Hitachi Virtual Storage Platform 5000 Series

SVOS RF 9.4

Hitachi Compatible PAV User Guide

The Compatible PAV software product enables an IBM host computer to issue multiple I/O requests to an LDEV on your storage system at a time, which can greatly improve access speed to the storage system.

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Preface

The Compatible PAV software product enables an IBM host computer to issue multiple I/O requests to an LDEV on your storage system at a time, which can greatly improve access speed to the storage system.

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

Intended audience

This document is intended for system administrators, Hitachi Vantara representatives, and authorized service providers who install, configure, and operate the Hitachi Virtual Storage Platform 5000 series storage system.

Readers of this document should be familiar with the following:

- Data processing and RAID storage systems and their basic functions.
- The Hitachi Device Manager - Storage Navigator software for Hitachi Virtual Storage Platform 5000 series, and the *System Administrator Guide*.
- The IBM® Parallel Access Volume host software.

Product version

This document revision applies to the following product versions:

- VSP 5000 series: firmware 90-04-0*x* or later
- SVOS RF 9.4 or later

Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document. Release notes are available on Hitachi Vantara Support Connect: https://knowledge.hitachivantara.com/Documents.

Changes made in this revision

- Added Compatible XRC support.

Document conventions

This document uses the following typographic conventions:

Convention	Description
Bold	- Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example: Click **OK**. - Indicates emphasized words in list items.
Italic	- Indicates a document title or emphasized words in text. - Indicates a variable, which is a placeholder for actual text provided by the user or for output by the system. Example: `pairdisplay -g group` (For exceptions to this convention for variables, see the entry for angle brackets.)
Monospace	Indicates text that is displayed on screen or entered by the user. Example: `pairdisplay -g oradb`
< > angle brackets	Indicates variables in the following scenarios: - Variables are not clearly separated from the surrounding text or from other variables. Example: `Status-<report-name><file-version>.csv` - Variables in headings.
[ ] square brackets	Indicates optional values. Example: [a | b] indicates that you can choose a, b, or nothing.
{ } braces	Indicates required or expected values. Example: { a | b } indicates that you must choose either a or b.
| vertical bar	Indicates that you have a choice between two or more options or arguments. Examples: [a | b] indicates that you can choose a, b, or nothing. { a | b } indicates that you must choose either a or b.

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

Icon	Label	Description
	Note	Calls attention to important or additional information.
	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Warns the user of adverse conditions and/or consequences (for example, disruptive operations, data loss, or a system crash).
	WARNING	Warns the user of a hazardous situation which, if not avoided, could result in death or serious injury.

Conventions for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 kilobyte (KB)	1,000 (10^3) bytes
1 megabyte (MB)	1,000 KB or $1,000^2$ bytes
1 gigabyte (GB)	1,000 MB or $1,000^3$ bytes
1 terabyte (TB)	1,000 GB or $1,000^4$ bytes
1 petabyte (PB)	1,000 TB or $1,000^5$ bytes
1 exabyte (EB)	1,000 PB or $1,000^6$ bytes

Logical capacity values (for example, logical device capacity, cache memory capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
1 cylinder	Mainframe: 870 KB

Logical capacity unit	Value
	Open-systems: ▪ OPEN-V: 960 KB ▪ Others: 720 KB
1 KB	1,024 (2^{10}) bytes
1 MB	1,024 KB or $1,024^2$ bytes
1 GB	1,024 MB or $1,024^3$ bytes
1 TB	1,024 GB or $1,024^4$ bytes
1 PB	1,024 TB or $1,024^5$ bytes
1 EB	1,024 PB or $1,024^6$ bytes

Accessing product documentation

Product user documentation is available on Hitachi Vantara Support Connect: https://knowledge.hitachivantara.com/Documents. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

Hitachi Vantara Support Connect is the destination for technical support of products and solutions sold by Hitachi Vantara. To contact technical support, log on to Hitachi Vantara Support Connect for contact information: https://support.hitachivantara.com/en_us/contact-us.html.

Hitachi Vantara Community is a global online community for Hitachi Vantara customers, partners, independent software vendors, employees, and prospects. It is the destination to get answers, discover insights, and make connections. **Join the conversation today!** Go to community.hitachivantara.com, register, and complete your profile.

Comments

Please send us your comments on this document to doc.comments@hitachivantara.com. Include the document title and number, including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Vantara LLC.

Thank you!

Chapter 1: Overview

This topic provides an overview of Hitachi Compatible PAV (PAV).

About Hitachi Compatible PAV

The Hitachi Compatible PAV (Compatible PAV) feature enables an IBM ® zSeries ® or S/390 ® host system to issue multiple I/O requests in parallel to individual logical devices (LDEVs) in the Hitachi Virtual Storage Platform 5000 series (VSP 5000 series) storage system.

When Compatible PAV is not used, the host system can start only one I/O request to a device at a time, and must wait for the I/O to complete before starting another I/O request to the same device. Compatible PAV enables the host system to start multiple I/O requests to the same device at the same time via alias addresses assigned to a device. When Compatible PAV is used, the host system has substantially faster access to the data stored in the VSP 5000 series storage system.

Devices used in Compatible PAV operations

The two device types used in Compatible PAV operations are base devices and alias devices:

- Base devices (on page 10)
- Alias devices (on page 11)

The VSP 5000 series storage system supports up to 256 devices per CU (control unit).

Base and alias devices are defined to the host OS using a combination of HCD/IODF/IOCDS.

Base devices

A base device is an installed and formatted device (for example, 3390-9) that contains user data. A base device must be defined to the host as a "B" device type (for example, 3390B). Base devices are defined by the storage system when the mainframe emulated volumes are defined and installed.

> ⚠ **Caution:** The following volumes cannot be defined as base devices:
> - Journal volumes for Universal Replicator for Mainframe
> - Migration volumes

A Cross-OS File Exchange volume is defined as a base, but a Cross-OS File Exchange volume cannot use Compatible PAV.

Alias devices

An alias device is an LDEV ID (address), where no actual LDEV is defined in the storage system, that can be used with the defined base addresses in the same CU to issue parallel requests to a base address that already has one or more active I/Os in process. Alias devices cannot be varied online. Each alias must be in the same logical CU image as the base device to which it is assigned. An alias device must be defined to the host as an "A" device type (for example, 3390A). To use alias devices, they must be configured in the storage system using Hitachi Command Suite or Hitachi Device Manager - Storage Navigator.

Compatible PAV modes

Compatible PAV operations can be performed in one of four operational modes (dynamic, static, Compatible Hyper PAV, or Compatible Super PAV). 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.

The VSP 5000 series storage system uses the I-2107 control unit emulation. You can use one of the following modes:

- Dynamic Compatible PAV mode

  For more information about this mode, see Compatible PAV in dynamic mode (on page 12) .

- Static Compatible PAV mode

  For more information about this mode, see Compatible PAV in static mode (on page 12) .

- Compatible Hyper PAV (Hyper PAV) mode

  You can specify the PAV feature (Compatible PAV, Compatible Hyper PAV, or Compatible Super PAV) to use for each host computer. Therefore, an alias device may accept I/O requests from PAV, HyperPAV, or SuperPAV.

  For more information about this mode, see Compatible Hyper PAV (on page 14) .

- Compatible Super PAV (Super PAV) mode

  You can specify the PAV feature (Compatible PAV,Compatible Hyper PAV, or Compatible Super PAV) to use for each host computer. Therefore, an alias device might accept I/O requests from PAV, and I/O requests from HyperPAV and SuperPAV. For more information about this mode, see Compatible Super PAV (on page 14) .

For more information:

- About WLM, see Workload Manager (on page 13) and Setting the WLM operational mode (on page 44) .

- About the WLMPAV parameter and HCD file, see Compatible PAV in dynamic mode (on page 12) .

Compatible PAV in dynamic mode

In Compatible PAV 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 VSP 5000 series. 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.

For more information about setting the WLM operational mode, see Setting the WLM operational mode (on page 44) .

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.
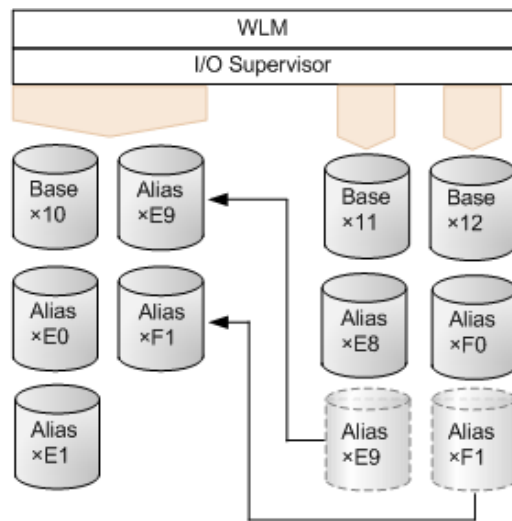
Compatible PAV in static mode

In Compatible PAV static mode, the number of alias devices assigned to each Compatible PAV base device remains the same, even when the number of I/O requests to each device changes.

To use static Compatible PAV, set the WLM operational mode to compatibility mode. The WLM operational mode must be set to compatibility mode to support static Compatible PAV operations. While in compatibility mode, WLM manages the system according to parameters in IPS and ICS (IEAIPSxx and IEAICSxx parmlib members).

For more information about setting the WLM operational mode, see Setting the WLM operational mode (on page 44) .

The following figure shows an example of Compatible PAV base devices assigned to alias devices.
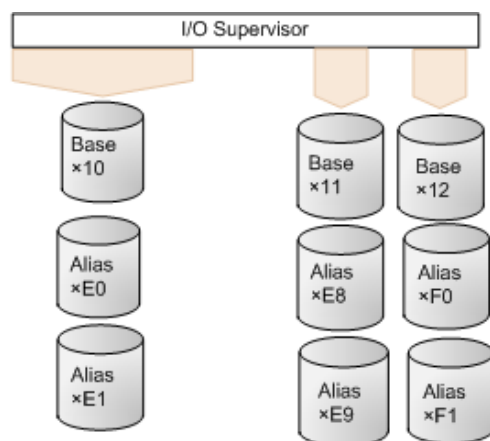
In this example, the x10, x11 and x12 base devices were originally assigned two alias devices each. As I/O requests converge on the base device x10 (indicated by the large arrow), the number of alias devices for each base device does not change.

Workload Manager

The host computer uses WLM for Compatible PAV. It is a software component of the IBM ® MVS/ESA and z/OS ® operating systems.

WLM supports dynamic and static Compatible PAV operations and manages workloads using one of the following operational modes:

- Goal mode

  For more information about this mode, see WLM in goal mode (on page 13) .

- Compatibility mode

  For more information about this mode, see WLM in compatibility mode (on page 13) .

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** screen 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** screen is set to No. While in compatibility mode, the WLM manages the system according to parameters in IPS and ICS (IEAIPSxx and IEAICSxx parmlib members).

Chapter 1: Overview

Compatible Hyper PAV

You can use the Compatible Hyper PAV feature to map an entire collection of alias devices to a single Compatible PAV base device in a CU and to have all other base devices in the same CU share these aliases.

The Hyper PAV feature does not require that you change the number of alias devices assigned to each base device. With the Compatible Hyper PAV feature, a whole collection of alias devices can be mapped to one base device in a CU when configuring the aliases using Hitachi Device Manager - Storage Navigator in the storage system.

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 from Compatible PAV or Compatible Hyper PAV.

Compatible Super PAV

The Compatible Hyper PAV feature enables you to map alias devices to base devices only within the same CU. If you want to map alias devices in a different CU, you must enable the Super PAV mainframe system function on the storage system. When the Super PAV mainframe system function is enabled, you can map an entire collection of alias devices to a single base device that is in a different CU.

You can specify the PAV feature (Compatible PAV, Compatible Hyper PAV, or Compatible Super PAV) to use for each host computer. Therefore, an alias device might accept I/O requests from Compatible PAV, Compatible Hyper PAV, and Compatible Super PAV.

I/O request workflow using 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.

The existence of defined aliases devices allows the operating system to issue parallel I/Os by issuing I/O to the base address and associated alias addresses for the base device. The maximum number of parallel I/Os is the number of aliases assigned to the base plus 1 for static or dynamic configurations. When Hyper PAV is used, the maximum number of parallel I/Os to a base address is the number of aliases configured in the CU plus 1. If multiple base devices are using aliases, the maximum number for any individual base device is reduced accordingly.

In the following figure, three alias devices are each assigned to base devices 1, 2 and 3.
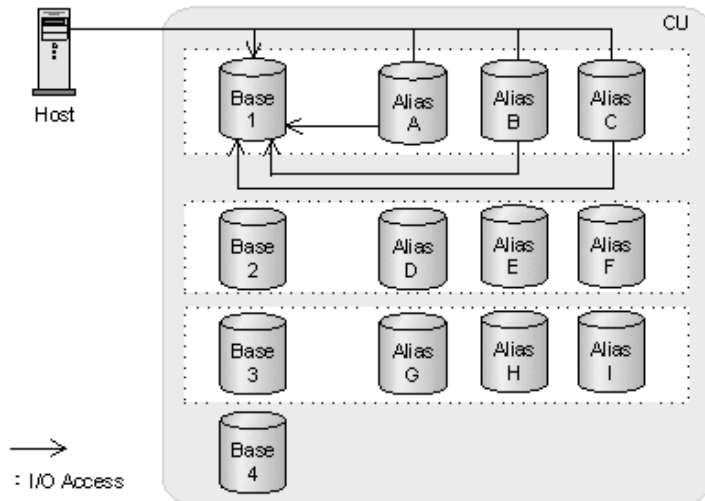
As illustrated with the arrows in the figure, I/O requests converge on base device 1 when a host computer accesses the device using Compatible PAV. Since alias devices A, B, and C were assigned to base device 1 in advance of the operation, I/O requests are automatically issued to these alias devices. 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 an alias device is not assigned to the device.

I/O request workflow 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 Hyper PAV, alias devices are pooled together in each CU. All base devices in the CU share the alias devices as a pool. The aliases are assigned to a specific base address for the duration of the I/O and then returned to the alias pool for the CU.

In the following figure, three alias devices each are assigned to base devices 1, 2, and 3.
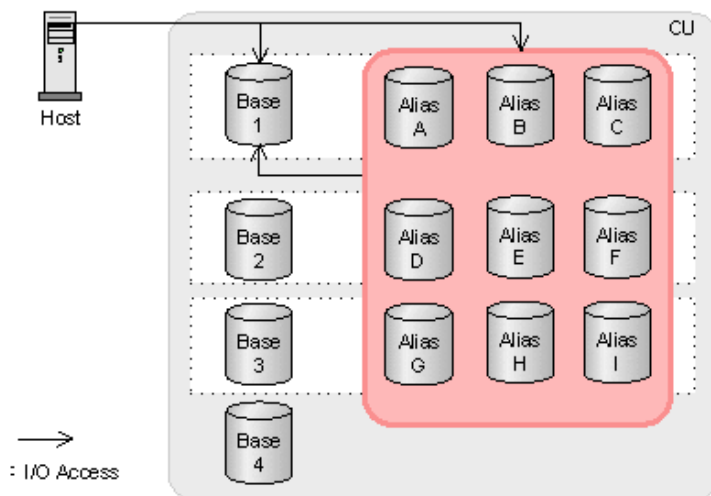
Chapter 1: Overview

As illustrated with the arrows in the figure, I/O requests converge on base device 1 when a host computer accesses the device using 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 can process multiple I/O requests even though an alias device was not specifically assigned to the device when the aliases were configured with Hitachi Device Manager - Storage Navigator.

