

FUJITSU Server PRIMEQUEST 2000 Series

Design Guide

CA92344-0696-07

Preface

1. PRIMEQUEST Overview
2. Basic Hardware Configuration
3. Hardware Configuration Design
4. Operation Management Design
5. OS/Support

Appendices

■ About This Manual

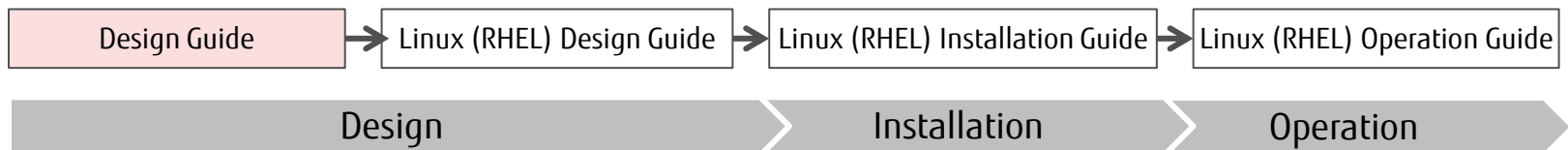
■ Contents of This Manual

This manual describes the concepts of system design and notes for users of the PRIMEQUEST 2000 series.

- For details on the operation of the main unit and other information, refer to the manuals for the PRIMEQUEST 2000 series main unit.
- For details on the operating environment of the software, refer to the website of each software.
- For details on virtualization, refer to the document of each virtualization software.


■ Organization of Manuals

The following figure shows the organization of manuals for the PRIMEQUEST 2000 series.



■ Symbols in This Manual

The following table shows the meaning of the symbol used in this manual.

Symbol	Meaning
	Indicates the page or document to refer to.

■ Abbreviations in This Manual

Name	Abbreviation	
PRIMEQUEST 2400E2	4 socket model	PRIMEQUEST 2000 series PRIMEQUEST
PRIMEQUEST 2400E3		
PRIMEQUEST 2800B2	8 socket model	
PRIMEQUEST 2800B3		
PRIMEQUEST 2800E2		
PRIMEQUEST 2800E3		
Microsoft® Windows Server® 2012 R2 Standard	Windows Server 2012 R2	Windows
Microsoft® Windows Server® 2012 R2 Datacenter	Windows Server 2012	
Microsoft® Windows Server® 2012 Standard		
Microsoft® Windows Server® 2012 Datacenter		
Red Hat® Enterprise Linux® 6 (for Intel64)	RHEL 6 (for Intel64) RHEL 6	RHEL Linux
Red Hat® Enterprise Linux® 7 (for Intel64)	RHEL 7 (for Intel64) RHEL 7	
SUSE® Linux® Enterprise Server 11	SLES 11	SLES Linux
SUSE® Linux® Enterprise Server 12	SLES 12	

Name	Abbreviation	
Oracle® Linux 7 Update 2	Oracle Linux	Linux
Oracle® VM Server for x86 Release 3.4	Oracle VM	
VMware vSphere® 5.5	VMware 5.5	VMware
VMware vSphere® 6		
VMware vSphere® 6.5	VMware 6	
PRIMEQUEST 2000 Series Hardware Installation Manual	Hardware Installation Manual	
PRIMEQUEST 2000 Series General Description	General Description	
PRIMEQUEST 2000 Series Installation Manual	Installation Manual	
PRIMEQUEST 2000 Series Administration Manual	Administration Manual	
PRIMEQUEST 2000 Series Tool Reference	Tool Reference	
PRIMEQUEST 2000 Series Linux Design Guide -Red Hat Enterprise Linux-	Linux (RHEL) Design Guide	
PRIMEQUEST 2000 Series Linux Installation Guide -Red Hat Enterprise Linux-	Linux (RHEL) Installation Guide	
PRIMEQUEST 2000 Series Linux Operation Guide -Red Hat Enterprise Linux-	Linux (RHEL) Operation Guide	

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1. PRIMEQUEST Overview

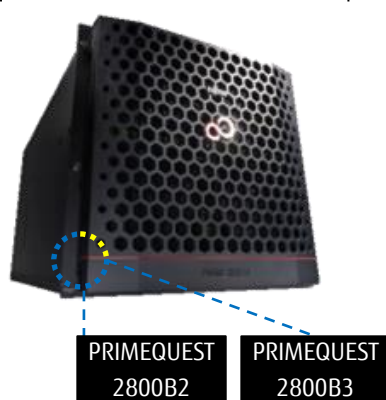
This chapter describes the overview of PRIMEQUEST.
For details, refer to "General Description".

1.1 Product Lineup

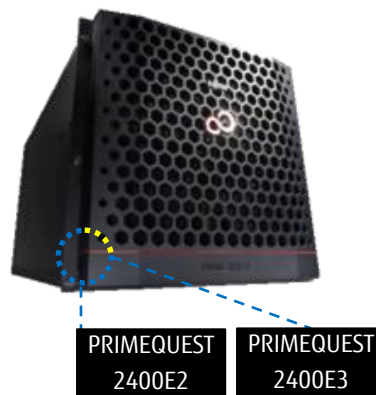
Core servers that combine the reliability of a mainframe and the cost efficiency of an open server to support mission critical operations

For Enterprise

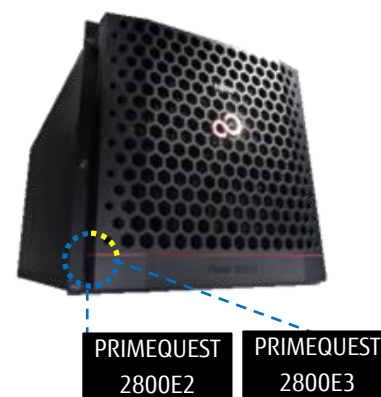
For Business



Up to 1 partition
2800B2: Up to 8 CPUs and 144 cores
2800B3: Up to 8 CPUs and 192 cores
Up to 16 PCIe slots



Up to 2 partitions
2400E2: Up to 4 CPUs and 72 cores
2400E3: Up to 4 CPUs and 96 cores
Up to 56 PCIe slots



Up to 4 partitions
2800E2: Up to 8 CPUs and 144 cores
2800E3: Up to 8 CPUs and 192 cores
Up to 56 PCIe slots

Highly-reliable servers that are based on the latest Intel architecture

1.2 Specifications (1/2)

Item		PRIMEQUEST 2000 series		
Purpose		Business	Enterprise	
Model name		2800B2	2400E2	2800E2
CPU	Type	Intel® Xeon® Processor E7 v3 Family		
	Number of cores (*1)	4/10/16/18		
Maximum SMP (sockets/cores) (*1)		8/144	4/72	8/144
Maximum number of partitions		1	2	4
Memory	Supported DIMMs	8GB/16GB/32GB/64GB		
	Maximum memory capacity (*1)	12TB (64GB DIMM x 192)	6TB (64GB DIMM x 96) With Memory Scale-up Boards: 12TB (64GB DIMM x 192)	12TB (64GB DIMM x 192)
Maximum internal disk capacity		14.4TB (DU 1.8TB x 8)	28.8TB (SB 1.8TB x 8, DU 1.8TB x 8)	43.2TB (SB 1.8TB x 16, DU 1.8TB x 8)
Maximum number of PCI slots (*1)		Up to 16 (internal only)	16 (internal only) / up to 56	16 (internal only) / up to 56
Height		10U		
Reliability, Availability, and Serviceability (RAS)				
Memory Mirror		Supported		
Memory Spare		Supported		
Flexible I/O		Supported		
Reserved SB		Not supported	Supported	
Extended Partitioning (including Extended Socket)		Not supported	Supported (RHEL)	
Memory Scale-up Board		Not supported	Supported (RHEL)	Not supported
Dynamic Reconfiguration		Not supported	Supported (RHEL)	
RAID		Hardware RAID / Software RAID		
Redundancy		Memory, IOU, PSU, FAN, HDD, SAS-SSD, PCI Express card, MMB, and power input system		
Hot plug		IOU (in a redundant configuration), PSU (in a redundant configuration), FAN, HDD (in a RAID configuration), SAS-SSD (in a RAID configuration), PCI Express card (when a PCI Box is equipped), and MMB (in a duplex configuration)		
Original dump function		sadump (RHEL)		
Cluster	Intra-cabinet	Supported		
	Inter-cabinet	Supported		
Remote operation		WOL, PXE, video redirection, and console redirection		

(*1) The maximum number of CPUs, the maximum number of cores, and the maximum memory capacity that can be configured in a system vary depending on the type and version of the OS. For details, refer to ["Appendix B OS Specifications"](#).

The maximum number of PCI slots depends on the type and the number of IO units.



For details, refer to "Chapter 1 Product Overview" in "General Description".

1.2 Specifications (2/2)

Item		PRIMEQUEST 2000 series		
Purpose		Business	Enterprise	
Model name		2800B3	2400E3	2800E3
CPU	Type	Intel® Xeon® Processor E7 v4 Family		
	Number of cores (*1)	4/10/14/18/22/24		
Maximum SMP (sockets/cores) (*1)		8/192	4/96	8/192
Maximum number of partitions		1	2	4
Memory	Supported DIMMs	8GB/16GB/32GB/64GB/128GB		
	Maximum memory capacity (*1)	12TB (64GB DIMM x 192)	12TB (128GB DIMM x 96) With Memory Scale-up Boards: 15TB	24TB (128GB DIMM x 192)
Maximum internal disk capacity		14.4TB (DU 1.8TB x 8)	28.8TB (SB 1.8TB x 8, DU 1.8TB x 8)	43.2TB (SB 1.8TB x 16, DU 1.8TB x 8)
Maximum number of PCI slots (*1)		16	16 (internal only) / up to 56	16 (internal only) / up to 56
Height		10U		
Reliability, Availability, and Serviceability (RAS)				
Memory Mirror		Supported		
Memory Spare		Supported		
Flexible I/O		Supported		
Reserved SB		Not supported	Supported	
Extended Partitioning (including Extended Socket)		Not supported	Supported (RHEL)	
Memory Scale-up Board		Not supported	Supported (RHEL)	Not supported
Dynamic Reconfiguration		Not supported	Supported (RHEL, SLES 12 SP1)	
RAID		Hardware RAID / Software RAID		
Redundancy		Memory, IOU, PSU, FAN, HDD, SAS-SSD, PCI Express card, MMB, and power input system		
Hot plug		IOU (in a redundant configuration), PSU (in a redundant configuration), FAN, HDD (in a RAID configuration), SAS-SSD (in a RAID configuration), PCI Express card (when a PCI Box is equipped), and MMB (in a duplex configuration)		
Original dump function		sadump (RHEL)		
Cluster	Intra-cabinet	Supported		
	Inter-cabinet	Supported		
Remote operation		WOL, PXE, video redirection, and console redirection		

(*1) The maximum number of CPUs, the maximum number of cores, and the maximum memory capacity that can be configured in a system vary depending on the type and version of the OS. For details, refer to ["Appendix B OS Specifications"](#).

The maximum number of PCI slots depends on the type and the number of IO units.

