tr>
<tr>
<td>Initial Base</td>
<td>Displays the LDKC, CU, and LDEV numbers of the base volume set by the user for the alias volume.</td>
</tr>
</tbody>
</table>
The Free Volume List box displays the LDEV IDs of unused volumes in the selected CU. Any free volume can be used as a Compatible PAV alias device. Use this list to select aliases to assign to base volumes. The following table describes the items in the Free Volume List box.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected</td>
<td>Displays the number of selected free devices and the total number of free devices in the selected CU image. For example, 8/47 indicates that eight free devices are selected out of a total of 47 free devices in the selected CU image.</td>
</tr>
<tr>
<td>Select All</td>
<td>Selects all volumes in the Free Volume List box.</td>
</tr>
</tbody>
</table>

**Free Volume List**

The Free Volume List box displays the LDEV IDs of unused volumes in the selected CU. Any free volume can be used as a Compatible PAV alias device. Use this list to select aliases to assign to base volumes. The following table describes the items in the Free Volume List box.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected</td>
<td>Displays the number of selected alias devices and the total number of alias devices in the selected CU image. For example, 2/4 indicates that two aliases are selected out of a total of four alias devices in the selected CU image.</td>
</tr>
<tr>
<td>Select All</td>
<td>Selects all volumes in the Alias Volume List box.</td>
</tr>
</tbody>
</table>
Glossary

This glossary defines the special terms used in this document. Click the desired letter below to display the glossary entries that start with that letter.

A

APAR
Authorized Problem Analysis Report

alias device
A formatted but unused mainframe logical device (LDEV) whose address can be used as an alias for a Parallel Access Volume (PAV) base device.
See also base device

B

base device
A formatted mainframe logical device (LDEV) that contains user data and can be accessed via alias devices using IBM Parallel Access Volume (PAV) host software. A base device must be defined to the host as a “B” device type (e.g., 3390B-9).
See also alias device

C

cache

capacity
The amount of data storage space available on a physical storage device, usually measured in bytes (MB, GB, TB, etc.).
CH
Channel

CHA
channel adapter

channel path
The communication path between a channel and a control unit. A channel path consists of the physical channel path and the logical path.

CHP
channel path

CU
control unit

D

DASD
direct-access storage device

device
A physical or logical unit with a specific function.

device emulation
Indicates the type of logical volume. Mainframe device emulation types provide logical volumes of fixed size, called logical volume images (LVIs), which contain EBCDIC data in CKD format. Typical mainframe device emulation types include 3390-9 and 3390-M. Open-systems device emulation types provide logical volumes of variable size, called logical units (LUs), that contain ASCII data in FBA format. The typical open-systems device emulation type is OPEN-V.

I

IPL
initial program load

IPS
Installation Performance Specification

ISPF/PDF
Interactive System Productivity Facility/package definition file
J

JCL
  job control language

L

LCU
  logical control unit

LDEV
  logical device

LU
  logical unit

LVI
  logical volume image (e.g., 3390-3R)

M

MIH
  missing interrupt handler

MVS
  Multiple Virtual Storage

N

NUM
  Number

P

PAV
  Parallel Access Volume

PPRC
  Peer-to-Peer Remote Copy
R

R-SIM
remote service information message

RAID
redundant array of independent disks

S

SIM
service information message

SIz
ShadowImage for z/OS

SMS
Storage Management Subsystem

SSCH
start subchannel

SSID
storage subsystem identification

V

VM
Virtual Machine

vol
Volume

VSE
Virtual Storage Extended

VTOC
volume table of contents

W

WLM
Workload Manager
X
XRC
Extended Remote Copy
Z
zvm
z/Virtual Machine
Index

A
alias device
  definition 1–2
assigning aliases to base devices 5–2
B
base device
  definition 1–2
Base Volume List B–2
base-to-alias device ratio 3–2
D
defining a base or alias device on an LCU 3–6
defining an LCU 3–2
displaying configuration parameters for a device 3–10
dynamic mode 1–2, 2–3
G
GTF I/O tracing 6–10
H
Hardware Configuration Definition (HCD) 3–1
HCD file 1–3
I
I/O request flows 1–5
M
MIH timer value 4–4
modes 1–2
MVS commands
  DEVSERV PATHS 6–7
  DEVSERV QPAV 6–8
  DISPLAY 6–6
  DISPLAY IOS HYPERPAV 6–10
  introduction 6–6
O
overview 1–2
P
Preventive Service Planning 2–4
R
reassigning aliases to different base devices 5–6
Refreshing data 5–8
removing aliases from base devices 5–4
requirements 2–2
S
static mode 1–3, 2–3
U
used capacity calculations 5–7
V
verifying base and alias device definition 6–3
verifying status of devices 6–4
viewing or modifying WLM mode 4–2
VM CP commands
  introduction 6–10
  QUERY CU 6–11
  QUERY DASD DETAILS 6–11
  QUERY PAV 6–12
  QUERY VIRTUAL DASD DETAILS 6–12
  QUERY VIRTUAL PAV 6–13
W
Window
  Alias Count (Initial) column B–3
  Alias Volume column B–3
  Alias Volume List B–2
  Base Volume column B–3
  CU list B–2
  Current Base column B–3
  Free Volume column B–4
Free Volume List B–2
Initial Base column B–3
LDKC list B–2
Used Capacity B–2
WLMPAV parameter 1–3
Workload Manager (WLM)
  compatibility mode 1–4
  goal mode 1–4
  overview 1–4