I/O request workflow using Compatible Super PAV

Multiple alias devices are assigned to a base device in a CU to enable the base device to handle multiple I/O requests. With the Super PAV feature, alias devices are grouped into an alias management group (AMG) and pooled. All base devices in a CU can share alias devices in the AMG. In addition, an AMG contains alias devices across CUs, therefore, a base device can use alias devices in different CUs.

When the Super PAV feature is enabled, two AMGs (an AMG for odd numbered CUs and an AMG for even numbered CUs) are created automatically. A base device can use only alias devices in the AMG to which alias devices in the same CU belong. The host computer allocates alias devices in the same CU as the base device if they are available. This I/O processing is handled by Hyper PAV. If the host cannot allocate alias devices in the same CU, it allocates alias devices in another CU within the AMG. This I/O processing is handled by Super PAV.

In the following figure, three alias devices each are allocated 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 Super PAV. The I/O requests are automatically issued to unused alias devices among the six alias devices A through F in the same CU of the AMG. If the six alias devices cannot be used or are not sufficient, alias devices G through I in another CU within the AMG can be used.

Although no alias device is allocated to base device 4, multiple I/O requests can be processed. Alias devices G through I in the same CU are allocated first, and then alias devices A through F in another CU are allocated if necessary.

The following figure illustrates I/O accesses using Super PAV.
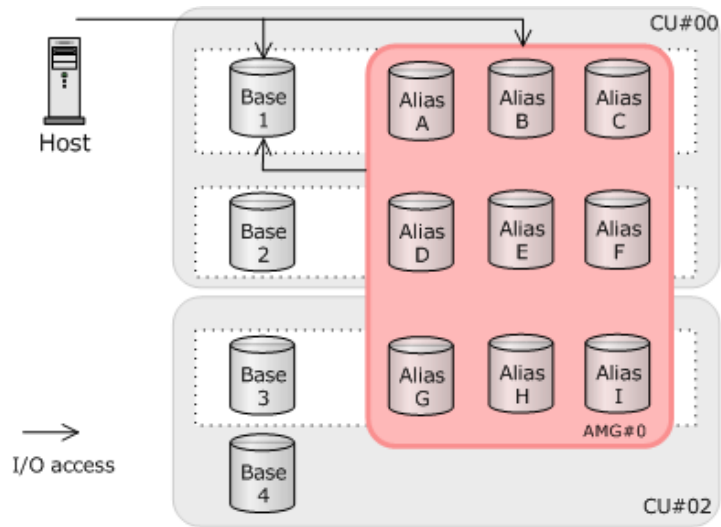
Chapter 2: Requirements and specifications

This topic contains requirements and specifications.

Requirements

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

Item	Requirements		
	Compatible PAV	Hyper PAV	Super PAV
Software License Keys	Compatible PAV Workload Manager (WLM)	Compatible PAV Hyper PAV Workload Manager (WLM)	
Host OS	▪ Dynamic mode: z/VM5.2 with PTF or later ▪ Static mode: VM/ESA2.4.0 or later	z/OS $^®$ 1.8 or later z/OS $^®$ 1.6 with PTF or later z/TPF OS 1.1 with APAR PJ41092 or later z/VM $^®$ 5.3 or later When you use z/VM $^®$, you must use z/OS $^®$ or z/TPF as a guest OS on z/VM $^®$.	z/OS $^®$ 2.2 or later with PTF containing APAR OA56359
Controller emulation type	I-2107	I-2107 or I-2107-TPF	I-2107
Device emulation type for base device	3380-3, 3380-A, 3390-3, 3390-9, 3390-A, 3390-L, 3390-M Cross-OS File Exchange devices listed below are not supported: 3390-3A, 3390-3B, 3390-3C 3390-9A, 3390-9B, 3390-9C, 3390-LA, 3390-LB, 3390-LC 3390-MA, 3390-MB, 3390-MC		

	Requirements		
Item	**Compatible PAV**	**Hyper PAV**	**Super PAV**
	For Compatible PAV and Hyper PAV, all devices including supported device emulation types do not operate in a CU that contains any of the above device emulation types which are online.		
	For Hyper PAV and the z/TPF OS, only the device emulation types listed below are supported:		
	3390-3, 3390-9, 3390-L, 3390-M		
	For Super PAV, Compatible Super PAV cannot be used on the storage system that has a CU in which both devices with Cross-OS File Exchange and other devices with mainframes are defined. For more information, see Restrictions on using Compatible Super PAV (on page 22) .		
Channel interface	FICON		
Storage system ID setting	One storage system ID for each set of 256 LDEVs		
Maximum number of aliases for one base device	255		
Alias device management	Alias device and its base device must belong to the same logical CU image. For Super PAV, alias devices are grouped into odd numbered CUs and even numbered CUs. A base device can also use alias devices in different CUs in the group to which alias devices in the same CU belong.		
Device Manager - Storage Navigator	PAV and Hyper PAV need the Device Manager - Storage Navigator secondary window. To use the Device Manager - Storage Navigator secondary window, install JRE and set up Java, see the chapter about how to use the Device Manager - Storage Navigator secondary window in the *System Administrator Guide*.		
Compatible functions	▪ Virtual LVI ▪ Volume Migration ▪ TrueCopy for Mainframe ▪ ShadowImage for Mainframe ▪ Universal Replicator for Mainframe ▪ IBM ® Concurrent Copy (CC) with restrictions ▪ Compatible XRC with restrictions		

Chapter 2: Requirements and specifications

	Requirements		
Item	**Compatible PAV**	**Hyper PAV**	**Super PAV**
	▪ PPRC ▪ Dynamic Provisioning for Mainframe ▪ Dynamic Tiering for Mainframe ▪ active flash for mainframe For z/TPF OS, only the functions listed below can be used: ▪ Virtual LVI ▪ ShadowImage for Mainframe ▪ TrueCopy for Mainframe ▪ Universal Replicator for Mainframe		

Functions incompatible with Compatible PAV

Devices using Compatible PAV, Compatible Hyper PAV, or Compatible Super PAV cannot be used concurrently with the following functions:

▪ Cross-OS File Exchange

▪ Open Volume Management

▪ ShadowImage (open system version)

▪ TrueCopy (open system version)

▪ Universal Replicator (open system version)

▪ Global-active device

The devices using any function other than Cross-OS File Exchange of the functions listed above can coexist in the same CU with devices using Compatible PAV, Compatible Hyper PAV, or Compatible Super PAV. However, the devices using Cross-OS File Exchange cannot coexist in the same CU with devices using Compatible PAV, Compatible Hyper PAV, or Compatible Super PAV.

Restrictions on using CC or Compatible XRC

When using Concurrent Copy (CC) or Compatible XRC, you cannot use the I-2107 emulation with another type of emulation in the same storage system.

Compatible PAV shared across multiple sysplexes

You can share Compatible PAV functionality across multiple sysplexes on a storage system.

To share static PAV, all connected systems must be in compatibility mode. To share dynamic PAV, the following requirements and restrictions apply:

- Only one sysplex must be running in Dynamic Alias Management mode. This master sysplex is the only sysplex connected to the storage system that assigns aliases.

- For all other connected sysplexes, set the WLMPAV (HCD) and Dynamic Alias Management (WLM) settings to No.

> 📄 **Note:** If you have enabled Dynamic Alias Management for more than one sysplex, unsynchronized alias transition and unpredictable response times may occur.

For more information about setting the WLM mode, Setting the WLM operational mode (on page 44) .

Considerations for using Compatible Super PAV

When using Compatible Super PAV, the following performance design, cautions, and restrictions are required.

Performance design of Compatible Super PAV

The Compatible Super PAV feature enables you to use alias volumes in a different CU from the one that contains base volumes. Therefore, when Compatible Hyper PAV is used, if you enable Compatible Super PAV, the throughput performance improvement can be expected by increasing I/O multiplicity. On the other hand, as the I/O multiplicity for base volumes increases, the load on the processor and the amount of data per unit time against base volume might be increased. These might cause the following effects:

Effects on using Compatible Super PAV:

- Increase in the processor availability ratio and delay in the associated I/O processing (increase in the amount of queuing time and response time).

- Suspend due to full journal volume caused by data inflow increase.

- Overload of the connection path between the primary and secondary sites.

In particular, in a system that contains a CU (a CU with a high IOSQ at all times) in which alias volumes are always depleted, using Compatible Super PAV causes the increase in the load on the system, and therefore the system balance might be lost. Make sure that there are no high load portions (such as the processor availability ratio or the path between the primary and secondary sites) before enabling Compatible Super PAV.

When Compatible Super PAV is newly installed, we recommend to define required alias volumes in its CU as with Compatible Hyper PAV. Alias volumes are grouped into even numbered CUs and odd numbered CUs, and only aliases in the same group can be shared. Therefore, make sure to design the appropriate number of alias volumes in order to avoid being biased by considering the number of base volumes in even numbered CUs and odd numbered CUs, and the assumed multiplicity.

In the configuration where the number of alias volumes in its CU is minimized and alias volumes are collectively defined in several CUs as pools, many I/Os use alias volumes in different CUs. In this case, you cannot manage how the host computer assigns alias volumes to many I/O operations to be performed. Therefore, we recommend to design alias volumes as much as possible based on the operations with Compatible Hyper PAV to avoid the complicated performance design.

Cautions on using Compatible Super PAV

Assume that Compatible Super PAV is enabled using Hitachi Device Manager - Storage Navigator, and the PAV mode of the host computer is switched to XPAV. In this case, if you run the following command on the terminal of the host computer, the I/O operations of Super PAV might not be performed after the PAV mode is switched back to XPAV.

```
SETIOS HYPERPAV=NO
```

After switching the PAV mode back to XPAV, make sure that alias volumes are recognized. If alias volumes in different CUs do not appear, see and take the corrective action.

Restrictions on using Compatible Super PAV

The following table lists the restrictions on using Compatible Super PAV.

Restriction	Recommended action
Compatible Super PAV cannot be used in the system that has a CU in which both devices with Cross-OS File Exchange and devices with mainframes are contained.	Both devices with Cross-OS File Exchange and devices with mainframes cannot be defined in one CU. If both devices have been already defined as mixed, move either of the devices to a different CU in order to change the configuration so that there is no CU in which both devices are contained. When Super PAV is enabled using Hitachi Device Manager - Storage Navigator, you cannot create a configuration where the devices with Cross-OS File Exchange and devices with mainframes are contained in one CU.
Compatible Super PAV does not work in CUs in which alias volumes are not defined.	Make sure to define one or more alias volumes in CUs in which you want to use Compatible Super PAV.

Restriction	Recommended action
Alias volumes in CUs that do not contain base volumes which are online cannot be used by different CUs because they cannot be recognized by a host computer.	In a CU in which you want to use alias volumes for Compatible Super PAV, make the base volumes come online to the host computer.

Recovering from the state in which alias volumes are not recognized

If the following operations are performed on a host computer or in the storage system by using Compatible Hyper PAV or Compatible Super PAV, the host computer might not recognize all alias volumes:

▪ Deleting alias volumes which are online.

▪ Turning off the power of the storage system while JOB is running.

▪ Switching the host computer mode to Base PAV.

If alias volumes are not recognized, take the corrective actions to enable Compatible Super PAV or Compatible Hyper PAV. To make sure that alias volumes are recognized, issue the following commands on the terminal of the host computer:

```
ds qpav, bbbb(base volume), volume
```

The following is an output example of the status that alias volumes are recognized.

```
DS QP,EE66,VOL
IEE459I 21.57.57 DEVSERV QPAVS 789
      HOST                        SUBSYSTEM
 CONFIGURATION            CONFIGURATION
---------------          ---------------------
 UNIT                                 UNIT     UA
 NUM. UA  TYPE          STATUS     SSID  ADDR.  TYPE
----- --  ----          ------     ----  ----   ----------
0EE66 C6  BASE-H                   7AF3  C6      BASE
1EE30 F0  ALIAS-H                  7AF1  F0
1EE6F EF  ALIAS-H                  7AF3  EF
****      3 DEVICE(S) MET THE SELECTION CRITERIA
```

The following is an output example of the status that alias volumes are not recognized. ALIAS-H does not appear if alias volumes are not recognized.

```
DS QP,EE66,VOL
IEE459I 21.57.57 DEVSERV QPAVS 789
      HOST                        SUBSYSTEM
 CONFIGURATION            CONFIGURATION
---------------          ---------------------
 UNIT                                 UNIT     UA
```

```
 NUM. UA  TYPE          STATUS      SSID  ADDR.  TYPE
----- --  ----          ------      ----  ----   ----------
0EE66 C6  BASE-H                    7AF3  C6     BASE
****      1 DEVICE(S) MET THE SELECTION CRITERIA
```

If alias volumes are not recognized, execute the following commands on the terminal of the host computer to re-recognize alias volumes.

```
vary bbbb-cccc (base volume), online, uncond
```

Alias volumes might not be re-recognized depending on the command execution timing, in which case retry the operations. If alias volumes are not recognized yet, take the corrective actions listed in the following table.

Operation	Phenomenon	Recommended action
Deleting alias volumes which are online.	Hyper PAV or Super PAV does not work in the operated storage system.	Take alias volumes offline from all connected host computers.
Turning off the power of the storage system while JOB is running.	Hyper PAV or Super PAV does not work in the operated storage system after turning on the power.	Take alias volumes offline from all connected host computers.
Switching the host computer mode to Base PAV.	I/O operations of Super PAV might not be performed in all storage systems connected to LPAR even if the PAV mode of the host computer is switched to XPAV.	Take alias volumes offline from all connected host computers. (If alias volumes in different CUs do not appear yet after coming online, take alias volumes offline again.)

Even if alias volumes are not recognized due to other operations, the VARY command might be used to recover the problem.

For details about the VARY command, see the descriptions about the VARY command in IBM "MVS System Command".

Chapter 3: Defining devices

This topic contains information on selecting base and alias device ratios and procedures on how to use the hardware configuration definition (HCD) software application to define the mapping of devices to LCUs that you have defined to the host systems using Hitachi Device Manager - Storage Navigator.

Unused device addresses usage as alias devices

You can use unused device addresses in a CU as aliases for base devices. An optimal base-to-alias device ratio ensures maximum efficiency in processing I/O requests.

Determining the optimal base-to-alias device ratio depends on the I/O rate for the individual base devices and the type of PAV in use (static, dynamic, HyperPAV, or SuperPAV). In the following sections some conservative ratios are suggested as starting points for initial configuration. Please contact your Hitachi representative and request an analysis to determine the optimal base-to-alias device ratio for your PAV implementation.