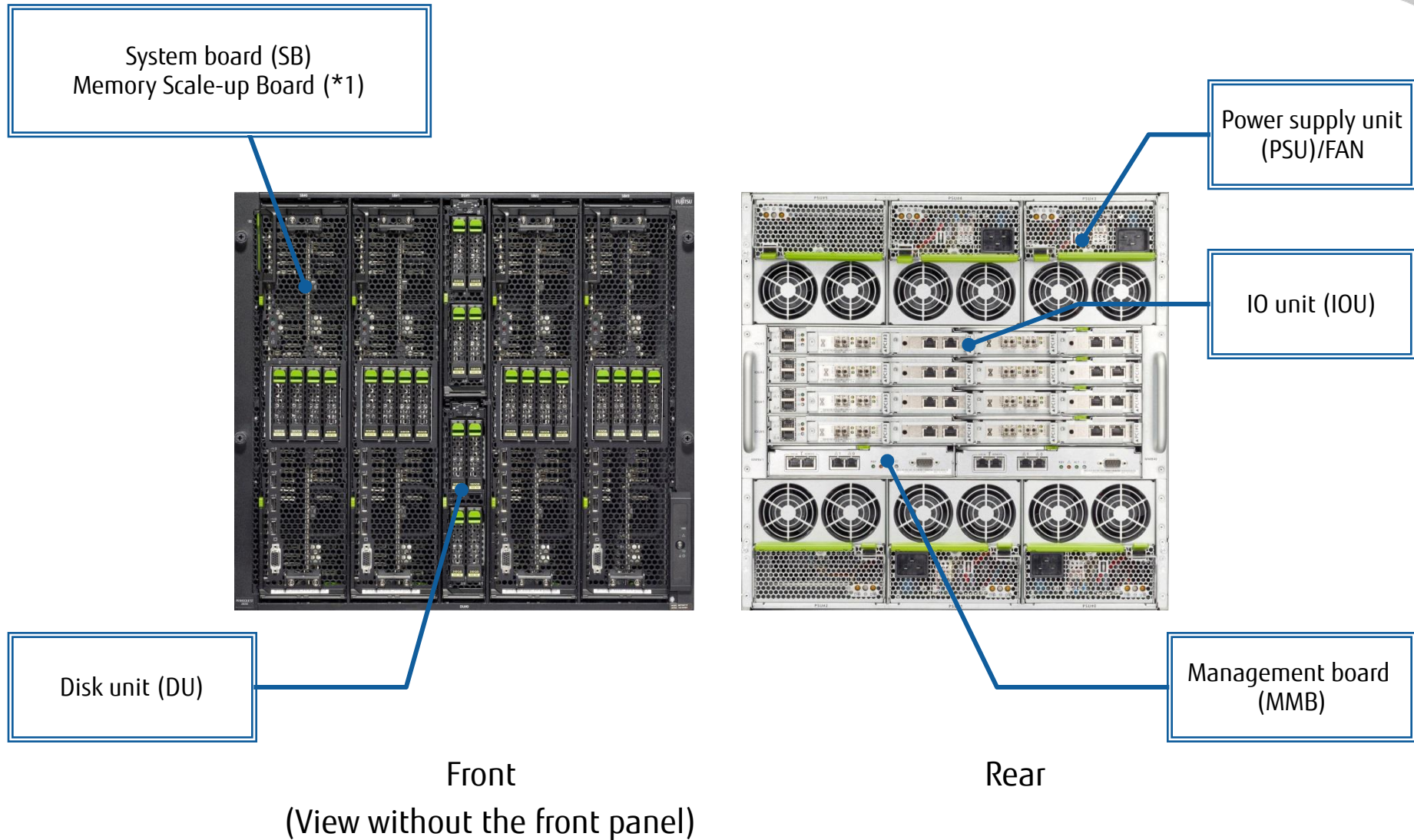


For details, refer to "Chapter 1 Product Overview" in "General Description".

1.3 Supported OS

👉 For the latest information on the supported OSs, refer to the following URL:
<http://sp.ts.fujitsu.com/dmsp/Publications/public/osrel-py.pdf>

1.4 Component Names



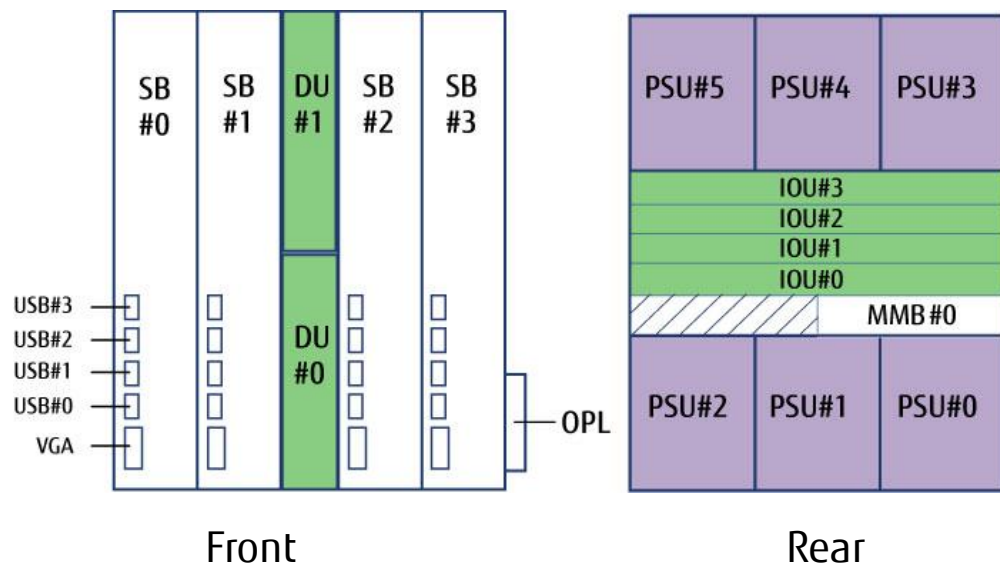
(*1) Memory Scale-up Boards are only available for the 2400E2/2400E3.

1.5 Basic Configuration

- Layout and Internal Connection Configuration for the 2800B2/2800B3
 - 👉 ["1.5.1 Basic Configuration \(2800B2/2800B3\)"](#)
- Layout and Internal Connection Configuration for the 2400E2/2400E3
 - 👉 ["1.5.2 Basic Configuration \(2400E2/2400E3\)"](#)
- Layout and Internal Connection Configuration for the 2400E2/2400E3 with Memory Scale-up Board
 - 👉 ["1.5.3 Basic Configuration \(2400E2/2400E3\) with Memory Scale-up Board"](#)
- Layout and Internal Connection Configuration for the 2800E2/2800E3
 - 👉 ["1.5.4 Basic Configuration \(2800E2/2800E3\)"](#)

1.5.1 Basic Configuration (2800B2/2800B3) (1/2)

■ 2800B2/2800B3 Layout

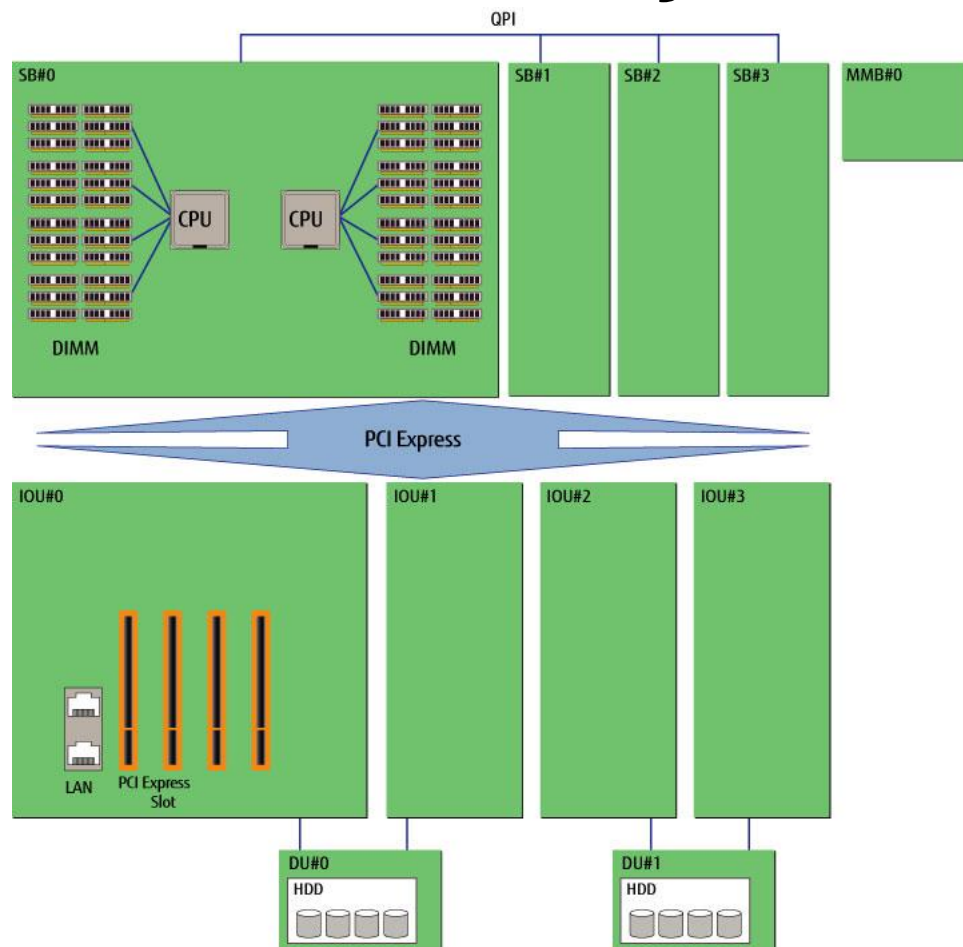


Basic components

Component	Max. installable number	Installed as standard
SB	4	No (must be ordered)
IOU	4	No (must be ordered)
MMB	1	1
PSU	6	No (must be ordered)
FAN	3	No
DU	2	No
AC cable	6	No (must be ordered)

1.5.1 Basic Configuration (2800B2/2800B3) (2/2)

Internal Connection Configuration for 2800B2/2800B3



QPI: QuickPath Interconnect

Maximum number of ports and cards for network connection

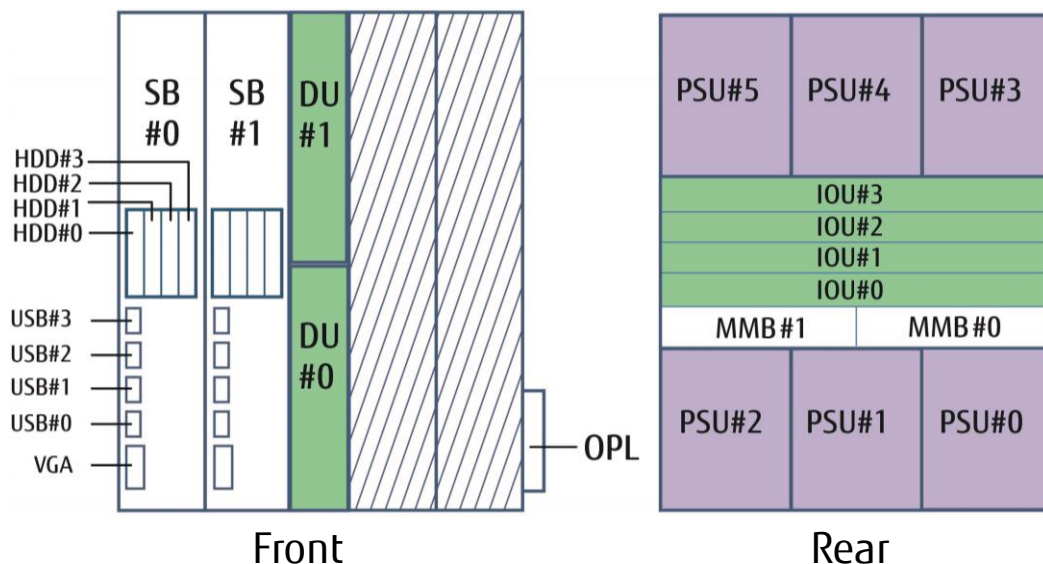
Component	Maximum number of ports and cards
IOU onboard LAN ports	8 ports
PCI Express slots on IOUs	16 cards (*1)

(*1) Three cards per 10GbE IO unit and four cards per 1GbE IO unit

👉 For details on the configuration, refer to "General Description".