Optimal static PAV results and base-to-alias device ratios

A base-to-alias device ratio of 1:3 for each CU is recommended as a starting point when using static PAV.

For example, if you define all 256 devices of a CU to the host system, 64 base devices and 192 alias devices would exist. Three alias devices could be assigned to each base device.

> **Note:** The optimal device ratio will vary based on how often a base device is accessed by the host system.

Optimal dynamic PAV results and base-to-alias device ratios

Since dynamic PAV changes alias assignments, a base-to-alias device ratio of 1:1 for each CU is recommended as a starting point.

Optimal HyperPAV results and base-to-alias device ratios

A base-to-alias device ratio of 128:128 for each CU is recommended as a starting point when using HyperPAV. This is a conservative initial recommendation. These devices can be assigned to a single base device when performing configuration using Hitachi Device Manager - Storage Navigator. All aliases in a CU will be placed in a pool and used as required for any base devices.

Optimal SuperPAV results and base-to-alias device ratios

A base-to-alias device ratio of 128:128 for each CU is recommended as a starting point when using SuperPAV. This is a conservative initial recommendation. These devices can be assigned to a single base device when performing configuration using Hitachi Device Manager - Storage Navigator.

The SuperPAV function uses aliases in the CU in which the base was first defined as long as aliases are available in that CU. The performance improvement provided by SuperPAV varies depending on whether sufficient alias devices are initially available for each base volume.

The methods for defining alias devices using Hitachi Device Manager - Storage Navigator for HyperPAV and for SuperPAV are the same. Defined alias devices are grouped into an AMG containing even numbered CUs and into an AMG containing odd numbered CUs. Base devices can use only alias devices in an AMG to which alias devices in the local CU belongs. Therefore, balance the number of used alias devices across even numbered CUs or odd numbered CUs.

Defining logical control units

You can use the **HCD main** screen to modify and view configuration data.

Before you begin

- The channel paths are defined.

- You are using z/OS ® or z/VM ®.

Procedure

1. From the **ISPF/PDF primary options** menu, select the **HCD** option.
2. On the HCD main screen, for **I/O definition file**, for **Work I/O definition file** (IODF), verify the file is the one you want to use and then select menu item 1, **Define, modify, or view configuration data**.

```
                         z/OS V1.11 HCD
 Command ===> _____

                        Hardware Configuration


 Select one of the following.


 1_  0.  Edit profile options
     1.  Define, modify, or view configuration data
     2.  Activate or process configuration data
     3.  Print or compare configuration data
     4.  Create or view graphical configuration report
     5.  Migrate configuration data
```

Chapter 3: Defining devices

```
     6.  Maintain I/O definition files
     7.  Query supported hardware and installed UIMs
     8.  Getting started with this dialog
     9.  What's new in this release


For options 1 to 5, specify the name of the IODF to be used.


I/O definition file . . . 'SYS1.IODF00.WORK'                    +
```

3. On the **Define, Modify or View Configuration Data** screen, select menu item 1, **Operating system configurations**.

```
                              z/OS V1.11 HCD
C                 Define, Modify, or View Configuration Data          _


        Select type of objects to define, modify, or view data.


S        4_ 1. Operating system configurations
                  consoles
1                 system-defined generics
                  EDTs
                    esoterics
                    user-modified generics
            2. Switches
                  ports
                  switch configurations
                    port matrix
            3. Processors
                  channel subsystems
                    partitions
F                   channel paths
            4. Control units
I           5. I/O devices
```

4. The **Control Unit List** screen is displayed. Press **F11** to add information.

```
  Goto  Filter  Backup  Query  Help
 ------------------------------------------------------------------------------
                           Control Unit List                Row xxx of yyy
Command ===> _____ Scroll ===> CSR
```

Chapter 3: Defining devices

```
Select one or more control units, then press Enter.  To add, use F11.


                           ---#---
/ CU   Type +        CUADD CSS MC  Serial-# + Description
/ 1600 2107          0     2       _____ _____
_ 1700 2107          1     2       _____ _____
_ 1800 2107          2     2       _____ _____
_ 1900 2107          3     2       _____ _____
_ 1A00 2107          4     2       _____ _____
_ 1B00 2107          5     2       _____ _____
_ 1C00 2107          6     2       _____ _____
_ 1D00 2107          7     2       _____ _____
_ 1E00 2107          0     2       _____ _____
_ 1E40 2107          1     2       _____ _____
_ 1E80 2107          2     2       _____ _____
_ 1EC0 2107          3F    2       _____ _____
_ 1EE0 2107          40    2       _____ _____
_ 1F00 2107          FE    2       _____ _____
_ 2000 3990                1       _____ _____
_ 2400 2105          14    2       _____ _____
_ 2480 2105          15    2       _____ _____
```

Chapter 3: Defining devices

5. On the **Add Control Unit** screen, enter the following information and then press **Enter** to continue:

   - Control unit number

   - Control unit type - 2107

   - Switch connection information

```
Goto  Filter  Backup  Query  Help
 ------------------------------------------------------------------------------
                             Control Unit List
 Command ===> _____  Scroll ===> CSR


 Select one or more control units, then press Enter.  To add, use F11.


                              ---#---
 / CU                           Add Control Unit
 _ 000
 _ 00A
 _ 010    Specify or revise the following values.
 _ 011
 _ 012    Control unit number  . . . . ____   +
 _ 013    Control unit type  . . . . . _____   +
 _ 014
 _ 015    Serial number  . . . . . . . _____
 _ 016    Description  . . . . . . . . _____
 _ 017
 _ 020    Connected to switches  . . . __  __  __  __  __  __  __  __  +
 # 030    Ports  . . . . . . . . . . . __  __  __  __  __  __  __  __  +
 # 034
 _ 038    If connected to a switch:
 _ 03E
 _ 040    Define more than eight ports . . 2   1.  Yes
 _ 041
 _ 042    Propose CHPID/link addresses and
 _ 043    unit addresses . . . . . . . . 2   1.  Yes
 _ 044
```

The **Select Processor / Control Unit** screen opens.

6. Select the processor complex to which the control unit attaches with slash (/) at the beginning of the line, and then press **Enter**.

```
                        Select Processor / CU    Row xxx of yyy More:    >
 Command ===> _____  Scroll ===> CSR


 Select processors to change CU/processor parameters, then press Enter.
```

Chapter 3: Defining devices

```
Control unit number . . : 0000     Control unit type . . . : 2107


              ---------------Channel Path ID . Link Address + ---------------
/ Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
_ SYSTEM.0
****************************** Bottom of data ******************************
```

The next **Select Processor / Control Unit** screen opens.

7. Select menu item 2, **Group connect**, and then press **Enter**.

```
                        Select Processor / CU
Command ===>               Actions on selected processors


Select proces
           Select by number or action code and press Enter.
Control unit
           __   1.  Select (connect, change)  . . . . . (s)
                2.  Group connect . . . . . . . . . . (g)
/ Proc.CSSID    3.  Disconnect  . . . . . . . . . . . (n)
/ SYSTEM.0
****************************** Bottom of data ******************************
```

The next **Select Processor / Control Unit** screen opens.

8. Enter the following information:

- chpids that attach to the control unit
- the logical control unit address

- the device starting address
- the number of devices supported

```
                        Select Processor / CU
                    Change Control Unit Definition


 Specify or revise the following values.

 Control unit number  . : 0000        Type . . . . . . : 2107
 Processor ID . . . . . : SYSTEM
 Channel Subsystem ID .  : 0

 Channel path IDs . . . . 2E    2F    34    35    __    __    __    __    +
 Link address . . . . . . ____  ____  ____  ____  ____  ____  ____  ____  +

 Unit address . . . . . . 00    __    __    __    __    __    __    +
 Number of units  . . . . 256   ___   ___   ___   ___   ___   ___

 Logical address  . . . . 0   + (same as CUADD)

 Protocol . . . . . . . . __   + (D, S or S4)
 I/O concurrency level  . 2   + (1, 2 or 3)
```

The LCU is defined.

Defining base or alias devices to host operating systems

Use the HCD program to define the mapping between a base or alias device to the host operating system LCU.

Procedure

1. From the **ISPF/PDF primary options** menu, select the **HCD** option.
2. On the HCD main screen, for **I/O definition file**, verify the name of the IODF or IODF.WORK I/O definition file you want to use, and then select menu item 1, **Define, modify, or view configuration data**.

```
                        z/OS V1.11 HCD
 Command ===>  _____

                     Hardware Configuration
```

```
Select one of the following.

1_  0.  Edit profile options
    1.  Define, modify, or view configuration data
    2.  Activate or process configuration data
    3.  Print or compare configuration data
    4.  Create or view graphical configuration report
    5.  Migrate configuration data
    6.  Maintain I/O definition files
    7.  Query supported hardware and installed UIMs
    8.  Getting started with this dialog
    9.  What's new in this release


For options 1 to 5, specify the name of the IODF to be used.


I/O definition file . . . 'SYS1.IODF00.WORK'
```

3. On the **Define, Modify, or View Configuration Data** screen, select **I/O devices** (menu item 5) as the type of object you want to define.

```
------------- Define, Modify, or View Configuration Data -------------


      Select type of objects to define, modify, or view data.


       5  1. Operating system configurations
              consoles
              system-defined generics
              EDTs
                esoterics
                user-modified generics
          2. Switches
              ports
              switch configurations
                port matrix
          3. Processors
              partitions
              channel paths
          4. Control units
          5. I/O devices

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

4. On the **I/O Device List** screen, complete the following:
   a. Select the device you want to define and add.

Chapter 3: Defining devices

b. Press **Enter**.

c. Press **F11**.

```
  Goto   Filter   Backup   Query   Help
 -------------------------------------------------------------------------
                              I/O Device List     Row 4854 of 9653 More:
 Command ===>                            Scroll ===> CSR


 Select one or more devices, then press Enter. To add, use F11.


   -------Device------- --#-- --------Control Unit Numbers + --------
 / Number Type +         PR OS 1--- 2--- 3--- 4--- 5--- 6--- 7--- 8--- Base
   8100    3390B          1  1    8100
   8102    3390B          1  1    8100
   8103    3390B          1  1    8100
   8104    3390B          1  1    8100
   8105    3390B          1  1    8100
   8106    3390B          1  1    8100
   8107    3390B          1  1    8100
   8108    3390B          1  1    8100
   8109    3390B          1  1    8100
   810A    3390B          1  1    8100
   810B    3390B          1  1    8100
   810C    3390B          1  1    8100
```

5. On the **Add Device** screen, complete the following information, and then press **Enter**.

- For **Device number**, type the device number.

- For **Number of devices**, type the number of devices.

- For **Device type**, type the PAV type.

  Supported base device types: 3390B

  Supported alias device types: 3390A

  > 📄 **Note:** The 3390A alias device and the 3390B base device are not related to the 3390-3A/B/C multiplatform devices or the 3390-A volume emulation.

- For **Description**, type a description of the PAV device.

- For **Connected to CUs**, type the CU to which the device is connected.

```
                            Add Device
```

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```
 Specify or revise the following values.


 Device number  . . . . . . . . 8101   (0000 - FFFF)
 Number of devices  . . . . . . 1
 Device type  . . . . . . . . . 3390B
 Serial number   . . . . . . . .
 Description  . . . . . . . . . 9980V PAV
 Volume serial number . . . . .          (for DASD)


 Connected to CUs . . 8100



  F1=Help     F2=Split    F3=Exit     F4=Prompt   F5=Reset    F9=Swap
  F12=Cancel -
```

6. On the **Device / Processor Definition** screen, for **Preferred Explicit Device**, select the processor ID/system combination that you want to change and then press **Enter**.

```
                        Device / Processor Definition
                                                      Row 1 of 1
 Command ===>                          Scroll ===> CSR


 Select processors to change device/processor definitions, then press
 Enter.


 Device number  . . : 8101          Number of devices  . : 1
 Device type  . . . : 3390B


                                 Preferred Explicit Device
 / Processor ID   UA +  Time-Out  STADET  CHPID +   Candidate List
 / SYSTEM#S              No       Yes               No
 ************************* Bottom of data **************************



  F1=Help      F2=Split     F3=Exit      F4=Prompt     F5=Reset
  F6=Previous  F7=Backward  F8=Forward   F9=Swap       F12=Cancel
 F22=Command
```

7. On the **Define Device / Processor** screen, complete the following and then press **Enter**.

```
                        Define Device / Processor
```

```
Specify or revise the following values.


Device number  . : 8101          Number of devices . . . . : 1
Device type  . . : 3390B
Processor ID . . : SYSTEM#S       Lab System - F9 - Skyline


Unit address . . . . . . . . . . 01  + (Only necessary when different from
                                        the last 2 digits of device number)
Time-Out . . . . . . . . . . . . No   (Yes or No)
STADET . . . . . . . . . . . . . Yes  (Yes or No)


Preferred CHPID   . . . . . . . .    +
Explicit device candidate list . No   (Yes or No)


 F1=Help     F2=Split    F3=Exit     F4=Prompt   F5=Reset    F9=Swap
F12=Cancel -
```

8. On the **Define Device to Operating System Configuration** screen, select the operating system to which you want to connect the devices and press **Enter**.

   ▪ For **Unit address**, if the address is different than the last two digits of the device number, type the unit address.

   ▪ For **Time-Out**, select **Yes** or **No**.

      Default: **No**

   ▪ For **STADET**, select **Yes** or **No**.

      Default: **Yes**

   ▪ For Explicit device candidate list, select **Yes** or **No**.

      Default: **No**

```
        Define Device to Operating System Configuration

                                                   Row 1 of 1
 Command ===>                    Scroll ===> CSR


 Select OSs to connect or disconnect devices, then press Enter.


 Device number  . : 8101          Number of devices  : 1
 Device type  . . : 3390B


 / Config. ID   Type    Description                      Defined
 / LABSYSTM     MVS     OS Configuration List (EDT's)
 *************************** Bottom of data ***************************
```

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```
   F1=Help      F2=Split     F3=Exit      F4=Prompt     F5=Reset
  F6=Previous  F7=Backward  F8=Forward   F9=Swap      F12=Cancel
F22=Command
```

9. On the **Actions on selected operating systems** screen, select menu item 1, **Select (connect, change)** and then press **Enter**.

```
        Actions on selected operating systems


 Select by number or action code and press Enter.

    1.  Select (connect, change) . . . . . (s)
    2.  Disconnect from OS  . . . . . . .  (n)


  F1=Help     F2=Split    F3=Exit     F9=Swap    F12=Cancel -
```

10. On the **Define Device Parameters / Features** screen, complete the following values, and then press **Enter** on your keyboard.

   - For **DYNAMIC**, type whether PAV is dynamic or static.

     Values:

     - **Yes:** The device supports a dynamic configuration.

     - **No:** The device supports a static configuration.

     Default: **Yes**

   - For **WLMPAV**, type whether the device is supported by WLM.

     Values:

     - **Yes:** The device supports WLM.

     - **No:** The device supports WLM.

     Default: **Yes**

```
                 Define Device Parameters / Features
                                                       Row 1 of 6
 Command ===>                        Scroll ===> CSR
```

Chapter 3: Defining devices

```
   Specify or revise the values below.