1.5.2 Basic Configuration (2400E2/2400E3) (1/2)

■ 2400E2/2400E3 Layout

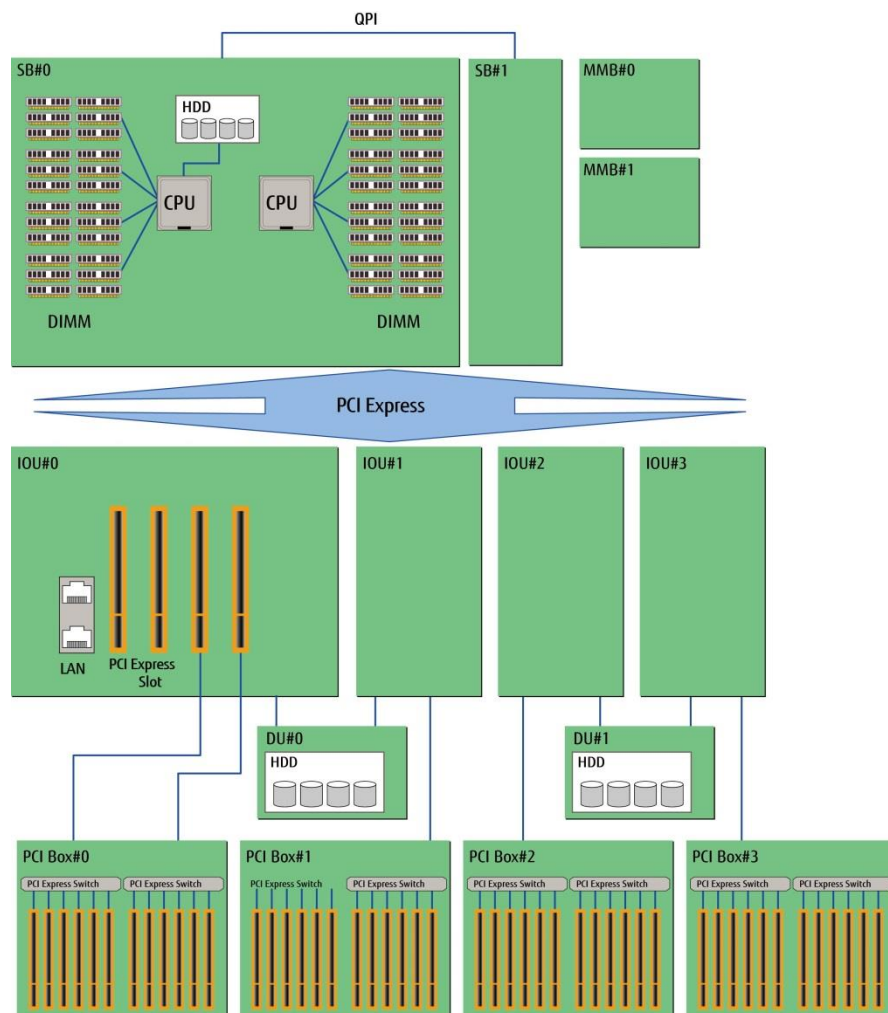


Basic components

Component	Max. installable number	Installed as standard
SB	2	No (must be ordered)
IOU	4	No (must be ordered)
MMB	2	1
PSU	6	No (must be ordered)
FAN	4	No
DU	2	No
AC cable	6	No (must be ordered)

1.5.2 Basic Configuration (2400E2/2400E3) (2/2)

Internal Connection Configuration for 2400E2/2400E3



Maximum number of ports and cards for network connection

Component	Maximum number of ports and cards
IOU onboard LAN ports	8 ports
PCI Express slots on IOUs	16 cards (*1)
PCI Express slots on PCI Boxes	48 cards

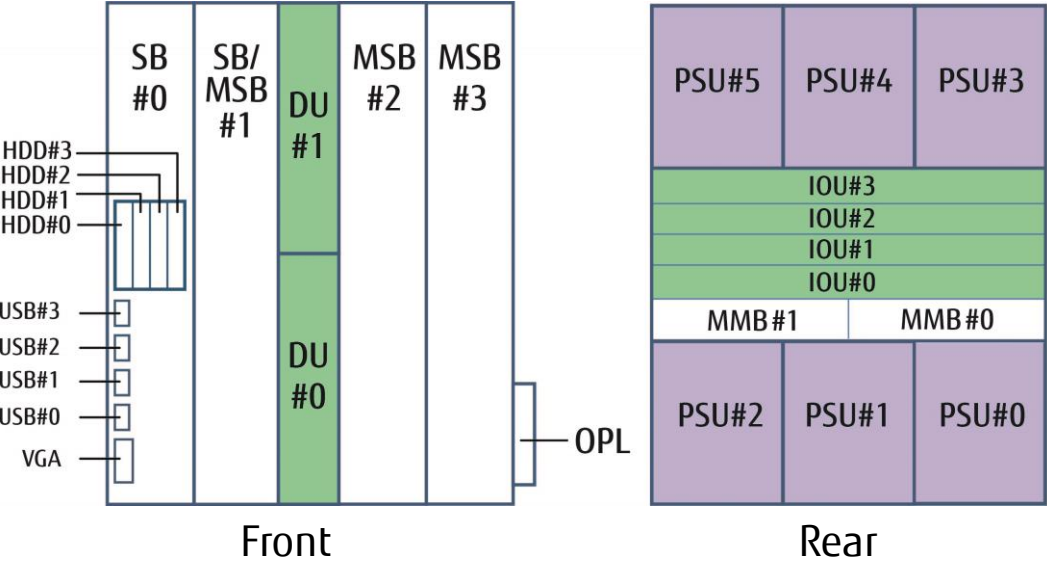
(*1) Three cards per 10GbE IO unit and four cards per 1GbE IO unit

* The number of available PCI Box slots depends on which type of IO unit is selected.

 For details on the configuration, refer to "General Description".

■

2400E2/2400E3 with Memory Scale-up Board Layout

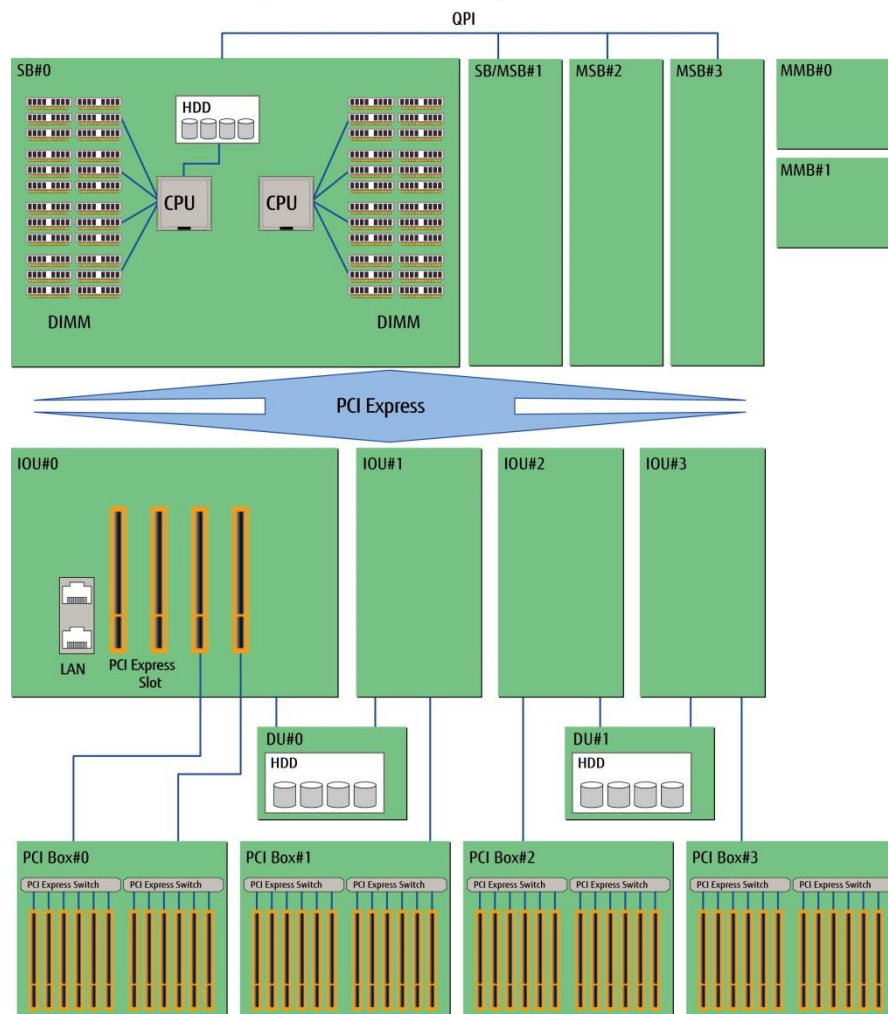


MSB: Memory Scale-up Board

Basic components

Component	Max. installable number		Installed as standard
SB	2	4	No (SBs must be ordered)
Memory Scale-up Board	3		
IOU	4		No (must be ordered)
MMB	2		1
PSU	6		No (must be ordered)
FAN	3		No
DU	2		No
AC cable	6		No (must be ordered)

■ Internal Connection Configuration for the 2400E2/2400E3 with Memory Scale-up Board



MSB: Memory Scale-up Board

Maximum number of ports and cards for network connection

Component	Maximum number of ports and cards
IOU onboard LAN ports	8 ports
PCI Express slots on IOUs	16 cards (*1)
PCI Express slots on PCI Boxes	48 cards

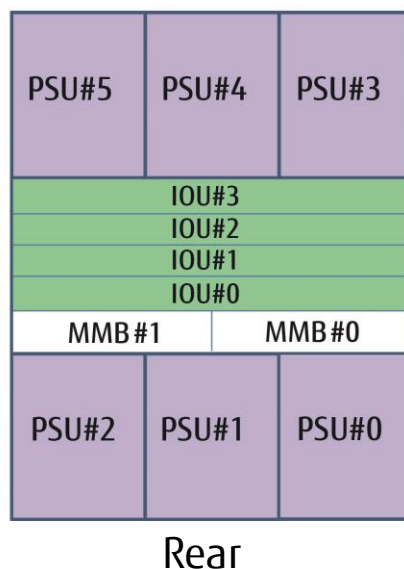
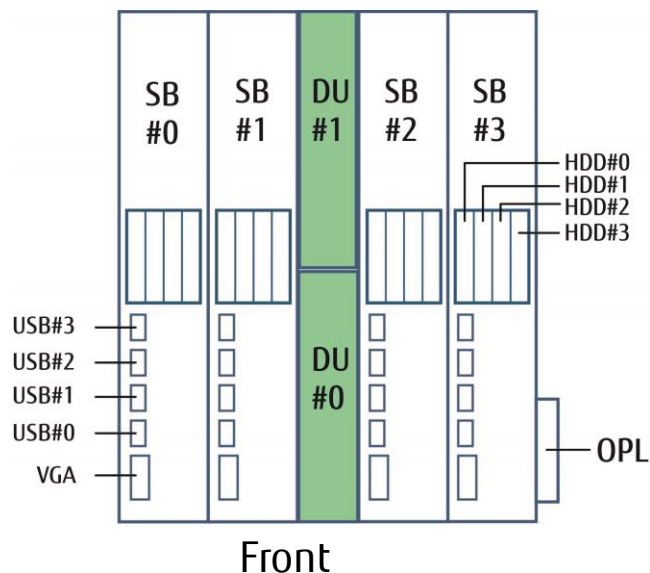
(*1) Three cards per 10GbE IO unit and four cards per 1GbE IO unit

* The number of available PCI Box slots depends on which type of IO unit is selected.

 For details on the configuration, refer to "General Description".

1.5.4 Basic Configuration (2800E2/2800E3) (1/2)

■ 2800E2/2800E3 Layout

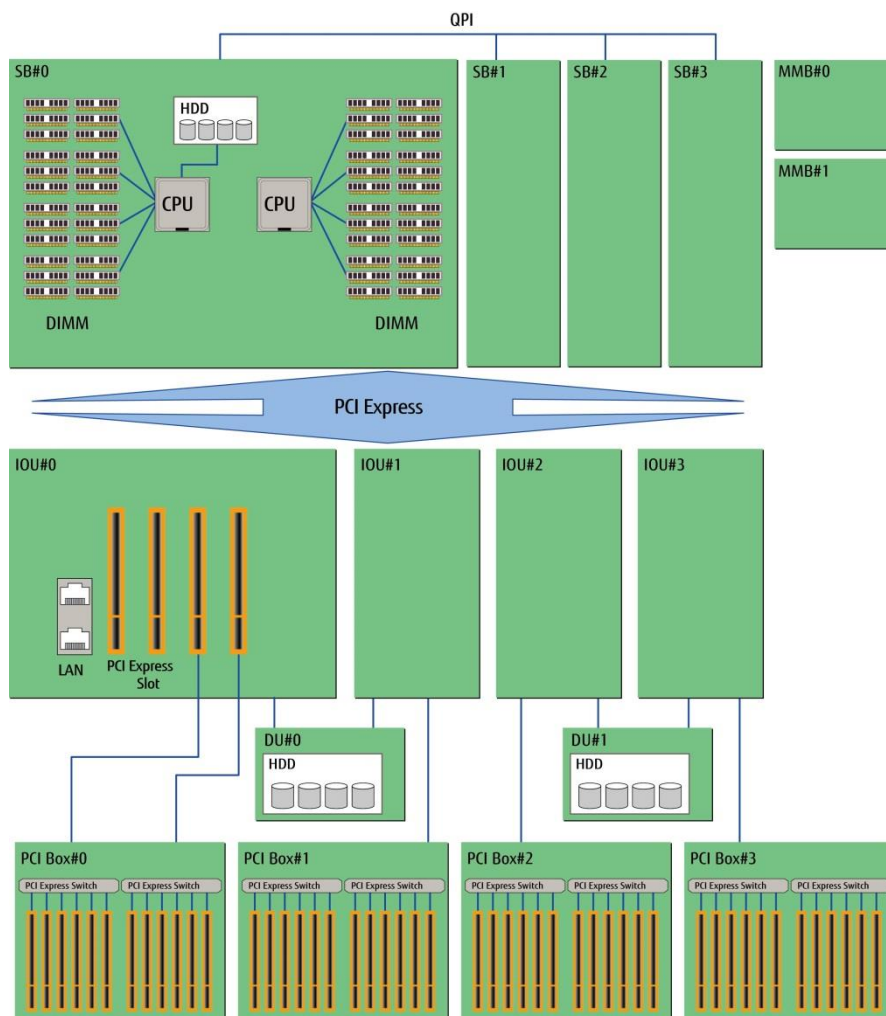


Basic components

Component	Max. installable number	Installed as standard
SB	4	No (must be ordered)
IOU	4	No (must be ordered)
MMB	2	1
PSU	6	No (must be ordered)
FAN	3	No
DU	2	No
AC cable	6	No (must be ordered)

1.5.4 Basic Configuration (2800E2/2800E3) (2/2)

Internal Connection Configuration for 2800E2/2800E3



Maximum number of ports and cards for network connection

Component	Maximum number of ports and cards
IOU onboard LAN ports	8 ports
PCI Express slots on IOUs	16 cards (*1)
PCI Express slots on PCI Boxes	48 cards

(*1) Three cards per 10GbE IO unit and four cards per 1GbE IO unit

* The number of available PCI Box slots depends on which type of IO unit is selected.

👉 For details on the configuration, refer to "General Description".

1.6 Features (1/7)

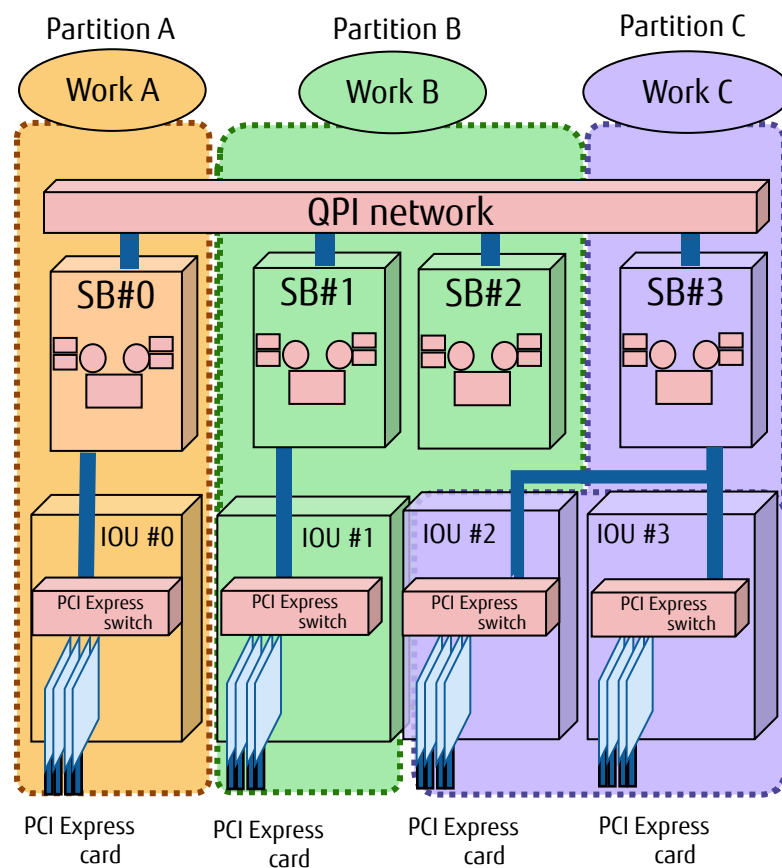
■ Hardware Partitioning (PPAR)

PPAR creates multiple separate blocks (partitions) in one cabinet and operates an independent system in each partition to allow flexible system operation.

- A different OS can be operated in each partition. Configuration example: 8 socket model
- An OS in one partition can be rebooted or shut down separately from other partitions.
- The partitions can be configured flexibly by using flexible I/O and Reserved SBs.


👉 For details, refer to "[3.2 Key Points for Hardware Partitioning Design](#)".

- Multiple configurations can be operated in a single cabinet, and multiple servers that are operated separately from each other can be integrated in the cabinet.
- If a failure occurs in a partition, the hardware can protect other partitions from being affected by the failure.



1.6 Features (2/7)

■ Memory Mirror Function

 For details, refer to "[2.2 System Board \(SB\)](#)".

Full Mirror Mode (which allows mirroring for all the memory that is installed in a PPAR block) and Partial Mirror Mode (which allows mirroring for only the memory on the Home SB in a PPAR block) are supported.

■ Memory Spare Function

This function ensures uninterrupted system operation by pro-actively monitoring the memory to detect a problem at the earliest possible time. Data is copied if a problem is detected.

■ Memory Scale-up Board

Memory Scale-up Boards are used for expanding the memory capacity of the partitions.

- Memory Scale-up Boards are only supported for the 2400E2/2400E3. A maximum of three boards can be installed in a cabinet.
- A maximum of 3TB can be installed in a single board.

■ Flexible I/O

- Partitioning does not have any limitations on the placement of SBs and IOUs.
- Flexible I/O enables the Reserved SB function by using alternative SBs.

1.6 Features (3/7)

■ Reserved SB Function

 For details, refer to "[3.2 Key Points for Hardware Partitioning Design](#)".

This function automatically disconnects a failed SB, incorporates a spare SB that has been configured in advance, and starts PPAR to continue system operation.

■ Degradation Function

If redundantly configured hardware fails, this function isolates the failed component and configures the system with the remaining hardware resources to continue system operation.

■ Active Processor Cores

This function specifies the number of CPU cores to run in a partition. The Active Processor Cores function is used in cases such as software license errors that occur when the number of CPU cores in SBs increases after the SBs are switched by the Reserved SB function.

* Consult your software vendors before using this function to reduce the number of software licenses.

■ Extended Partitioning

This function further divides the blocks that were divided by PPAR into smaller partitions.

■ Extended Socket

This function enables high-speed communications of up to 20Gbps between extended partitions that were configured in the same physical partition.

1.6 Features (4/7)

■ Dynamic Reconfiguration

Dynamic Reconfiguration links with RHEL to enable the addition or the removal of hardware resources such as CPUs, memory, and I/O in a partition without stopping the PPAR system.

Adding or removing SB units or IOU units with PCI Box LH modules is possible.

Notes on hot removal of SBs:

2400E2/2800E2 supports hot removal of SBs for RHEL 7.1 or later.

2400E3/2800E3 supports hot removal of SBs for RHEL 7.2 or later.

■ RAID

 For details, refer to "[3.3 Key Points for I/O Configuration Design](#)".

Software RAID and hardware RAID ensures the reliability and availability of the system.

■ Redundancy

By duplicating or multiplexing internal components, even if memory or other hardware fails, it is possible to prevent the system operation from being stopped.

1.6 Features (5/7)

■ Hot Plug

A component that is stopped due to a failure can be replaced without stopping the operation of the partition.

■ Original Dump Function

☞ For details, refer to "[3.3 Key Points for I/O Configuration Design](#)".

This function collects system information when a problem occurs in the OS.

■ Cluster System

☞ For details, refer to "[3.4 Key Points for Cluster Configurations](#)".

Partition redundancy that is based on an inter-cabinet cluster or an intra-cabinet cluster is supported.

■ Boot Devices

The following boot types are supported:

- Internal HDD/SAS-SSD (RAID card)
- HDD/SAS-SSD installed in a JX40 S2 (RAID card)
- iSCSI-SAN boot
- FC-SAN boot
- FCoE boot

1.6 Features (6/7)

■ Remote Operation Function

■ Wake On LAN (WOL) Function

- This function enables the power of partitions to be controlled remotely.
- Both onboard LANs on IOUs and LAN cards are supported.

■ Preboot eXecution Environment (PXE) Function

- This function enables operations such as installing and updating the OS to be managed from a server on the network.
- Only onboard LANs on IOUs are supported. (LAN cards are scheduled to be supported in the future.)

■ Console Functions

• Video Redirection Connection

This function remotely performs KVM operations from a console that is connected to a LAN. This allows a virtual media function (in which FD/CD/DVD drives on the console PC can be used as the drives for the PRIMEQUEST).

• Text Console Redirection (for Maintenance)

This function directs the serial output from a partition to a terminal via a LAN.

■ USB Port Disable Function

The front USB ports on the Home SB can be enabled or disabled in the BIOS menu.

1.6 Features (7/7)

■ Green Compliance and Power Saving

■ Power Saving Function

This function automatically adjusts the system operation so that the power consumption does not exceed the specified maximum value.