   Configuration ID . : LABSYSTM     OS Configuration List (EDT's)
   Device number  . . : 8101         Number of devices  : 1
   Device type  . . . : 3390B


   Parameter/
   Feature      Value    P Req.  Description
   OFFLINE      No               Device considered online or offline at IPL
   DYNAMIC      Yes              Device supports dynamic configuration
   LOCANY       No               UCB can reside in 31 bit storage
   WLMPAV       Yes              Device supports work load manager
   SHARED       Yes              Device shared with other syst
   SHAREDUP     No               Shared when system physically partitioned
   **************************** Bottom of data *****************************




    F1=Help       F2=Split     F3=Exit       F4=Prompt     F5=Reset
    F7=Backward   F8=Forward   F9=Swap       F12=Cancel    F22=Command -
```

The base or alias device is defined.

Finding a device eligible for dynamic 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 PAV management by WLM.

Procedure

1. From the ISPF/PDF primary options menu, select the **HCD** option.

2. On the HCD main screen, verify the name of the IODF or IODF.WORK I/O definition file you want to use, and then select menu item 1, **Define, modify, or view configuration data**.

```
                     z/OS V1.11 HCD
Command ===> _____


                        Hardware Configuration


Select one of the following.
```

Chapter 3: Defining devices

```
1_   0.  Edit profile options
     1.  Define, modify, or view configuration data
     2.  Activate or process configuration data
     3.  Print or compare configuration data
     4.  Create or view graphical configuration report
     5.  Migrate configuration data
     6.  Maintain I/O definition files
     7.  Query supported hardware and installed UIMs
     8.  Getting started with this dialog
     9.  What's new in this release


For options 1 to 5, specify the name of the IODF to be used.


I/O definition file . . . 'SYS1.IODF00.WORK'                    +
```

3. On the **Define, Modify, or View Configuration Data** screen, select menu item 5, **I/O devices**.

```
------------- Define, Modify, or View Configuration Data -------------


     Select type of objects to define, modify, or view data.


     5  1. Operating system configurations
             consoles
             system-defined generics
             EDTs
               esoterics
               user-modified generics
        2. Switches
             ports
             switch configurations
               port matrix
        3. Processors
             partitions
             channel paths
        4. Control units
        5. I/O devices


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

4. On the **I/O Device List** screen, select the desired device by entering a slash (/) by the device number, and press **Enter**.

Chapter 3: Defining devices

The following figure shows **device 8101** is selected.

```
  Goto  Filter  Backup  Query  Help
------------------------------------------------------------------------
                           I/O Device List    Row 4854 of 9653 More:       >
Command ===>                                        Scroll ===> CSR


Select one or more devices, then press Enter. To add, use F11.


   -------Device------- --#-- --------Control Unit Numbers + --------
/ Number Type +        PR OS 1--- 2--- 3--- 4--- 5--- 6--- 7--- 8--- Base
  8100   3390B         1  1   8100
/ 8101   3390B         1  1   8100
  8102   3390B         1  1   8100
  8103   3390B         1  1   8100
  8104   3390B         1  1   8100
  8105   3390B         1  1   8100
  8106   3390B         1  1   8100
  8107   3390B         1  1   8100
  8108   3390B         1  1   8100
  8109   3390B         1  1   8100
  810A   3390B         1  1   8100
  810B   3390B         1  1   8100
  810C   3390B         1  1   8100
```

5. On the **Actions on selected devices** screen, select menu item 8, **View device definition**, and press **Enter**.

```
            Actions on selected devices



 Select by number or action code and press Enter.


  8  1.  Add like . . . . . . . . . . . . (a)
     2.  Change  . . . . . . . . . . . . . (c)
     3.  CSS group change  . . . . . . . . (g)
     4.  OS group change . . . . . . . . . (o)
     5.  Device type group change  . . . . (t)
     6.  Prime serial number and VOLSER  . (i)
     7.  Delete  . . . . . . . . . . . . . (d)
     8.  View device definition  . . . . . (v)
     9.  View logical CU information . . . (l)
     10. View related CTC connections  . . (k)
     11. View graphically . . . . . . . . (h)
```

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

6. On the **View Device Definition** screen, review the information for accuracy and then press **Enter**.

```
                      View Device Definition



Device number  . . . . . . . : 8101
Device type  . . . . . . . . : 3390B

Serial number  .. . . . . . . :
Description  . . . . . . . . : 9980V PAV - 8101 (B)

Volume serial number . . . . :          (for DASD)

Connected to CUs : 8100

ENTER to continue.




  F1=Help     F2=Split    F3=Exit     F9=Swap    F12=Cancel -
```

7. On the **View Device / Processor Definition** screen, select a Processor/System ID combination.

```
              View Device / Processor Definition
                                                    Row 1 of 1
Command ===>                               Scroll ===> CSR

Select one or more processors to view the device candidate list, or
ENTER to continue without selection.

Device number  . : 8101     Device type  . : 3390B

                                Preferred  Explicit Device
/ Processor ID  UA   Time-Out  STADET  CHPID     Candidate List
/ SYSTEM#S      00   No        Yes               Yes

************************** Bottom of data ****************************
```

```
F1=Help        F2=Split       F3=Exit        F6=Previous    F7=Backward
F8=Forward     F9=Swap        F12=Cancel     F22=Command
```

8. On the **View Device Candidate List** screen, review the candidate list for this device and then press **Enter**.

```
              View Device Candidate List
                                                    Row 1 of 5
Command ===>                                        Scroll ===> CSR


The following partitions are allowed to have access to the
device.


Device number  . : 8101      Device type  . . . : 3390B
Processor ID . . : SYSTEM#S   Lab System - F9 - Skyline


ENTER to continue.


Partition Name   Description                      Reachable
AS04             System A / LPAR 4                  Yes
DASDPERF         DASD Performance & Testing         Yes
MVSLAB           MVS Lab System - OS/390 2.9        Yes
OS390            OS/390 Testing (ie. SYSPLEX)       Yes
VMLAB            VM Lab System - VM/ESA 1.2.0       Yes
*********************** Bottom of data *************************



 F1=Help      F2=Split     F3=Exit     F7=Backward  F8=Forward
 F9=Swap      F12=Cancel   F22=Command -
```

9. On the **View Device / OS Configuration Definitions** screen, select the operating system for which you want to view more details and press **Enter**.

```
         View Device / OS Configuration Definitions
                                                    Row 1 of 1
Command ===>                                        Scroll ===> CSR


Select OSs to view more details, then press Enter.


Device number  . : 8101     Device type  . . : 3390B


/ Config. ID   Type     Description
/ LABSYSTM     MVS      OS Configuration List (EDT's)
************************* Bottom of data ***************************
```

```
 F1=Help        F2=Split       F3=Exit        F6=Previous    F7=Backward

 F8=Forward     F9=Swap        F12=Cancel     F22=Command -
```

10. On the **View Device Parameter / Feature Definition** screen, verify that **WLMPAV** is set to **Yes**.

```
    View Device Parameter / Feature Definition

                                                       Row 1 of 6
Command ===>                                      Scroll ===> CSR


Configuration ID . : LABSYSTM      OS Configuration List (EDT's)
Device number  . . : 8100          Device type  . . . : 3390B
Generic / VM device type  . . . . :  3390


ENTER to continue.


Parameter/
Feature     Value    Req.  Description
OFFLINE     No             Device considered online or offline at IPL
DYNAMIC     Yes            Device supports dynamic configuration
LOCANY      Yes            UCB can reside in 31 bit storage
WLMPAV      Yes            Device supports work load manager
SHARED      Yes            Device shared with other systems
SHAREDUP    No             Shared when system physically partitioned
***************************** Bottom of data ******************************



 F1=Help        F2=Split       F3=Exit        F7=Backward     F8=Forward
 F9=Swap        F12=Cancel     F22=Command -
```

Address mapping between base and alias devices

To avoid serious failures that can occur during data processing, complete the following:

- Define the unit address mapping for base and alias devices to the host operating system.

- Match the address mapping defined in the storage system using Hitachi Device Manager - Storage Navigator.

The following figure shows examples of mappings between base devices and alias devices.

```
(A) x 00-x3F:Base    (B) x 00-x3F:Base   (C) x 00-x7F:Alias   (D) x 00-x3F:Alias
```

```
x 40-xFF:Alias       x 40-x7F:Alias     x 80-xFF:Base      x 40-x7F:Base
                     x 80-xBF:Base                         x 80-xBF:Alias
                     x C0-xFF:Alias                        x C0-xFF:Base
```

Chapter 4: Preparing for Compatible PAV operations

This topic describes the operations you must complete to prepare PAV to use with your storage system.

Setting the WLM operational mode

The WLM operational mode setting depends on the PAV mode used.

- 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 and Compatible Super PAV, you do not need to set the WLM operation modes.

Procedure

1. On the WLM startup screen, press **Enter**.

2. On the **Choose Service Definition** screen, select menu item 1, **Read saved definition**, and press **Enter**.

```
   File  Help
 ---------------------------------------------------------------------

Command ===>



|                  Choose Service Definition                    |
|                                                               |
|             Select one of the following options.              |
|                1 1.  Read saved definition                    |
|                  2.  Extract definition from WLM              |
|                      couple data set                          |
|                  3.  Create new definition                    |
|                                                               |
|             F1=Help      F2=Split      F5=KeysHelp            |
|             F9=Swap      F12=Cancel                           |
```

```
|                          ENTER to continue                       |
```

3. On the **WLM primary options** screen, select menu item 8, **Service Coefficients/ Options** and press **Enter**.

```
File  Utilities  Notes  Options  Help
------------------------------------------------------------------------
Functionality LEVEL008        Definition Menu        WLM Appl LEVEL011
Command ===>

Definition data set  . . : none

Definition name  . . . . . STANDARD  (Required)
Description  . . . . . . . Standard Definition

Select one of the
following options. . . . . 8  1.  Policies
                              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
```

4. On the **Service Coefficient/Service Definition Options** screen, complete the following:

   ▪ For **Dynamic alias management**, choose the mode.

   Values:

   - **Yes:** Sets the WLM mode to goal mode. In goal mode, the number of alias devices assigned to each PAV base device can dynamically increase or decrease based on the number of I/O requests to each device.

   - **No:** Sets the WLM mode to compatibility mode. In compatibility mode, the number of alias devices assigned to each PAV base device remains the same, even when the number of I/O requests to each device changes.

   Default: **Yes**

   ▪ For **I/O priority management**, enter a priority. The effect of this field setting depends on the setting for **Dynamic alias management**.

   The following table shows how the setting of for these items controls whether the Dynamic Alias Algorithm is in effect.

Dynamic Alias Management	I/O Priority Management	Dynamic Alias Algorithm in Effect
No	No	None (static PAV only)
No	Yes	None (static PAV only)
Yes	No	Efficiency only
Yes	Yes	Both efficiency and goal

```
  Coefficients/Options   Notes   Options   Help
-----------------------------------------------------------------------
            Service Coefficient/Service Definition Options
Command ===>


Enter or change the Service Coefficients:


CPU  . . . . . . . . . . . . . 1.0      (0.0-99.9)
IOC  . . . . . . . . . . . . . 0.1      (0.0-99.9)
MSO  . . . . . . . . . . . . . 0.0000   (0.0000-99.9999)
SRB  . . . . . . . . . . . . . 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)
```

5. (If you want to set the WLM to goal mode) In the **WLM View Device Parameter / Feature Definition** screen, verify that **DYNAMIC** and **WLMPAV** are set to **Yes**.

Enabling the Super PAV mainframe system function

Use this procedure to enable the Super PAV mainframe system function on the storage system.

By default the Super PAV mainframe system function is disabled on the storage system. If you plan to use the IBM® SuperPAV host function, you must enable the Super PAV mainframe system function on the storage system in advance.

> ⚠ **Caution:** If the storage system restarts with volatilization (Forced outage with volatile DKC and DKU, PS-OFF to volatile PS-ON, or Offline microcode replacement), the Super PAV mainframe system function is reset to the default setting of disabled. If this function was enabled before the volatilization, you must re-enable it after the volatilization.

Before you begin

The Storage Administrator (Initial Configuration) role is required to perform this task.

Procedure

1. Click **Actions** > **Mainframe Connection** > **Edit Mainframe System Functions**.
2. Select the **Super PAV** mainframe system function, click **Enable** , and then click **Finish**.
3. In the **Task Name** text box, accept the default task name ("date-window name"), or type a unique name for the task.

   You can enter up to 32 ASCII characters and symbols, with the exception of the following: \ / : , ; * ? " < > |.
4. If you want the **Tasks** window to open after you click **Apply**, select **Go to tasks window for status**.
5. Click **Apply**.
   If **Go to tasks window for status** was selected, the **Tasks** window opens.

Compatible Hyper PAV enablement from z/OS ® on z/VM ® workflow

Complete the following process to enable Hyper PAV on z/OS ® and z/VM ® guest:

Procedure

1. Enable Hyper PAV on z/OS ®.

   For more information about enabling Hyper PAV on z/OS ®, see

2. Enable Hyper PAV from z/OS ® on z/VM ® guest.

For more information about enabling Hyper PAV from z/OS ® on z/VM ® guest, see .

Enabling HyperPAV on z/OS ®

Run the following command from the host system console:

```
SETIOS HYPERPAV=YES
```

An example of the command is shown below:

```
SETIOS HYPERPAV=YES
 IOS189I HYPERPAV MODE CHANGE INITIATED - CONTROL UNIT CONVERSION WILL
 COMPLETE ASYNCHRONOUSLY
```

You can set the **SETIOS** command for each logical partition (LPAR).

> **Note:** The **SETIOS** command is valid only through the next system IPL. For consistency across IPLs, update SYS1.PARMLIB(IECIOSxx) to set HYPERPAV=YES.