■ Energy-Saving Measures

- Power-efficient devices (LV-DIMM and SAS-SSD) are available.
- A highly-efficient power supply unit (80 PLUS platinum certified) is available.

■ Optimized Cooling

Cooling is optimized by finely controlling the FAN speed for each cooling group.

■ Reduction of Power Consumption

Power capping for PRIMEQUEST can automatically lower system performance so as to keep power consumption under pre-determined value.

■ Compliant with RoHS Directive (Revision in September 2010)

2. Basic Hardware Configuration

This chapter describes the basic configuration of each component.

For details, refer to "General Description".

2.1 Operator Panel (OPL)

The panel for displaying the system status

■ System LED Control

A device (I2C LED Driver) installed to control the system LEDs that display the system status.

■ Intake Air Temperature Sensor

A sensor that is installed for monitoring the intake air temperatures of the main unit.

■ System FRU

A system FRU (I2C EEPROM) that is installed for storing information about the main unit.



2.2 System Board (SB)

A board for installing CPUs and memory. Internal storage can be installed in higher-end models compared to the 2400E2/2400E3.

■ Features

- Up to four SBs can be installed in a cabinet (or up to two SBs for a 2 or 4 socket model).
- At least one CPU and a set of memory modules (two modules) must be installed on an SB. Up to two CPUs, 24 sets of memory modules (48 modules), one RAID card, four 2.5-inch internal hard disk drives (HDDs) or internal solid state drives (SAS-SSDs) can be installed on an SB.
- In RAID configurations, hot replacements can be performed for internal HDDs and SAS-SSDs (excluding RAID0 and non-mirror configurations).
- RAID0, RAID1, RAID1E, RAID5, RAID6, and RAID10 are supported.
- A hot spare disk is supported.

■ External Ports

For a partition, the following ports are supported for the local KVM.

(The local KVM cannot be connected permanently.
Use the video redirection function.)

When multiple SBs are used to configure partitions, only the external ports of the Home SB are available.

- USB 1.1/USB 2.0 x 4 (USB Type A)
- VGA x 1 (D-sub 15pin)



USB ports →

VGA port →

2.2.1 CPU (1/5)

Intel® Xeon® processors are used.

A QPI interface and memory controllers are integrated in these processors.

It is possible to scale up the configuration by connecting CPUs via the QPI.

CPUs Supported by
the PRIMEQUEST
2000 Series (1)

Product number	Performance	Number of cores	2800B2	2400E2	2800E2
Intel® Xeon® Processor E7-8890v3	2.50GHz/45.0MB	18	Yes	Yes	Yes
Intel® Xeon® Processor E7-8880v3	2.30GHz/45.0MB	18	Yes	Yes	Yes
Intel® Xeon® Processor E7-8870v3	2.10GHz/45.0MB	18	Yes	Yes	Yes
Intel® Xeon® Processor E7-8867v3	2.50GHz/45.0MB	16	Yes	Yes	Yes
Intel® Xeon® Processor E7-8860v3	2.20GHz/40.0MB	16	Yes	Yes	Yes
Intel® Xeon® Processor E7-8891v3	2.80GHz/45.0MB	10	Yes	Yes	Yes
Intel® Xeon® Processor E7-8893v3	3.20GHz/45.0MB	4	Yes	Yes	Yes

Note: For the latest information on the supported CPUs, contact your sales representative.

The CPUs that can be installed vary between models. The CPUs listed in table (1) and table (2) cannot be mixed.

To use Memory Scale-up Boards, two CPUs must be installed in the system board of the connection destination.

However, connections to Memory Scale-up Boards are not available if the Intel® Xeon® Processor E7-8860v3 is installed in the system board.

Yes: Installable

-: Not installable

2.2.1 CPU (2/5)

CPUs Supported by
the PRIMEQUEST
2000 Series (2)

Product number	Performance	Number of cores	2800B3	2400E3	2800E3
Intel® Xeon® Processor E7-8894v4	2.40GHz/60.0MB	24	Yes	Yes	Yes
Intel® Xeon® Processor E7-8890v4	2.20GHz/60.0MB	24	Yes	Yes	Yes
Intel® Xeon® Processor E7-8880v4	2.20GHz/55.0MB	22	Yes	Yes	Yes
Intel® Xeon® Processor E7-8870v4	2.10GHz/50.0MB	20	Yes	Yes	Yes
Intel® Xeon® Processor E7-8867v4	2.40GHz/45.0MB	18	Yes	Yes	Yes
Intel® Xeon® Processor E7-8860v4	2.20GHz/45.0MB	18	Yes	Yes	Yes
Intel® Xeon® Processor E7-8855v4	2.10GHz/35.0MB	14	Yes	Yes	Yes
Intel® Xeon® Processor E7-8891v4	2.80GHz/60.0MB	10	Yes	Yes	Yes
Intel® Xeon® Processor E7-8893v4	3.20GHz/60.0MB	4	Yes	Yes	Yes

Note: For the latest information on the supported CPUs, contact your sales representative.

The CPUs that can be installed vary between models. The CPUs listed in table (1) and table (2) cannot be mixed.

To use Memory Scale-up Boards, two CPUs must be installed in the system board of the connection destination.

However, connections to Memory Scale-up Boards are not available if the Intel® Xeon® Processor E7-8855v4 is installed in the system board.

Yes: Installable

-: Not installable

2.2.1 CPU (3/5)

■ QuickPath Interconnect (QPI)

- A high-speed system bus delivering up to 9.6GT/s (bandwidth 38.4GB/s)
- The QPI connects a CPU and a chipset or connects CPUs to each other.

■ CPU Installation Conditions



For details, refer to "Appendix G Component Mounting Conditions" in "Administration Manual".

- CPUs must be installed from CPU#0 on an SB in the order of the slot numbers.
- SBs in which no CPU is installed cannot be incorporated in a PPAR block.
- At least one set of memory modules (two modules) must be installed for a CPU.

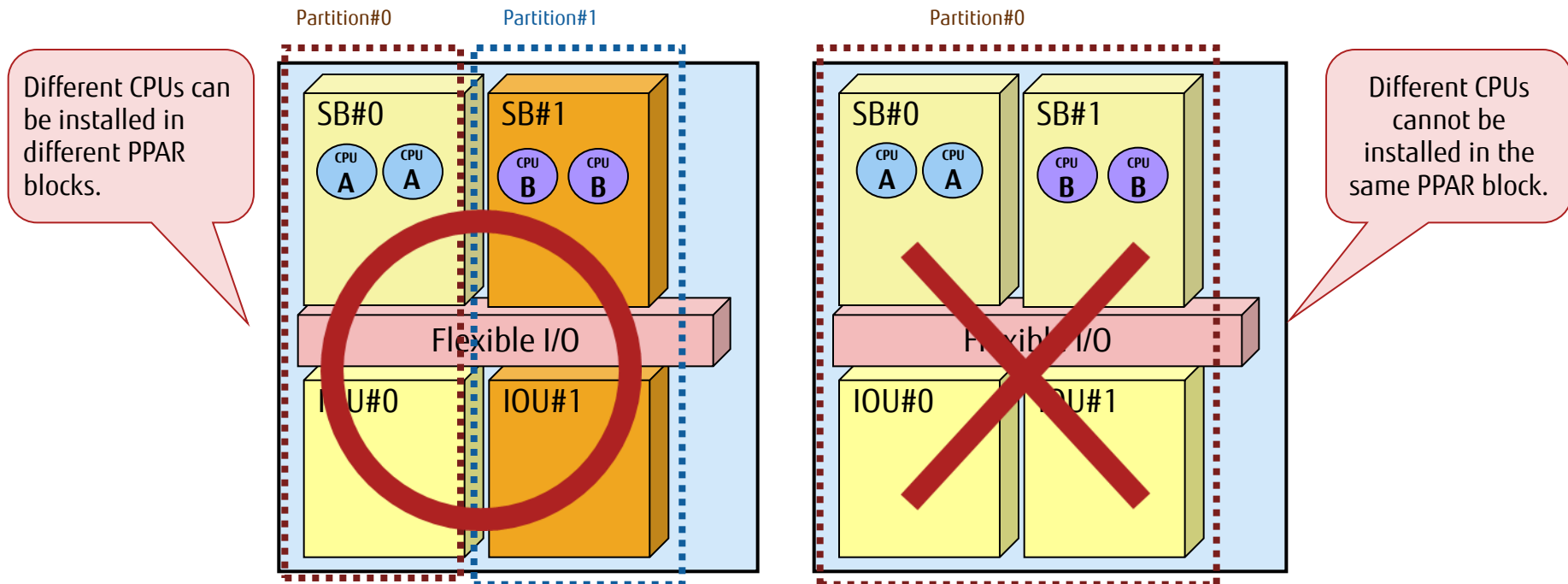
■ Conditions for Installing Different CPUs

Different types of CPUs can be installed in different PPAR blocks.
(The CPUs must be supported in the PRIMEQUEST model.)

2.2.1 CPU (4/5)

■ Conditions for Installing Different CPUs (1/2)

Different types of CPUs can be installed in different PPAR blocks of a cabinet (*).



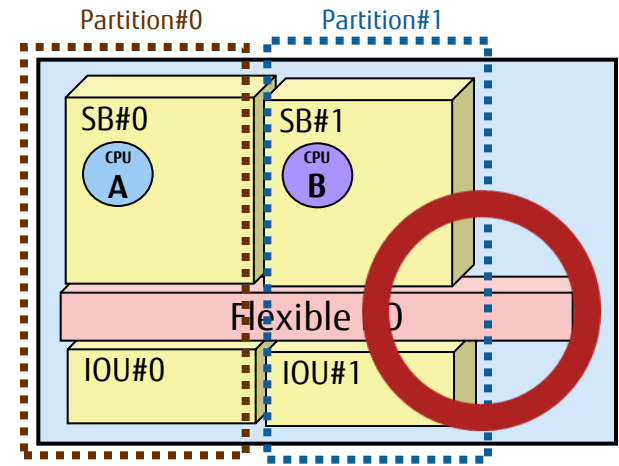
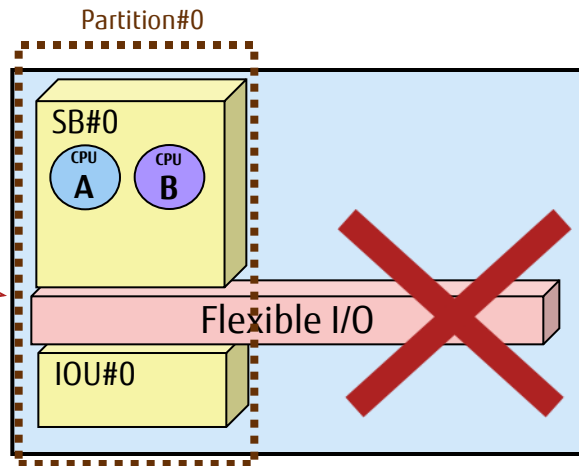
(*) The CPUs must be supported in the PRIMEQUEST model.

2.2.1 CPU (5/5)

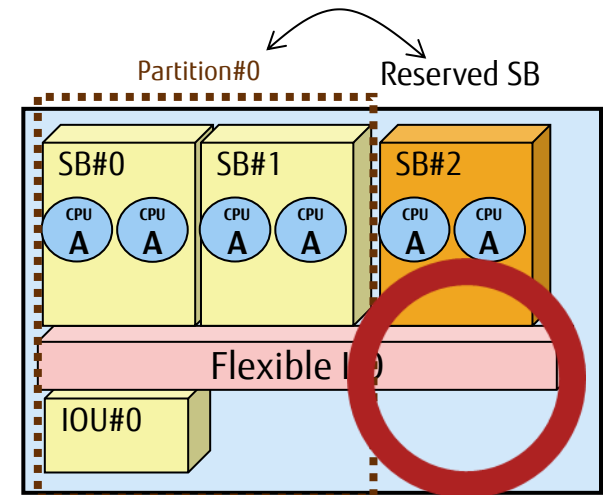
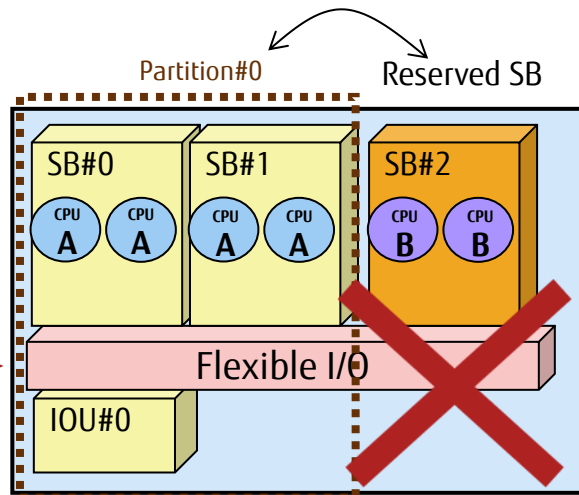
■ Conditions for Installing Different CPUs (2/2)

Different types of CPUs cannot be installed in the same PPAR block of a cabinet.

Different types of CPUs cannot be installed in the same PPAR block.



This installation is not allowed because PPAR#0 is switched from SB#0 to SB#2 if a failure occurs in SB#0.



2.2.2 Memory (1/7)

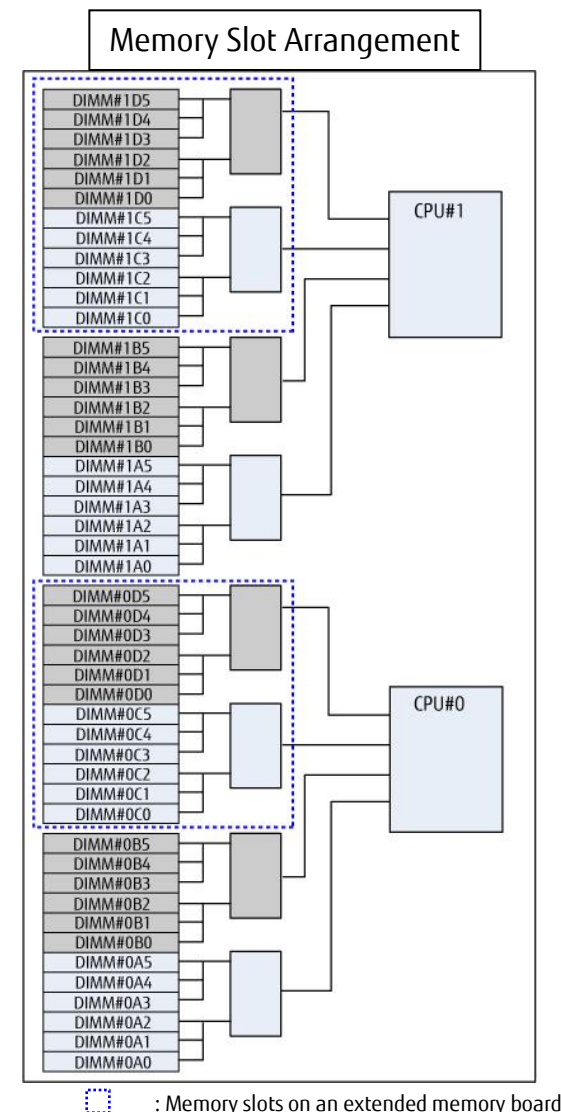
Supported memory types are 8GB, 16GB, 32GB, 64GB, and 128GB DDR3/DDR4 DIMM.

- Install a set of two identical DIMMs.
 - Install four DIMMs (two sets) to use the Memory Mirror function. (Refer to "[2.2.2 Memory \(4/7\)](#)".)
 - Install six DIMMs (three sets) to use the Memory Spare function. (Refer to "[2.2.2 Memory \(4/7\)](#)".)
 - Refer to "[2.2.2 Memory \(5/7\)](#)" to use the Dynamic Reconfiguration function in either of the following conditions:
 - When one partition is configured with a total of four boards that consist of system boards and Memory Scale-up boards.
 - When one PPAR block is configured with eight CPUs and the Segment Mode (*1) is set as the PCI Address mode.
- For one CPU, six sets of memory modules can be installed in the memory slots on the SB and another six sets of memory modules can be installed on an optional extended memory board.
- Installed memory operates only when the relevant CPU is operating.
- Installation Group
 - Install memory modules in pairs where the memory slot numbers third digit has a difference of 3.
- 128GB DIMMs are supported only AC 200V environment.

Installation Group (1 CPU and Normal Mode)

Installation group	Memory slot numbers
1	0A0, 0A3
2	0A1, 0A4
3	0A2, 0A5
4	0B0, 0B3
5	0B1, 0B4
6	0B2, 0B5
:	:
24	1D2, 1D5

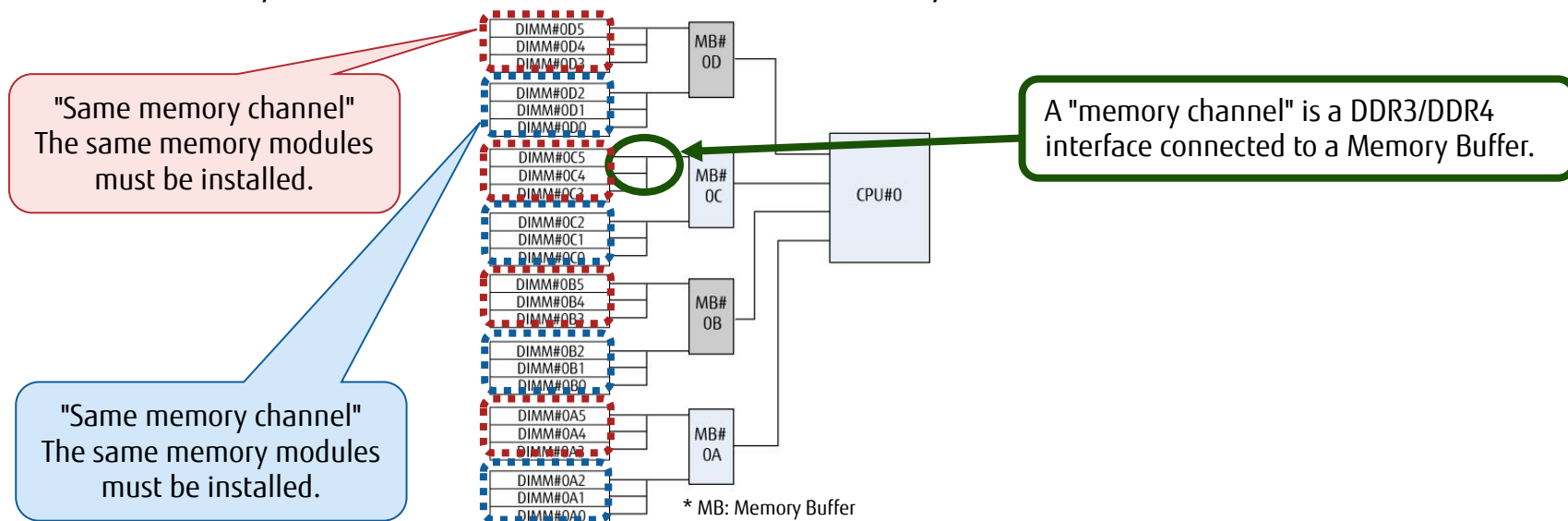
(*1) Segment Mode: A "PCI Address Mode" that uses Seg/Bus/Dev/Func (default) to configure a type of PCI space in a partition. Segment Mode allows the use of more I/O than "Bus Mode".



2.2.2 Memory (2/7)

■ Memory Installation Conditions

- For one CPU, 1 to 12 sets of memory modules can be installed.
- Memory must be added on a set basis.
(Add memory on a two-set basis when the Memory Mirror function is used or on a three-set basis when the Memory Spare function is used.)
When only one set of memory module is installed, if one module fails, the SB is disconnected from the PPAR block. Therefore, it is recommended to install at least two sets of memory modules.
- Only the same memory modules can be installed to the same memory channel of each Memory Buffer. Different memory modules can be installed for different memory channels.



- When the Memory Mirror function is used, install the same configuration of memory (in size and the number of modules) in multiple memory channels that are used for mirroring.
- When the Memory Spare function is used, install the same memory modules in all six slots of the same Memory Buffer.

2.2.2 Memory (3/7)

■ Memory Installation Order

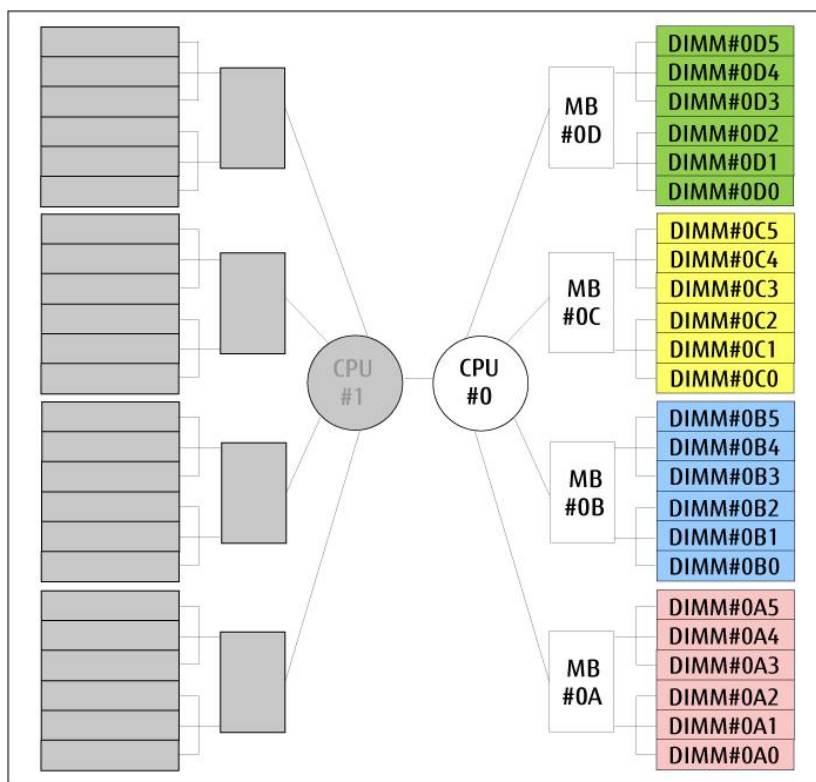
- When installing memory modules in the memory slots whose slot numbers have the same first and second digits, install the modules in the order of the third digit pairs, i.e., (0 and 3), (1 and 4), and (2 and 5).

☞ Refer to the table in the following "Example of Installation Order".

- There are multiple patterns in installation order depending on whether the Memory Mirror function or Memory Spare function is used or not.

☞ For details on installation order, refer to "G.2.1 DIMM mounting order and DIMM mixed mounting condition" in "Administration Manual" and the following slides.

[Example of Installation Order] 1 CPU and Normal Mode (The Same Type of Memory is Shown in the Same Color.)