Enabling HyperPAV from z/OS ® on z/VM ®

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

Procedure

1. Run 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. Run the following commands from z/VM ® system console to all alias devices that are used for Hyper PAV in the corresponding CU to enable Hyper PAV:

   ```
   DET alias_device_number1-alias_device_number2

   VARY OFFLINE alias_device_number1-alias_device_number2

   SET CU HYPERPAV ssid1-ssid2

   VARY ONLINE alias_device_number1-alias_device_number2

   ATT alias_device_number1-alias_device_number2*
   ```

3. Enable Hyper PAV on the z/OS ® by running the following command from the host system console:

   ```
   SETIOS HYPERPAV=YES
   ```

4. Run 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
   ```

The **SETIOS** command is valid only through the next system IPL. For consistency across IPLs, update SYS1.PARMLIB(IECIOSxx) to set HYPERPAV=XPAV.

Enabling SuperPAV on z/OS ®

Run the following command from the host system console:

```
SETIOS HYPERPAV=XPAV
```

An example of the command is shown below:

```
SETIOS HYPERPAV=XPAV
 IOS189I HYPERPAV MODE CHANGE INITIATED – CONTROL UNIT CONVERSION WILL
 COMPLETE ASYNCHRONOUSLY
```

> 📄 **Note:** You can set the **SETIOS** command for each logical partition (LPAR).

Enabling HyperPAV and SuperPAV in a mixed storage environment

If you have multiple storage system models at various levels of PAV support, update parmlib or issue the associated **SETIOS** commands in the following order to ensure HyperPAV is supported in the event SuperPAV is not supported:

```
Update SYS1.PARMLIB(IECIOSxx)
HYPERPAV=YES     (HyperPAV)
HYPERPAV=XPAV    (SuperPAV)
```

```
SETIOS operator command
SETIOS HYPERPAV=YES (HyperPAV)
SETIOS HYPERPAV=XPAV (SuperPAV)
```

MIH timer value setting workflow

Set the MIH timer value for PAV operations. You can set the value at any time.

Procedure

1. During IPL, use the MIH parameter in the IECIOSxx parmlib member. Set the MIH timer value in MVS/ESA or z/OS ® to 30 seconds.

2. Run the **SETIOS** system command.

Chapter 5: Performing Compatible PAV operations

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

Assigning alias volumes to base volumes

You can assign aliases to base volumes in the Hitachi Virtual Storage Platform 5000 series storage system. You can assign up to 255 aliases to a base device in a single CU.

Aliases are assigned in the storage system by selecting LDEV addresses that do not have any provisioning (for example, emulated devices such as a 3390-x) assigned to them. These addresses are called free volumes. The list of free volumes is the list of addresses in the CU that can be used as aliases to assign to base volumes. It is important to note that any address that does not have a provisioned device assigned will be on the free volumes list. You must make sure that the free volumes assigned as aliases in Device Manager - Storage Navigator are the corresponding device addresses that are defined as aliases in the IO configuration.

If the number of free volumes you select to assign to the selected base volumes is larger than the number of base volumes you have selected, the PAV function attempts to allocate the free volumes equally to the base volumes. For example, if you select six free volumes and two base volumes, three free volumes (aliases) are allocated to each base volume.

If you are using Hyper PAV to issue I/O requests only to a CU, complete the following:

1. Decide the number of aliases that are necessary for the CU.
2. Assign the aliases to arbitrary base volumes.

Assigned aliases function as aliases for all base volumes in a CU when using Hyper PAV.

> ⚠️ **Caution:** Assigning alias volumes simultaneously in more than one CU can degrade host performance.

Before you begin

- The PAV and Hyper PAV (if applicable) license keys must be installed in the storage system using Device Manager - Storage Navigator.

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

- You must enable the Device Manager - Storage Navigator secondary window. For more information, see the chapter about how to use the Device Manager - Storage Navigator secondary window in the *System Administrator Guide*.

- Base devices are defined in the storage system.

Procedure

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

   If you select **Actions** and do not see a **Mainframe Connection** item listed on the drop-down menu, the Device Manager - Storage Navigator secondary window function probably is not enabled.

2. Click [icon] 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.
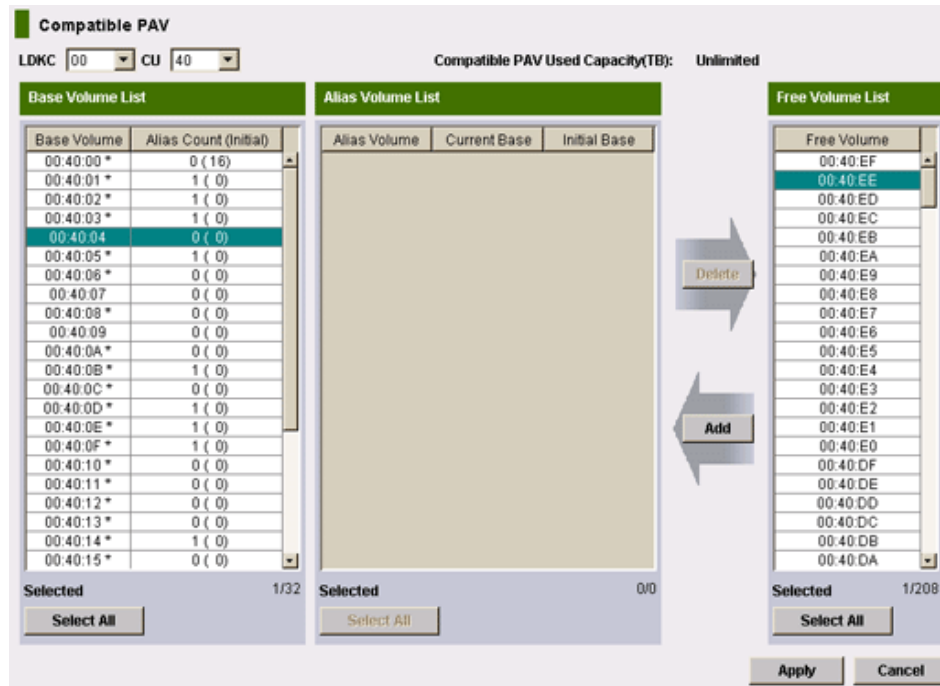
4. From the **CU** list, select the CU image which contains the desired base volumes.

   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 any type of open system volume. In these cases, select another CU image.

5. Select one or more base volumes in the **Base Volume List**.
6. Select one or more free volumes in the **Free Volume List**.
7. Click **Add** to assign the selected free volumes to the selected base volumes. The assignments appear in the **Alias Volume List** shown in the following figure.
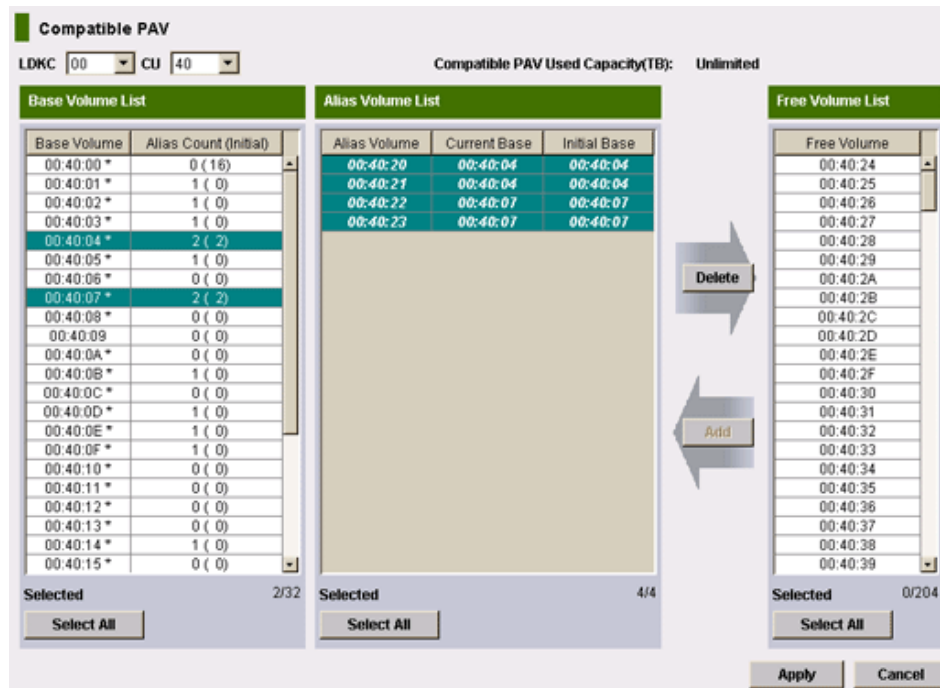
8. Confirm the alias volumes assigned to the selected base volumes in the **Alias Volume List** are the intended assignments.

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

Deleting alias volumes from base volumes

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

Before you begin

▪ I/O operations are not currently being performed on the base device.

> ⚠️ **Caution:** Deleting alias devices while I/O operations are occurring can cause a serious failure.

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

▪ You must enable the Device Manager - Storage Navigator secondary window. To enable this feature, see the chapter about how to use the Device Manager - Storage Navigator secondary window in the *System Administrator Guide*.

Procedure

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

   If you select **Actions** and do not see a **Mainframe Connection** item listed on the drop-down menu, the Device Manager - Storage Navigator secondary window function probably is not enabled.

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.
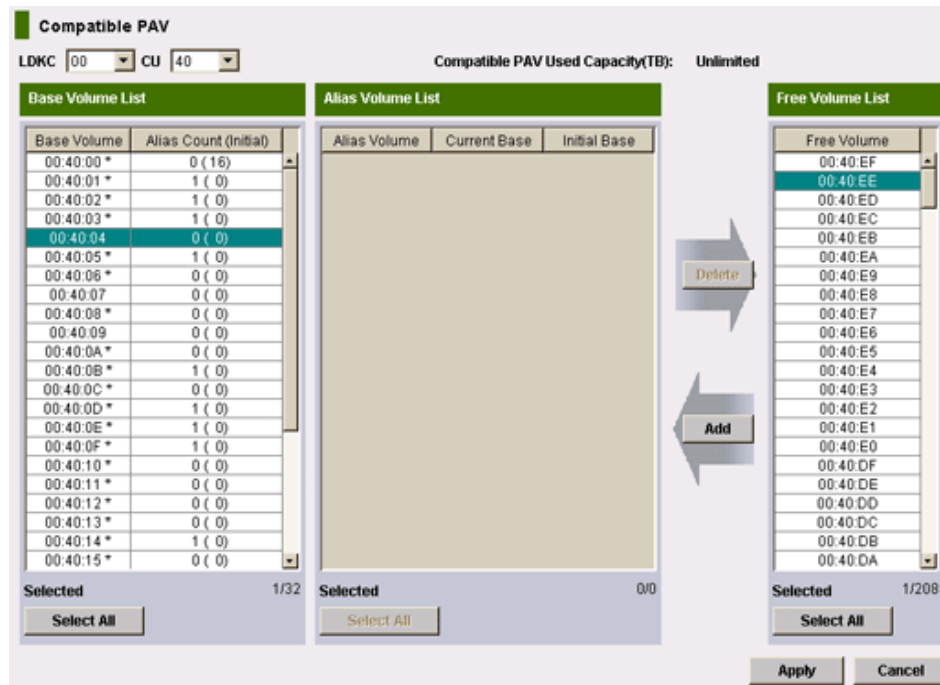
4. From the **CU** list, select the CU image which contains the aliases to be removed.

   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 volumes appear in the **Alias Volume List** as shown in the following figure.

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 volumes from the selected base volumes and move these alias volumes back to the **Free Volume List**.

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

Assigning alias volumes to different base volumes

Alias volumes may be manually assigned to a different base volume in the same CU image using the Compatible PAV window. This only applies to static or dynamic Compatible PAV.

Before you begin

▪ The number of requests to the base volume to which you are moving the alias volume is less that 50 IOPS. Use the Resource Measurement Facility Report Analysis (RMF) or another available software application to get this performance information.

> ⚠ **Caution:** To avoid a decline in processing performance, do not assign alias volumes to a different base volume if more than 50 IOPS exist.

▪ You must have Storage Administrator (Provisioning) role to reassign aliases.

▪ You must enable the Device Manager - Storage Navigator secondary window. For more information, see the chapter about how to use the Device Manager - Storage Navigator secondary window in the *System Administrator Guide*.

Procedure

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

    If you select **Actions** and do not see a **Mainframe Connection** item listed on the
    drop-down menu, the Device Manager - Storage Navigator secondary window
    function probably is not enabled.

2. In the **Compatible PAV** window, click to change to Modify mode, and then
    complete the following:

    - For **LDKC**, select the LDKC that includes the CU image you want to modify.

    - For **CU**, select the CU image that contains the aliases to be reassigned.

    - For **Base Volume List**, select the base volumes. Alias volumes for each selected
      base volumes appear in the **Alias Volume List**.

    - For **Alias Volume List**, confirm the alias volumes assigned to the selected base
      volumes. Select one or more alias volumes to remove and click **Delete** to remove
      the selected alias volumes from the selected base volumes and move these alias
      volumes back to the **Free Volume List**.

      Select different base volumes. These base volumes can be in the same CU image.
      Or you can change the CU image using the **LDKC** and **CU** lists.

      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 volumes to the selected base volumes. The assignments
      appear in the **Alias Volume List**.

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

Calculating Hitachi Compatible PAV used capacity

The capacity used by Compatible PAV is the total capacity of the base volumes accessed
from alias volumes by Compatible PAV, Hyper PAV, or Super PAV.

The capacity of the base volumes that are not accessed from any alias volumes is not
included in the capacity used by Compatible PAV even if alias volumes are added for the
base volumes by Hitachi Device Manager - Storage Navigator. If there is no access to an
alias in the past, the capacity of the related base volume is excluded.

The storage system recalculates the capacity used by Compatible PAV when any of the
following Compatible PAV operations is performed:

- Initial access from an alias volume to a base volume

- Removing all alias volumes from a CU

- Uninstalling a base volume by using Virtual LVI or external storage

> 📄 **Note:**
>
> When Super PAV is disabled by Hitachi Device Manager - Storage Navigator, if all alias volumes are removed from a CU, the capacity of the base volumes in the CU is not included in the capacity used by Compatible PAV.
>
> When Super PAV is enabled by Hitachi Device Manager - Storage Navigator, even if all alias volumes are removed from a CU, the capacity of the corresponding base volumes is included in the capacity used by Compatible PAV if alias volumes are set in another CU.

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.

Chapter 6: 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 PAV activities from the host computer.

Verifying the device definitions

Use this task to verify that the host recognizes the devices as specified.

Procedure

1. Run the **MVS DEVSERV QPAV** command, using the following syntax:

   DS QPAV,*device_unit_ID*,VOLUME

   Information about the base device and corresponding alias addresses are shown.

   The following is sample output of this command on a PAV device.

```
DS QPAV, D222,VOLUME
IEE459I 08:20:32 DEVSERV QPAVS 591
HOST                                              SUBSYSTEM
CONFIGURATION                                     CONFIGURATION
------------                                      ------------
UNIT                                              UNIT    UA
NUM     UA         TYPE         STATUS    SSID    ADDR    TYPE
---     --         ----         ------    ----    ---     ----
D222    22         BASE                   0102    22      BASE
D2FE    FE         ALIAS-D222             0102    FE      ALIAS-22
D2FF    FF         ALIAS-D222             0102    FF      ALIAS-22
***3 DEVICE(S) MET THE SELECTION CRITERIA
```

   The following figure shows sample output of this command on a Hyper PAV or Super PAV device.

```
DS QPAV,5000,VOLUME
IEE459I 22.28.19 DEVSERV QPAVS 726
HOST                                              SUBSYSTEM
CONFIGURATION                                     CONFIGURATION
```

```
------------                                    ------------
UNIT                                             UNIT     UA
NUM     UA          TYPE          STATUS    SSID  ADDR   TYPE
---     --          ----          ------    ----  ---    ----
05000   00          BASE-H                  5150  00     BASE
****    1 DEVICE(S) MET THE SELECTION CRITERIA
```

> 📄 **Note:** The relationship between base and alias devices does not appear as fixed to the operating system when using Hyper PAV. Therefore, only the information about base devices is shown.

2. Verify that the information shown matches the base and alias device definitions displayed by Device Manager - Storage Navigator.

> 📄 **Note:** When using Dynamic PAV, the assignments may be different from what you assigned using Device Manager - Storage Navigator. This is because the WLM changes the assignments based on workload and goals. In such a situation, this is normal and does not cause issues.

Verifying the status of devices per channel path

Use this task to verify the status of the devices for each CHP.

Procedure

1. For each CHP ID connected to the storage system, run the following command:

   MVS Display Matrix

   Using the following syntax:

   `D M=CHP(CHP_ID)`

   The following figure shows a sample output of this command.

```
D M=CHP(80)
IEE174I 10.05.24 DISPLAY M 779
CHPID 80:TYPE=05, DESC=ESCON SWITCHED POINT TO POINT
DEVICE STATUS FOR CHANNEL PATH 80
      0   1   2   3   4   5   6   7   8   9   A   B   C   D   E   F
680   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +
681   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +
682   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +
683   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +
684   AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL
685   AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL
686   AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL
687   AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL  AL
688   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +
689   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +   +
```

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```
68A   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
68B   +    +    +    +    +    +    +    +    +    +    +    +    +    +    +    +
68C   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL
68D   UL   UL   UL   UL   UL   UL   AL   AL   AL   AL   AL   AL   AL   AL   AL   AL
68E   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL
68F   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL   UL
*************************SYMBOL EXPLANATIONS**********************
+ ONLINE   @ PATH NOT VALIDATED   - OFFLINE   .DOES NOT EXIST
* PHYSICALLY ONLINE   $ PATH NOT OPERATIONAL
BX DEVICE IS BOXED   SN SUBCHANNEL NOT AVAILABLE
DN DEVICE NOT AVAILABLE   PE SUBCHANNEL IN PERMANENT ERROR
AL DEVICE IS AN ALIAS   UL DEVICE IS AN UNBOUND ALIAS
```

2. Verify that the information shown by running the command matches the device status that you defined when you created the IO configuration definition using HCD. If the information shown is incorrect, redefine the devices to the host operating system.

   For more information about redefining devices to host operating systems, see Defining base or alias devices to host operating systems (on page 31) .

Verifying Compatible Hyper PAV aliases from z/OS ®

Procedure

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

   SETIOS HYPERPAV=YES

2. Run the **DEVSERV QPAV** command from the host.

   For more information about the proper syntax and an example of this command, see DEVSERV QPAV commands (on page 64) .

3. Verify that the aliases that are shown are those assigned for Hyper PAV.

   ▪ If the correct aliases for Hyper PAV are not shown, and the host only accesses one VSP 5000 series storage system, perform the following:

     - Disable the **Compatible Hyper PAV** option on the host computer.

     - Enable the option again.

   ▪ If the host accesses multiple storage systems that use Hyper PAV, run 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

4. If you are using Cross-OS File Exchange on the host computer, run 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
```

5. Run the `DEVSERV QPAV` command.
6. Check the alias devices in the returned results.

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

If you restart the VSP 5000 series storage system while using Hyper PAV, verify that the correct aliases on a z/OS ® system that is a guest operating system on z/VM ® are still configured for the CU.

Procedure

1. Enable the **Compatible Hyper PAV** option on z/VM ® and z/OS ®.
2. Run the `QUERY PAV` command from z/VM ®.

   For proper syntax and an example of this command, see QUERY PAV command (on page 71) .
3. Verify that the displayed aliases are those assigned for Hyper PAV.
4. Run the `DEVSERV QPAV` command from z/OS ®.

   For proper syntax and an example of this command, see DEVSERV QPAV commands (on page 64) .
5. Verify that the displayed aliases are those assigned for Hyper PAV.
6. If the correct aliases for Hyper PAV are not shown, run the following commands:

   `QUERY PAV`

   `DEVSERV QPAV`
7. If the host only accesses one VSP 5000 series storage system, disable the **Compatible Hyper PAV** option on the host computer, and then enable the option again.
8. If the host accesses other storage systems that use Hyper PAV, complete the following:

   a. Run the following command from z/OS ® which is used as a guest operating system on z/VM ® to all base devices in the corresponding CU:

   ```
   V base_device_number1-base_device_number2,OFFLINE
   ```

   b. Run the commands from z/VM ® to all base devices and alias devices used for Hyper PAV in the corresponding CU. For details about the commands, see Sample of commands run to all base devices and alias devices from z/VM (on page 62) .

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c. Run the following command from z/OS ® to all base devices in the corresponding CU.

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

d. Run the following command from z/OS ® to all channel paths configured on the corresponding CU. You must run this command for each channel path.

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

9. Run the **DEVSERV QPAV** command.
10. Check for the alias devices in the returned results.

Sample of commands run to all base devices and alias devices from z/VM ®

To verify the aliases of Compatible Hyper PAV from z/OS ® on z/VM ®, if the host accesses other storage systems that use Hyper PAV, run the following commands from z/VM ® to all base devices and alias devices used for Hyper PAV in the corresponding CU.

Procedure

1. `DET alias_device_number1-alias_device_number2`
2. `DET base_device_number1-base_device_number2`
3. `VARY OFFLINE alias_device_number1-alias_device_number2`
4. `VARY OFFLINE base_device_number1-base_device_number2`
5. `VARY OFFLINE CHPID channel_path1`
6. `VARY OFFLINE CHPID channel_path2`
7. `VARY ONLINE CHPID channel_path1`
8. `VARY ONLINE CHPID channel_path2`
9. `VARY ONLINE base_device_number1-base_device_number2`
10. `VARY ONLINE alias_device_number1-alias_device_number2`
11. `ATT base_device_number1-base_device_number2*`
12. `ATT alias_device_number1-alias_device_number2*`

MVS ® commands to monitor Compatible PAV

Use MVS ® commands to monitor the PAV activities on the VSP 5000 series storage system from z/OS ®.

DISPLAY command

The MVS ® **DISPLAY** command shows path information and alias count for the specified base device.

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Run this command using the following syntax:

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

The following figure shows a sample output of this command for a PAV base device with six aliases.

```
D M=DEV(8300)
IEE174I 15.33.58 DISPLAY M 739
DEVICE 8300    STATUS=ONLINE
CHP                    63 40 64 65
DEST LINK ADDRESS      DD EA E9 E8
DEST LOGICAL ADDRESS  02 02 02 02
PATH ONLINE            N  Y  Y  Y
CHP PHYSICALLY ONLINE Y  Y  Y  Y
PATH OPERATIONAL       N  Y  Y  Y
MANAGED                N  N  N  N
MAXIMUM MANAGED CHPID(S) ALLOWED:  0
ND         = 002105.    .HTC.02.000000012345
DEVICE NED =   2105.    .HTC.02.000000012345
PAV BASE AND ALIASES  6
```

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

```
D M=DEV(5000)
 IEA494I 261F,SBF61F,PPRC PAIR FULL DUPLEX,SSID=C9F6,CCA=1F
 IEE174I 22.30.30 DISPLAY M 746
 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
 CU NUMBER              5000 5000
 MAXIMUM MANAGED CHPID(S) ALLOWED:  0
 DESTINATION CU LOGICAL ADDRESS = 00
 SCP CU ND        = 002107.900.HTC.55.000000063503.0008
 SCP TOKEN NED    = 002107.900.HTC.55.000000063503.0000
 SCP DEVICE NED   = 002107.900.HTC.55.000000063503.0000
 HYPERPAV ALIASES CONFIGURED = 16
FUNCTIONS ENABLED = MIDAW
```

The following figure shows a sample output of this command for a Super PAV base device with 192 aliases.

```
D M=DEV(1580)
IEE174I 11.44.36 DISPLAY M 870
DEVICE 01580 STATUS=ONLINE
```

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```
CHP 76 77 78 79 86 87 88 89
ENTRY LINK ADDRESS .. .. .. .. .. .. .. ..
DEST LINK ADDRESS 0D 0D 0D 0D 0D 0D 0D 0D
PATH ONLINE Y N N N N N N N
CHP PHYSICALLY ONLINE Y N N N N N N N
PATH OPERATIONAL Y N N N N N N N
MANAGED N N N N N N N N
CU NUMBER 1580 1580 1580 1580 1580 1580 1580 1580
INTERFACE ID 0000 .... .... .... .... .... .... ....
MAXIMUM MANAGED CHPID(S) ALLOWED: 0
DESTINATION CU LOGICAL ADDRESS = 02
SCP CU ND = 002107.985.IBM.75.0000000GZY11.0000
SCP TOKEN NED = 002107.900.IBM.75.0000000GZY11.0200
SCP DEVICE NED = 002107.900.IBM.75.0000000GZY11.0200
WWNN = 5005076308FFD02A
HYPERPAV ALIASES CONFIGURED = 192
FUNCTIONS ENABLED = MIDAW, ZHPF, XPAV
```

DEVSERV PATHS command

The **MVS DEVSERV PATHS** command shows the status of the specified base device.

Run this command using the following syntax:

```
DS P,device_unit_ID
```

The following figure shows a sample output of this command.

```
DS P,8300
IEE459I 15.43.32 DEVSERV PATHS 755
UNIT DTYPE  M CNT VOLSER  CHPID=PATH STATUS
     RTYPE    SSID CFW TC   DFW   PIN  DC-STATE CCA  DDC   ALT   CU-TYP
8300,33903 ,O,000,PA8300,63=< 40=+ 64=+ 65=+
    2105     8300 Y  YY.  YY.    N    SIMPLEX   00   00         2105
*********************** SYMBOL DEFINITIONS ***********************
O = ONLINE                          + = PATH AVAILABLE
< = PHYSICALLY UNAVAILABLE
```

DEVSERV QPAV commands

You can use the MVS **DEVSERV QPAV** commands to complete the following operations:

- Show the status of PAV base devices.

  For more information about showing the status of PAV base devices, see Showing the PAV base device status (on page 65) .

- Show the status of a Hyper PAV base device and its alias devices.

  For more information about showing the status of Hyper PAV base devices and its alias devices, see Showing the status of Hyper PAV or Super PAV base devices and alias devices (on page 65) .

- Show the SSID status.

  For more information about showing the status of an SSID, see <u>Showing the SSID status (on page 66)</u> .

- Show the status of the host and subsystem configuration.

  For more information about showing the host and subsystem configuration status, see <u>Showing the host and subsystem configuration status (on page 68)</u> .

Showing the PAV base device status

Use this task to the status of PAV base devices.

Run this command using the following syntax:

DS QP,*device_unit_ID*,4

The following figure shows a sample output of this command.

```
DS QP,8300,4
 IEE459I 15.50.16 DEVSERV QPAVS 013
      HOST                            SUBSYSTEM
  CONFIGURATION                     CONFIGURATION
  -------------                     -------------------
  UNIT                                 UNIT    UA
  NUM. 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
```

Showing the status of Hyper PAV or Super PAV base devices and alias devices

Use the following task to show the status of a Hyper PAV or Super PAV base device and its alias devices.

Run this command using the following syntax.

DS QP,*device_unit_ID*,HPAV

The following figure shows a sample output of this command.

```
DS QP,5000,HPAV
 IEE459I 22.38.45 DEVSERV QPAVS 844
      HOST                            SUBSYSTEM
  CONFIGURATION                     CONFIGURATION
  --------------                    --------------------
  UNIT                                 UNIT    UA
  NUM. UA  TYPE         STATUS     SSID  ADDR.   TYPE
  ----- --  ----        ------     ----  ----    ----------
  05000 00  BASE-H                 5150   00      BASE
```

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```
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
0504A 4A  ALIAS-H                 5150    4A
0504B 4B  ALIAS-H                 5150    4B
0504C 4C  ALIAS-H                 5150    4C
0504D 4D  ALIAS-H                 5150    4D
0504E 4E  ALIAS-H                 5150    4E
0504F 4F  ALIAS-H                 5150    4F
****     16 DEVICE(S)  IN HYPERPAV ALIAS POOL
```

Showing the SSID status

Use the following task to show the SSID status.

Run this command using the following syntax:

```
DS QP,SSID=SSID
```

The following figure shows a sample output of this command for PAV.

```
DS QP,SSID=8300
 IEE459I 15.56.03 DEVSERV QPAVS 026
      HOST                            SUBSYSTEM
  CONFIGURATION                    CONFIGURATION
 -------------                    ------------------
  UNIT                                UNIT   UA
  NUM. 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
  8304 04  BASE                    8300   04     BASE
  8306 06  BASE                    8300   06     BASE
  8307 07  BASE                    8300   07     BASE
  8308 08  BASE                    8300   08     BASE
  8309 09  BASE                    8300   09     BASE
  830A 0A  BASE                    8300   0A     BASE
  830C 0C  BASE                    8300   0C     BASE
  830D 0D  BASE                    8300   0D     BASE
  830E 0E  BASE                    8300   0E     BASE
```

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```
  830F 0F  BASE                    8300   0F      BASE
  8310 10  BASE                    8300   10      BASE
  8311 11  BASE                    8300   11      BASE
  8312 12  BASE                    8300   12      BASE
  8313 13  BASE                    8300   13      BASE
  8314 14  BASE                    8300   14      BASE
  8315 15  BASE                    8300   15      BASE
  8316 16  BASE                    8300   16      BASE
  8317 17  BASE                    8300   17      BASE
  8318 18  BASE                    8300   18      BASE
  8319 19  BASE                    8300   19      BASE
  831A 1A  BASE                    8300   1A      BASE
  831B 1B  BASE                    8300   1B      BASE
  831D 1D  BASE                    8300   1D      BASE
  831F 1F  BASE                    8300   1F      BASE
  8320 20  BASE                    8300   20      BASE
  8321 21  BASE                    8300   21      BASE
  8322 22  BASE                    8300   22      BASE
  83F6 F6  ALIAS-8301              8300   F6      ALIAS-01
  83F7 F7  ALIAS-8301              8300   F7      ALIAS-01
  83F8 F8  ALIAS-8301              8300   F8      ALIAS-01
  83F9 F9  ALIAS-8301              8300   F9      ALIAS-01
  83FA FA  ALIAS-8301              8300   FA      ALIAS-01
  83FB FB  ALIAS-8300              8300   FB      ALIAS-00
  83FC FC  ALIAS-8300              8300   FC      ALIAS-00
  83FD FD  ALIAS-8300              8300   FD      ALIAS-00
  83FE FE  ALIAS-8300              8300   FE      ALIAS-00
  83FF FF  ALIAS-8300              8300   FF      ALIAS-00
  ****     41 DEVICE(S) MET THE SELECTION CRITERIA
```

The following figure shows a sample output of this command for Hyper PAV and Super PAV.

```
DS QP,SSID=0A02
 IEE459I 11.46.43 DEVSERV QPAVS 880
      HOST                              SUBSYSTEM
  CONFIGURATION                         CONFIGURATION
  -------------                         --------------------
  UNIT                                  UNIT UA
  NUM.  UA TYPE      STATUS     SSID ADDR. TYPE
  ----- -- ----      ------     ---- ---- -----------
  01580 00 BASE-H               0A02 00 BASE
  01581 01 BASE-H               0A02 01 BASE
  01582 02 BASE-H               0A02 02 BASE
  01583 03 BASE-H               0A02 03 BASE
  01584 04 BASE-H               0A02 04 BASE
  01585 05 BASE-H               0A02 05 BASE
  01586 06 BASE-H               0A02 06 BASE
```

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```
     01587 07 BASE-H              0A02 07 BASE
     01588 08 BASE-H              0A02 08 BASE
     01589 09 BASE-H              0A02 09 BASE
     0158A 0A BASE-H              0A02 0A BASE
     0158B 0B BASE-H              0A02 0B BASE
     0158C 0C BASE-H              0A02 0C BASE
     0158D 0D BASE-H              0A02 0D BASE
     0158E 0E BASE-H              0A02 0E BASE
     0158F 0F BASE-H              0A02 0F BASE
     11880 40 ALIAS-H             0A02 40
     11881 41 ALIAS-H             0A02 41
     11882 42 ALIAS-H             0A02 42
     11883 43 ALIAS-H             0A02 43
     11884 44 ALIAS-H             0A02 44
     11885 45 ALIAS-H             0A02 45
     11886 46 ALIAS-H             0A02 46
     11887 47 ALIAS-H             0A02 47
     11888 48 ALIAS-H             0A02 48
     11889 49 ALIAS-H             0A02 49
     1188A 4A ALIAS-H             0A02 4A
     1188B 4B ALIAS-H             0A02 4B
     1188C 4C ALIAS-H             0A02 4C
     1188D 4D ALIAS-H             0A02 4D
     1188E 4E ALIAS-H             0A02 4E
     1188F 4F ALIAS-H             0A02 4F
**** 32 DEVICE(S) MET THE SELECTION CRITERIA
```

Showing the host and subsystem configuration status

Use this task to show the status of the host and subsystem configuration.

Run the command using the following syntax:

DS QP,*device_unit_ID*,VOLUME

The following figure shows a sample output of this command.