CPU#	MB#	Memory slot#	Installation order
0	D	0D5	12
		0D4	8
		0D3	4
		0D2	12
		0D1	8
		0D0	4
	C	0C5	10
		0C4	6
		0C3	2
		0C2	10
		0C1	6
		0C0	2
	B	0B5	11
		0B4	7
		0B3	3
		0B2	11
		0B1	7
		0B0	3
	A	0A5	9
		0A4	5
		0A3	1
		0A2	9
		0A1	5
		0A0	1


2.2.2 Memory (4/7)

- DIMM installation order for each mode

	CPU#0								CPU#1							
Slot No.	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0C3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	1D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0C4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	1D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0C5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	1D5
Normal Mode	□1	□1	○4	○4	◇2	◇2	✧6	✧6	■1	■1	●5	●5	◆3	◆3	✧7	✧7
	□8	□8	○12	○12	◇10	◇10	✧14	✧14	■9	■9	●13	●13	◆11	◆11	✧15	✧15
	□16	□16	○20	○20	◇18	◇18	✧22	✧22	■17	■17	●21	●21	◆19	◆19	✧23	✧23
Mirror Mode	□1	□1	□1	□1	◇2	◇2	◇2	◇2	■1	■1	■1	■1	◆3	◆3	◆3	◆3
	□4	□4	□4	□4	◇6	◇6	◇6	◇6	■5	■5	■5	■5	◆7	◆7	◆7	◆7
	□8	□8	□8	□8	◇10	◇10	◇10	◇10	■9	■9	■9	■9	◆11	◆11	◆11	◆11
Spare Mode	□1	□1	○4	○4	◇2	◇2	✧6	✧6	■1	■1	●5	●5	◆3	◆3	✧7	✧7
	□1	□1	○4	○4	◇2	◇2	✧6	✧6	■1	■1	●5	●5	◆3	◆3	✧7	✧7
	□1	□1	○4	○4	◇2	◇2	✧6	✧6	■1	■1	●5	●5	◆3	◆3	✧7	✧7

(Slots with the same symbols must have the same type of DIMM installed.)

- Install DIMMs at the same time in the slots with the same installation order number.
- When only one CPU is installed, install the DIMMs in the slots starting from the smallest slot number on CPU#0.
- DIMMs are available in sets of two.

-  Refer to the next slide to use the Dynamic Reconfiguration function in either of the following conditions:
- When one partition is configured with a total of four boards that consist of system boards and Memory Scale-up boards.
 - When one PPAR block is configured with eight CPUs (Segment Mode).

2.2.2 Memory (5/7)

- DIMM installation order for each mode (when one of the following conditions apply)
 - Dynamic Reconfiguration is used
 - One partition is configured with four boards that are a combination of system boards and Memory Scale-up Boards
 - One PPAR block is configured with eight CPUs when the Segment Mode is set as the PCI Address mode

	CPU#0								CPU#1							
Slot No.	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0C3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	1D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0C4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	1D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0C5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	1D5
Normal Mode	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2
	□3	□3	○4	○4	□3	□3	○4	○4	□3	□3	○4	○4	□3	□3	○4	○4
	□5	□5	○6	○6	□5	□5	○6	○6	□5	□5	○6	○6	□5	□5	○6	○6
Mirror Mode	□1	□1	□1	□1	□1	□1	□1	□1	□1	□1	□1	□1	□1	□1	□1	□1
	□2	□2	□2	□2	□2	□2	□2	□2	□2	□2	□2	□2	□2	□2	□2	□2
	□3	□3	□3	□3	□3	□3	□3	□3	□3	□3	□3	□3	□3	□3	□3	□3
Spare Mode	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2
	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2
	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2	□1	□1	○2	○2

(Slots with the same symbols must have the same type of DIMM installed.)

- Install DIMMs at the same time in the slots with the same installation order number.
- When Dynamic Reconfiguration is used or one PPAR block is configured with eight CPUs, two CPUs are installed in an SB.
- When only one CPU is installed and Dynamic Reconfiguration is enabled, IOU- Dynamic Reconfiguration requires memory installation for CPU#0 in the above order.
- DIMMs are available in sets of two.

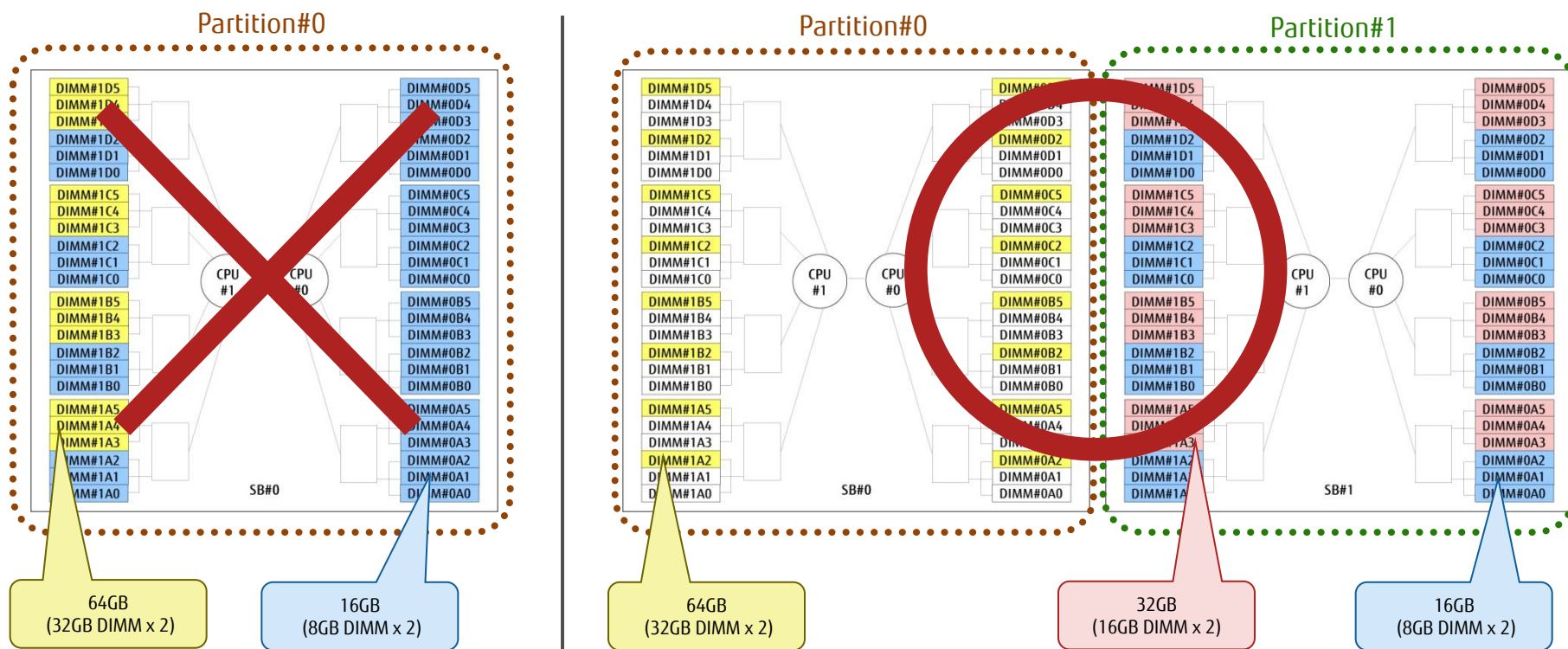
2.2.2 Memory (6/7)

■ Conditions of Installing Different Memory Modules

16GB memory (8GB single-rank (*1) DIMM x 2) and 32GB memory (16GB dual-rank (*1) DIMM x 2) can be installed in the same partition.

Different types of memory modules other than the above combination cannot be installed together in the same partition.

Different types of memory modules can be installed in a different partition on a different SB.



(*1) Memory rank: A unit of data input and output by a memory controller from the DRAM chips on a DIMM
Memory access performance increases as the rank number increases.

2.2.2 Memory (7/7)

■ Memory Mirror

- Mirroring is performed between the memory group in MB#xA and MB#xB and the memory group in MB#xC and MB#xD that are controlled by the same CPU.
- Memory Mirror is available even if only one CPU is installed in an SB.

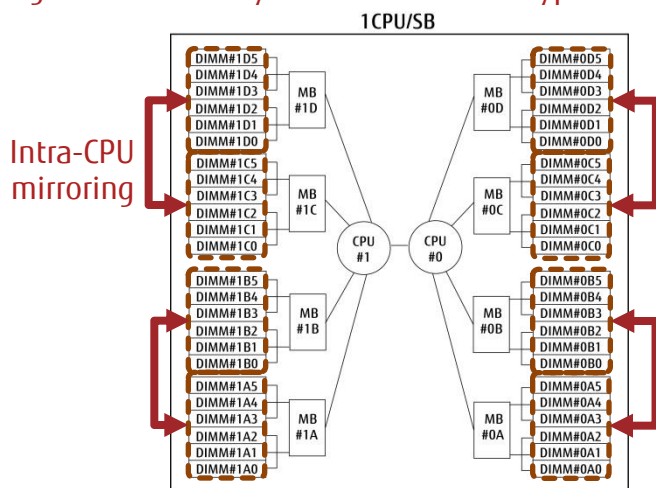
■ Memory Spare

- When multiple DIMM pairs are configured, a DIMM rank is used as a spare of other ranks.
- If the number of correctable errors that occur in a specific time period in a rank exceeds a threshold, the contents of the memory are copied to the rank that has been reserved as a spare and the DIMM rank in which the errors occurred is disconnected.

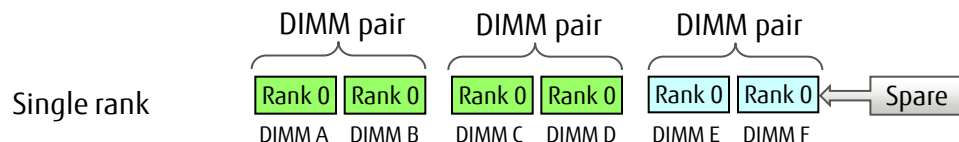
* Memory Mirror and Memory Spare cannot be enabled at the same time.

Memory Mirror

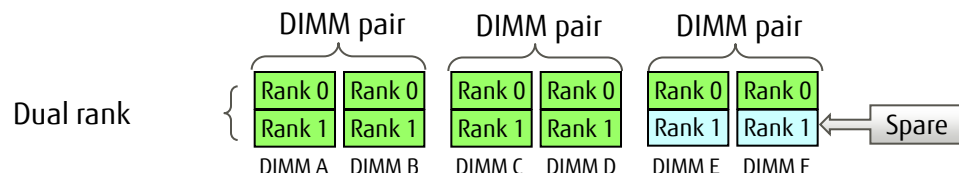
Mirroring is available only between the same types of memory.



Memory Spare



* The available memory capacity is two-thirds of the total capacity of the installed memory.



* The available memory capacity is five-sixths of the total capacity of the installed memory.

2.2.3 Memory Scale-up Board

Memory installation boards only for the 2400E2/2400E3

■ Features

- Up to three Memory Scale-up Boards can be installed in a cabinet.
- At least four sets of memory modules (eight modules) must be installed in a Memory Scale-up Board.
A maximum of 24 sets of memory modules (48 modules) can be installed in a Memory Scale-up Board.

■ Memory Installation Conditions

- Same as the system board (except 128GB DIMMs cannot be installed)
(For details, refer to ["2.2.2 Memory \(2/7\)"](#).)