```
DS QP,8300,VOLUME
 IEE459I 16.00.15 DEVSERV QPAVS 041
      HOST                            SUBSYSTEM
  CONFIGURATION                      CONFIGURATION
  -------------                      -------------------
  UNIT                                 UNIT    UA
  NUM. UA  TYPE         STATUS    SSID  ADDR.   TYPE
  ---- --  ----         ------    ----  ----    ------------
  8300 00  BASE                   8300   00      BASE
  83FB FB  ALIAS-8300             8300   FB      ALIAS-00
  83FC FC  ALIAS-8300             8300   FC      ALIAS-00
  83FD FD  ALIAS-8300             8300   FD      ALIAS-00
  83FE FE  ALIAS-8300             8300   FE      ALIAS-00
```

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```
  83FF FF  ALIAS-8300              8300   FF     ALIAS-00
  ****      6 DEVICE(S) MET THE SELECTION CRITERIA
```

DISPLAY IOS HYPERPAV command

The MVS ® **`DISPLAY IOS HYPERPAV`** command shows the current Hyper PAV mode status.

Run this command using the following syntax:

```
D IOS,HYPERPAV
```

The following figure shows a sample output of this command in Hyper PAV mode.

```
D IOS,HYPERPAV
 IOS098I 22.31.34 HYPERPAV DATA 776
 HYPERPAV MODE IS SET TO YES
```

The following figure shows a sample output of this command in Super PAV mode.

```
D IOS,HYPERPAV
 IOS098I 11.47.52 HYPERPAV DATA 884
 HYPERPAV MODE IS SET TO XPAV
```

GTF I/O tracing

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 PAV base device and automatically includes the alias addresses currently assigned to the base device.

VM CP commands for z/VM ®

You can use VM CP commands to monitor the PAV activities on the VSP 5000 series storage system 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 you can omit.

- italic characters: Indicate a type of operand. An arbitrary value that you can enter.

- brackets ([ ]): Indicate an operand that you can omit.

- braces ({ }): Indicate that you must select an operand from the list of operands enclosed by the braces.

> 📄 **Note:** Delimit operands enclosed within the braces using vertical bars (|).

QUERY CU command

The **QUERY CU** command shows information about DASD CU.

Run this command using the following syntax:

Q CU [DASD] {*ssid* | *ssid1* | *ssid2*} {ALiases | DEVices | PAVMode}

The following figure shows a sample output of this command.

```
q cu dasd b600 ali
DASD CU B600 ALIASES:
A0C0 A0C1 A0C2 A0C3 A0C4 A0C5 A0C6 A0C7
A0C8 A0C9 A0CA A0CB A0CC A0CD A0CE A0CF
A0D0 A0D1 A0D2 A0D3 A0D4 A0D5 A0D6 A0D7
A0D8 A0D9 A0DA A0DB A0DC A0DD 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

q cu dasd b600 dev
DASD CU B600 DEVICES:
A000 A001 A002 A003 A004 A005 A006 A007
A008 A009 A00A A00B A00C A00D A00E A00F
A040 A041 A042 A043 A044 A045 A046 A047
A048 A049 A04A A04B A04C A04D A04E A04F
A050 A051 A052 A053 A054 A055 A056 A057
A058 A059 A05A A05B A05C A05D A05E A05F
A060 A061 A062 A063 A064 A065 A066 A067
A068 A069 A06A A06B A06C A06D A06E A06F
A070 A071 A072 A073 A074 A075 A076 A077
A078 A079 A07A A07B A07C A07D A07E A07F
A080 A081 A082 A083 A084 A085 A086 A087
A088 A089 A08A A08B A08C A08D A08E A08F
A090 A091 A092 A093 A094 A095 A096 A097
A098 A099 A09A A09B A09C A09D A09E A09F
A0C0 A0C1 A0C2 A0C3 A0C4 A0C5 A0C6 A0C7
A0C8 A0C9 A0CA A0CB A0CC A0CD A0CE A0CF
A0D0 A0D1 A0D2 A0D3 A0D4 A0D5 A0D6 A0D7
A0D8 A0D9 A0DA A0DB A0DC A0DD 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:** You can only run `QUERY CU` on the z/VM ® instance that is directly connected to the LPAR. Attempting to run this command on z/VM ® that is operating as a guest operating system on another z/VM ® causes the command to be rejected.

QUERY DASD DETAILS command

The `QUERY DASD DETAILS` command shows information about DASD (RDEV).

Run this command using the following syntax:

```
Query DAsd DETAILS {rdev | rdev1 - rdev2}
```

The following figure shows a sample output of this command.

```
q dasd details a000
A000  CUTYPE = 2107-E8, DEVTYPE = 3390-0A, VOLSER = CMA000, CYLS = 3339
      CACHE DETAILS:  CACHE NVS CFW DFW PINNED CONCOPY
          -SUBSYSTEM   Y    Y   Y   -    N       N
             -DEVICE   Y    -   -   Y    N       N
      DEVICE DETAILS: CCA = 00, DDC = --
      DUPLEX DETAILS:  --
      HYPERPAV DETAILS: BASE VOLUME IN POOL 0
      CU DETAILS: SSID = B600, CUNUM = A000
```

QUERY PAV command

Use the `QUERY PAV` command to show the list of PAV or Hyper PAV devices (including information on those devices) that are managed by the corresponding storage system.

Run this command using the following syntax:

```
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

Use the `QUERY VIRTUAL DASD DETAILS` command to show information about all DASDs that z/VM ® can access.

Run this command using the following syntax:

```
Query Virtual DAsd [DETAILS]
```

The following figure shows a sample output of this command.

```
Q V DASD details
                                        .
                                        .
                                        .
DASD 1000 3390 CMA000 R/W        3339 CYL ON DASD  A000 SUBCHANNEL = 005D
       HYPERPAVBASE(0)
DASD 3000 3390        R/W           1 CYL ON DASD  A0C0 SUBCHANNEL = 005F
       HYPERPAVALIAS(A0C0,0)
DASD A001 ON DASD  A001 R/W CMA001 SUBCHANNEL = 005E
       DEVCTL HYPERPAVBASE(0)
```

> ⚠️ **Caution:** The DETAILS operand is only valid for dedicated DASD and mini-disk DASD.

QUERY VIRTUAL PAV command

Use the `QUERY VIRTUAL PAV` command to show the status of all PAV and Hyper PAV devices that z/VM ® can access.

Run this command using the following syntax:

```
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 CMA000 ASSIGNED A000 POOL 0

<ALIAS>
q v pav 3000
HYPERPAV ALIAS 3000 ASSIGNED A0C0 POOL 0
```

Chapter 7: Troubleshooting

This topic provides PAV troubleshooting information.

General troubleshooting

For more information about troubleshooting using Device Manager - Storage Navigator, see the *System Administrator Guide*.

For a complete list of Device Manager - Storage Navigator error codes, see the *Hitachi Device Manager - Storage Navigator Messages*.

Contacting customer support

If you are unable to resolve an error condition in Device Manager - Storage Navigator, contact Hitachi Vantara customer support for assistance.

Before you contact customer support, please gather as much information about the problem as possible, including the following:

- The circumstances surrounding the error or failure.
- The exact content of any error messages displayed on the host systems.
- The exact content of any error messages displayed by Device Manager - Storage Navigator.
- The Device Manager - Storage Navigator configuration information. Use the Device Manager - Storage Navigator Dump Tool to download the dump files and configuration information from the SVP.
- The service information messages (SIMs), including reference codes and severity levels, displayed by Device Manager - Storage Navigator.

The Hitachi Vantara customer support staff is available 24 hours a day, seven days a week. To contact technical support, log on to Hitachi Vantara Support Connect for contact information: https://support.hitachivantara.com/en_us/contact-us.html

Appendix A: Discontinuing HyperPAV and SuperPAV

This topic describes the procedures for discontinuing IBM® HyperPAV and IBM® SuperPAV operations.

Disabling HyperPAV from z/OS ®

Before you begin

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

- All alias device assignments in the storage system must be deleted. For more information about deleting alias devices from base devices, see Deleting alias volumes from base volumes (on page 53) .

Procedure

1. Run 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. Run the following command from the host system console to disable the **HyperPAV** option on the host computer.

   `SETIOS HYPERPAV=NO`

3. Run the following DEVSERV command from the z/OS ® to an arbitrary device per CU:

   `DS QD,device_ID,VALIDATE`

4. To verify that the aliases assigned for HyperPAV are released, from the host, run the following command:

   `DEVSERV QPAV`

   For proper syntax and an example of this command, see DEVSERV QPAV commands (on page 64) .

Disabling SuperPAV from z/OS ®

Before you begin

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

- All alias device assignments in the storage system must be deleted. For more information about deleting alias devices from base devices, see <u>Deleting alias volumes from base volumes (on page 53)</u> .

Procedure

1. Run 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. Perform either of the following methods to disable the Compatible Super PAV option on the host computer.

   - If you want to switch to HyperPAV, issue the following command:

     `SETIOS HYPERPAV=YES`

   - If you want to switch to PAV, issue the following command:

     `SETIOS HYPERPAV=NO`

3. Run the following DEVSERV command from the z/OS ® to an arbitrary device per CU:

   `DS QD,`*`device_ID`*`,VALIDATE`

4. To verify that the aliases assigned for SuperPAV are released, from the host, run the following command:

   `DEVSERV QPAV`

   For proper syntax and an example of this command, see <u>DEVSERV QPAV commands (on page 64)</u> .

Disabling HyperPAV from z/OS ® when using multiple storage systems

Use this procedure when HyperPAV is still used on other storage systems which are accessed from the corresponding host.

Before you begin

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

- All alias device assignments in the storage system must be deleted. For more information about deleting alias devices from base devices, see <u>Deleting alias volumes from base volumes (on page 53)</u> .

Procedure

1. Run 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. Run 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`

3. Run the DEVSERV QPAV command from the host to verify that the aliases assigned for HyperPAV are released.

   See DEVSERV QPAV commands (on page 64) for proper syntax and an example of this command.

Disabling SuperPAV from z/OS ® when using multiple storage systems

Use this procedure when SuperPAV is still used on other storage systems which are accessed from the corresponding host.

Before you begin

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

- All alias device assignments in the storage system must be deleted. For more information about deleting alias devices from base devices, see Deleting alias volumes from base volumes (on page 53) .

Procedure

1. Run 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. Run 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`

3. Run the DEVSERV QPAV command from the host to verify that the aliases assigned for SuperPAV are released.

   See DEVSERV QPAV commands (on page 64) for proper syntax and an example of this command.

Disabling HyperPAV from z/OS ® on z/VM ®

You can disable HyperPAV from z/OS ® on z/VM ®.

Before you begin

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

- All alias device assignments in the storage system must be deleted. For more information about deleting alias devices from bases devices, see <u>Deleting alias volumes from base volumes (on page 53)</u> .

Procedure

1. From z/OS ® on z/VM ®, run 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. Run the following command from the host system console to disable the **HyperPAV** option on the host computer.

   ```
   SETIOS HYPERPAV=NO
   ```

3. Run the following commands from z/VM ® system console to all alias devices that are used for HyperPAV in the corresponding CU:

   ```
   DET alias_device_number1-alias_device_number2
   
   VARY OFFLINE alias_device_number1-alias_device_number2
   
   SET CU PAV ssid1-ssid2
   
   VARY ONLINE alias_device_number1-alias_device_number2
   
   ATT alias_device_number1-alias_device_number2*
   ```

   An asterisk (*) is required at the end of the ATT command.

4. Run the following DEVSERV command from the z/OS ® to an arbitrary device per CU:

   ```
   DS QD,device_ID,VALIDATE
   ```

5. Run the QUERY PAV command from z/VM ® to verify that the aliases assigned for HyperPAV are released.

   For proper syntax and an example of this command, see <u>QUERY PAV command (on page 71)</u> .

6. Run the DEVSERV QPAV command from the z/OS ® to verify that the aliases assigned for HyperPAV are released.

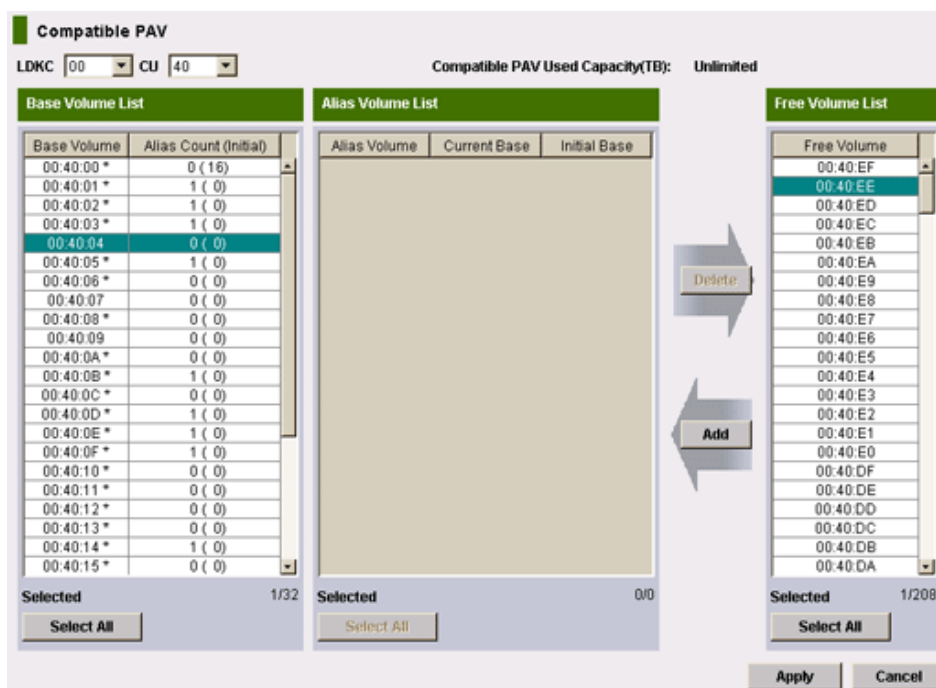   See <u>DEVSERV QPAV commands (on page 64)</u> for proper syntax and an example of this command.

Appendix B: Compatible PAV GUI reference

This topic describes the items and options available in the **Assign Alias Volumes** window.

Hitachi Compatible PAV window

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

Item	Description
LDKC	Selects the LDKC that contains the desired CUs and LDEVs.
CU	Selects the logical CU image that contains the desired LDEVs. 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.
Compatible PAV Used Capacity	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.

Item	Description
	Values: Unlimited: Indicates that the licensed capacity is unlimited. --- : Indicates you are using a temporary key or the emergency key. The used capacity is enclosed in angle brackets (< >): Indicates the calculation has not been completed.
Base Volume List	Displays the LDEVs that are currently in use in the selected CU image. For a description of the items, see <u>Base Volume List (on page 79)</u> .
Alias Volume List	Displays the alias devices assigned to the selected base devices. For a description of the items, see <u>Alias Volume List (on page 80)</u> .
Free Volume List	Displays the LDEV addresses of unused volumes in the selected CU. For a description of the items, see <u>Free Volume List (on page 80)</u> .
Add	Assigns aliases to selected base devices. When you click Add, the selected free LDEVs are assigned to the selected base devices. The new alias devices are displayed in the Alias Volume List, and the LDEV addresses are no longer displayed in the Free Volume List. To complete your request to assign the new aliases as specified, you must click Apply.
Delete button	Removes aliases assigned to a selected base device. When you click Delete, the selected alias devices are removed from the Alias Volume List, and their LDEVs are displayed in the Free Volume List. To complete removing the aliases as specified, you must click Apply.
Apply button	Applies the settings to the storage system.
Cancel button	Discards any changes and restores the initial settings.

Base Volume List

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

Item	Description
Base Volume	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 *). The capacity of the volumes attached asterisks (*) is an object for calculation of used capacity.
Alias Count (Initial)	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.
Selected	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.
Select All	Selects all volumes in the Base Volume List.

Alias Volume List

The Alias Volume List displays the alias devices assigned to the selected base devices. 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 Alias Volume List.

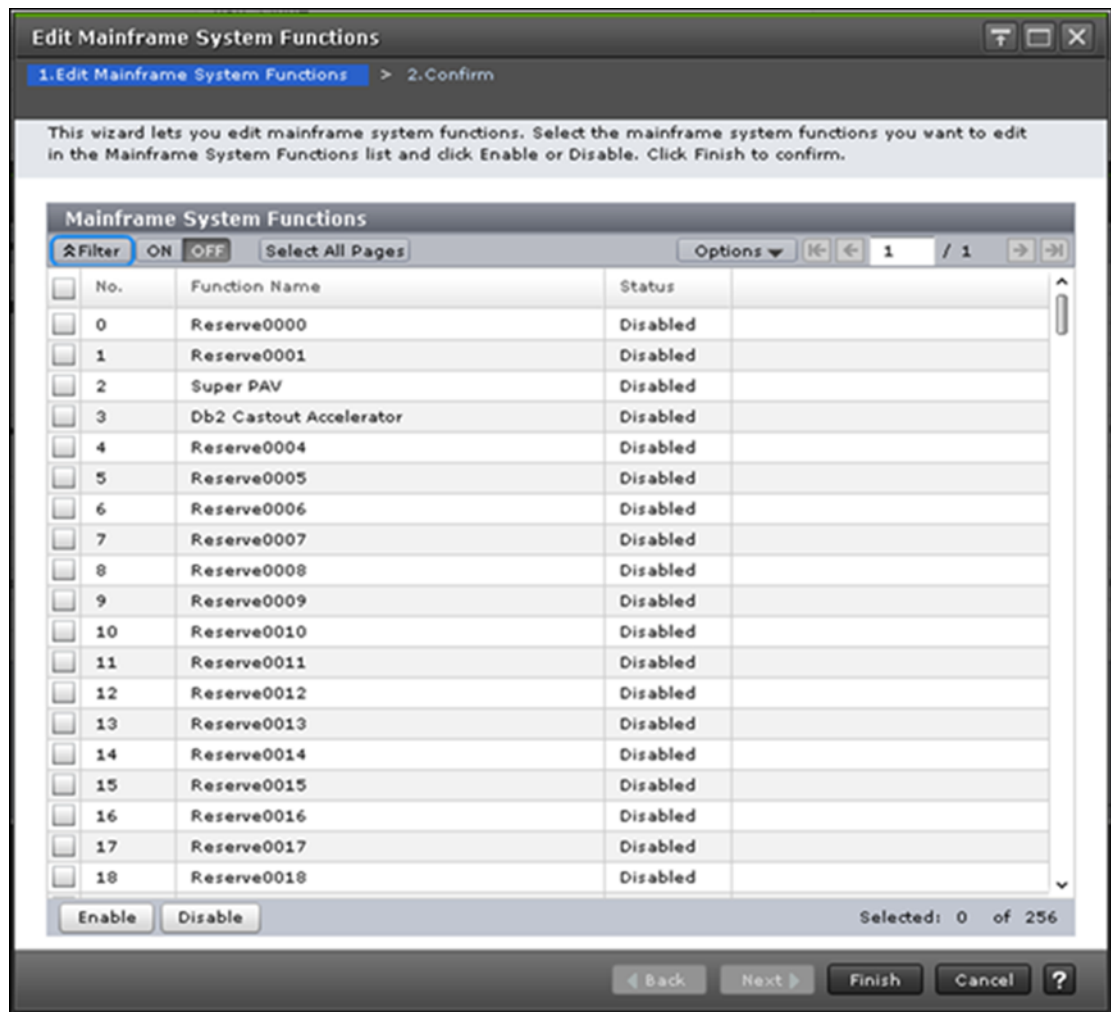| Item	Description
Alias Volume	Displays the LDKC, CU, and LDEV numbers of the alias volume.
Current Base	Displays the LDKC, CU, and LDEV numbers of the base volume currently assigned to the alias volume in the disk storage system.
Initial Base	Displays the LDKC, CU, and LDEV numbers of the base volume set by the user for the alias volume.
Selected	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.
Select All button	Selects all volumes in the Alias Volume List.

Free Volume List

The Free Volume List 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.

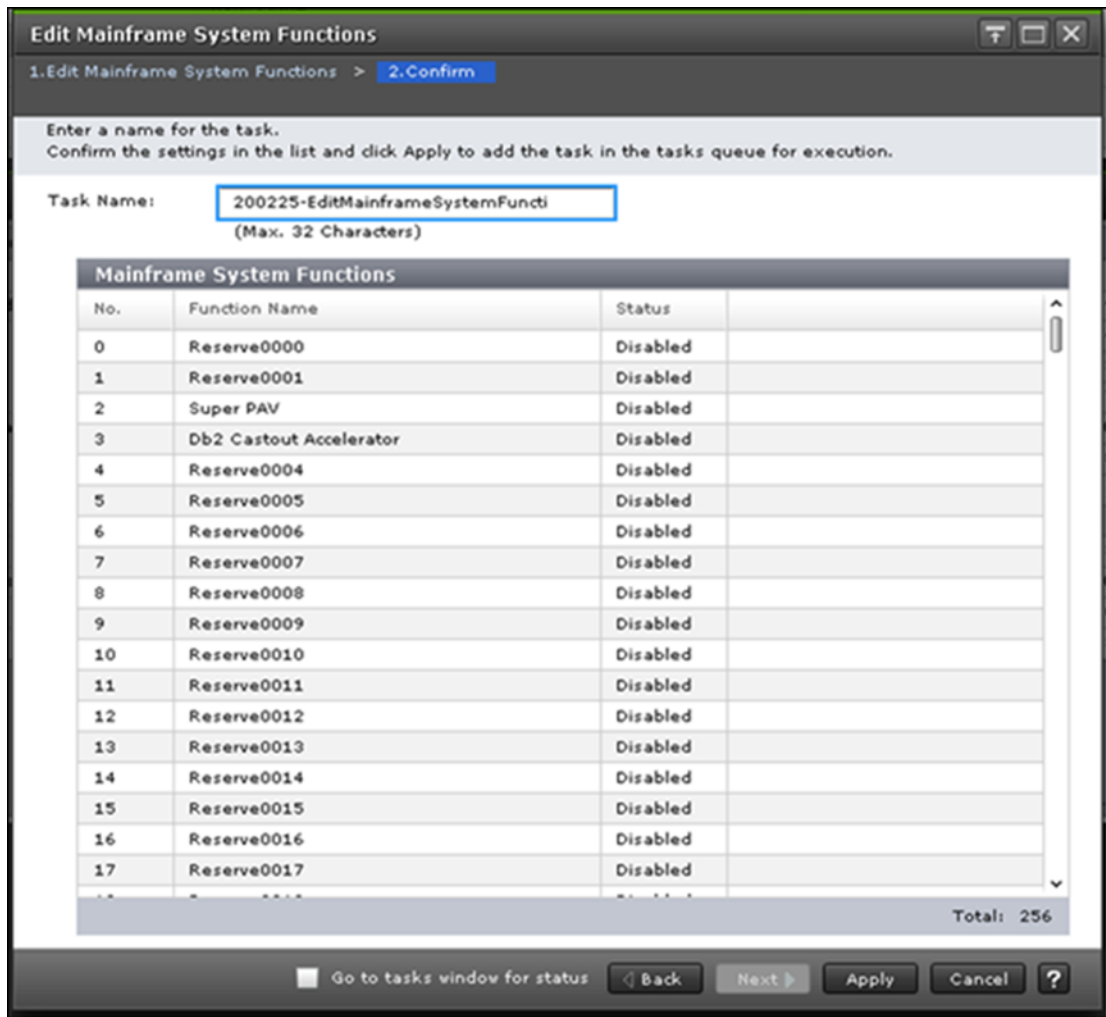| Item	Description
Free Volume	Displays the complete list of volumes available for assignment.
Selected	Displays the number of selected free devices and the total number of free devices in the selected CU image. For example, 8/47 indicates that eight free devices are selected out of a total of 47 free devices in the selected CU image.
Select All	Selects all volumes in the Free Volume List.

Edit Mainframe System Functions wizard

Edit Mainframe System Functions window

Use this window to enable and disable the mainframe system functions.

Item	Description
No.	Number of the mainframe system function
Function Name	Name of the mainframe system function: ▪ Super PAV: If this item is enabled, the Super PAV functions can be used on the storage system. ▪ Db2 Castout Accelerator: If this item is enabled, the DB2® Cast Out Accelerator functions can be used on the storage system. ▪ Reserve0000 to Reserve0001, Reserve0004 to Reserve0255: These items are reserved for future use and cannot be selected.
Status	Status of the mainframe system function

Edit Mainframe System Functions confirmation window

Appendix B: Compatible PAV GUI reference

Item	Description
No.	Number of the mainframe system function
Function Name	Name of the mainframe system function: ▪ Super PAV: If this item is enabled, functions of Super PAV can be used in the storage system. ▪ Db2 Castout Accelerator: If this item is enabled, the DB2® Cast Out Accelerator functions can be used on the storage system. ▪ Reserve0000 to Reserve0001, Reserve0004 to Reserve0255: These items are reserved for future use and cannot be selected.
Status	Status of the mainframe system function

Glossary

alias device

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

APAR

Authorized Problem Analysis Report

base device

A formatted mainframe logical device (LDEV) that contains user data and can be accessed through alias devices using Hitachi Compatible PAV (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

cache

A set of RAM (Random Access Memory) modules used to store data temporarily.

capacity

The amount of data storage space available on a physical storage device, generally measured in bytes (MB, GB, TB, and so on).

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.

control unit (CU)

Created in an enterprise-class storage system. Also called a CU image. The LDEVs created in a storage system are connected to a single CU, and a number is assigned to each CU for identifying its LDEVs. Therefore, volumes (LDEVs) in a storage system are specified by the CU number (CU#) and LDEV number.

DASD

direct-access storage device

device (dev or DEV)

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.

IPL

initial program load

ISPF/PDF

Interactive System Productivity Facility/package definition file

JCL

job control language

LCU

logical control unit

logical device (LDEV)

A volume created in a storage system. See also LU.

logical volume

An area on a disk consisting of device files that are logically integrated using a volume manager. Also referred to as an LDEV.

logical volume image (LVI)

An LDEV that is configured for use by mainframe hosts (for example, 3390-3).

MIH

missing interrupt handler

MVS

Multiple Virtual Storage

NUM

number

PAV

Hitachi Compatible PAV

PPRC

Peer-to-Peer Remote Copy

R-SIM

remote service information message

RAID

redundant array of independent disks

A collection of two or more disk drives that presents the image of a single logical disk drive to the system. Part of the physical storage capacity is used to store redundant information about user data stored on the remainder of the storage capacity. In the event of a single device failure, the data can be read or regenerated from the other disk drives.

RAID employs the technique of disk striping, which involves partitioning each drive's storage space into units ranging from a sector (512 bytes) up to several megabytes. The stripes of all the disks are interleaved and addressed in order.

SIM

service information message

SIz

ShadowImage for Mainframe

SMS

Storage Management Subsystem

SSCH

start subchannel

storage subsystem identifier (SSID)

In a mainframe environment, SSIDs are used for reporting information from the control unit (CU) image to the mainframe operating system. An SSID is assigned to each group of 64 or 256 volumes to define one or four SSIDs per CU image. The user-specified SSIDs are assigned during storage system installation and must be unique to all connected host operating environments.

virtual machine

One instance of an operating system along with one or more applications running in an isolated partition within the computer. A VM enables different operating systems to run in the same computer at the same time as well as prevents applications from interfering with each other. All virtual machines run simultaneously.

volume (vol or VOL)

A name for the logical device (LDEV), or logical unit (LU), or concatenated LDEVs, that are created in a storage system that have been defined to one or more hosts as a single data storage unit.

VTOC

volume table of contents

WLM

Workload Manager

XRC

IBM® Extended Remote Copy

z/VM

z/Virtual Machine

Hitachi Vantara