■ Notes

- To use Memory Scale-up Boards, two CPUs must be installed in the system board of the connection destination.
However, connections to Memory Scale-up Boards are not available if the Intel® Xeon® Processor E7-8860v3 or the Intel® Xeon® Processor E7-8855v4 is installed in the system board.
- SBs can be specified as Reserved SBs even if the partitions also include Memory Scale-up Boards.
Memory Scale-up Boards do not support spare switching similar to Reserved SBs.
 - * Memory Scale-up Boards support the degradation function.
- The supported OSs are RHEL6 and RHEL7 only.
Windows Server, SLES, Oracle Linux, Oracle VM and VMware are not supported.



2.3 Management Board (MMB) (1/3)

A system control board that is equipped with an independent dedicated processor

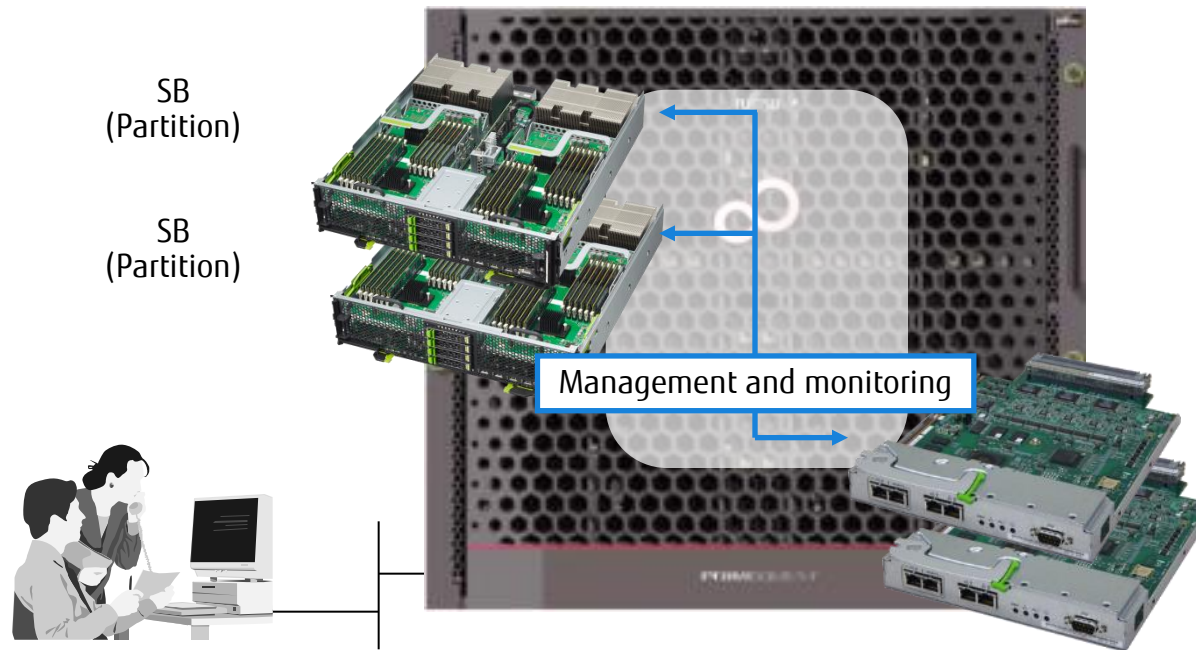
■ Features

- Redundant configuration can be achieved by installing two boards.
- Hot swap is possible only in a redundant configuration.
- The dedicated CPU operates as a dedicated host for system management.
- A Web server that is included in an MMB provides a graphical user interface.
- An MMB can be operated from a Web browser (GUI) on a remote PC, and it is not necessary to prepare an operation management server separately.
- Hardware management and monitoring function
- Consolidated management and monitoring of the power supply, fan, and hardware of each partition
- Hardware setup (configuration change) function
- Power control in the cabinet, sensor monitoring, partition configuration settings, Memory Mirror mode settings, and reset process
- Collection and display of operation logs and error logs



2.3 Management Board (MMB) (2/3)

- High-Level Security
 - An original protocol is used to perform internal communication.
 - Server management interfaces (Web Server and SNMP) are managed collectively.
 - It is possible to add user definitions that allow operating only specific partitions. This function prevents wrong operations and malicious operations on partitions.



MMB (One board is included in the default configuration. Another MMB can be added for redundancy.)

2.3 Management Board (MMB) (3/3)

■ External Ports

- User port x 2

Used to connect to the management LAN for operation management of PRIMEQUEST.

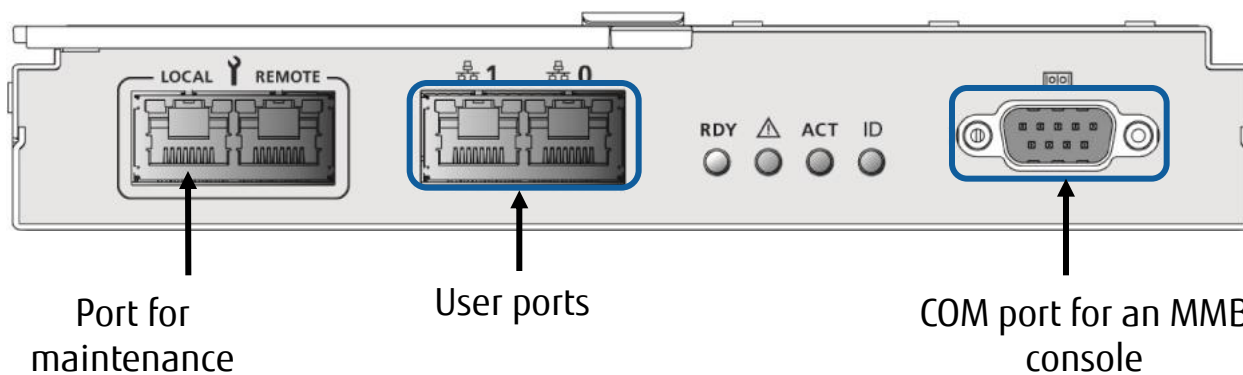
Duplication is possible.

- Port for maintenance x 1

Used by field engineers for maintenance.

- COM port for an MMB console

Used for initial setting.



2.4 IO Unit (IOU) (1/3)

A unit that is equipped with PCI Express slots and LAN ports

There are two types of IOUs: 1GbE and 10GbE.

■ Features

- An IOU connects components and external devices to an SB.
- Up to four IOUs can be installed in a cabinet.
- The number of PCI Express slots that can be installed in each IOU is as follows:
 - 1GbE IO unit : 4
 - 10GbE IO unit : 3
- To connect a PCI Box, install a PCI Box connection card in the specified PCI Express slot on the IOU.
- 1GbE IO units and 10GbE IO units can be installed together in the same cabinet.

2.4 IO Unit (IOU) (2/3)

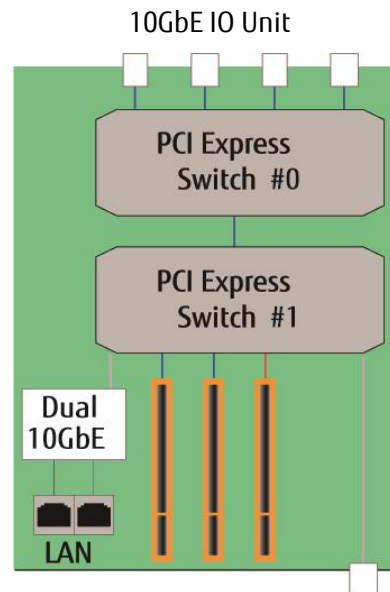
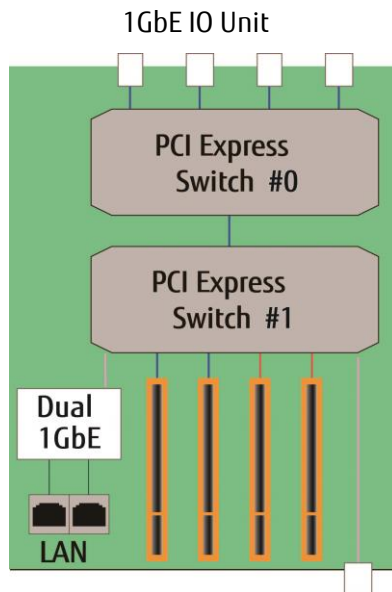
■ 1GbE IO Unit

- A 1GbE IO unit has two 1000BASE-T LAN ports.
- Up to four PCI cards with low profile bracket sizes can be installed.



■ 10GbE IO Unit

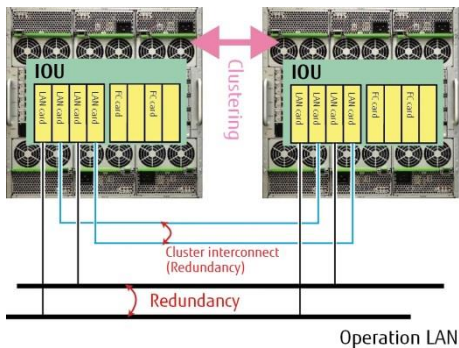
- A 10GbE IO unit has two 10GBASE-T LAN ports.
- Up to three PCI cards can be installed.
(If the bracket size of the PCI card is full height, up to two cards can be installed.)



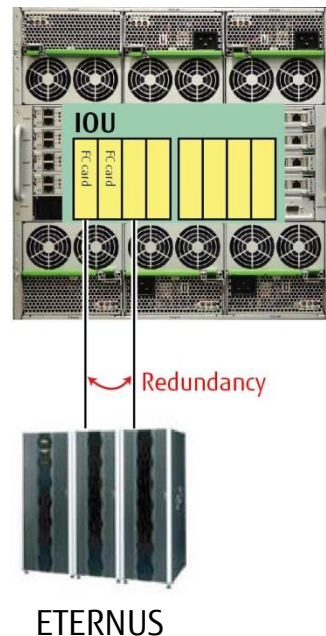
2.4 IO Unit (IOU) (3/3)

■ IOU Configuration Examples

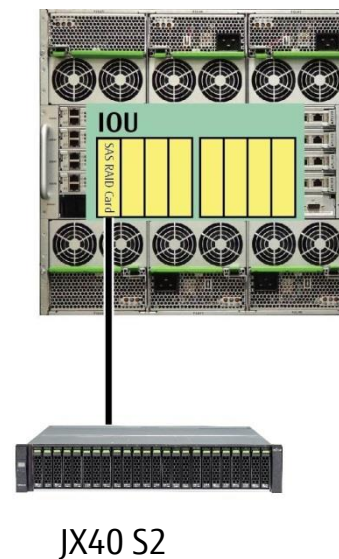
[Example with LAN Cards]
Addition of LAN ports in a cluster configuration



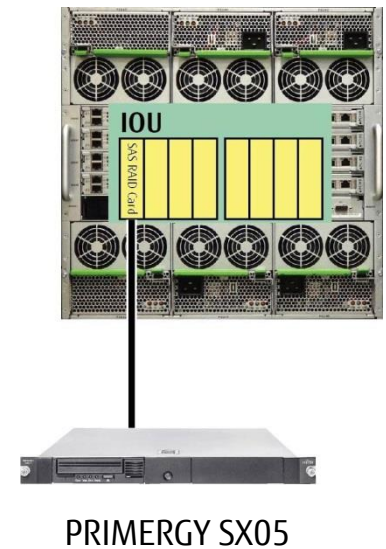
[Example with FC Cards]
Connection to an external storage device (ETERNUS)



[Example with a SAS Array Controller Card]
Connection to an external hard disk cabinet (JX40 S2)



[Example with a SAS Card]
Connection to a backup cabinet (PRIMERGY SX05)



2.5 Disk Unit (DU)

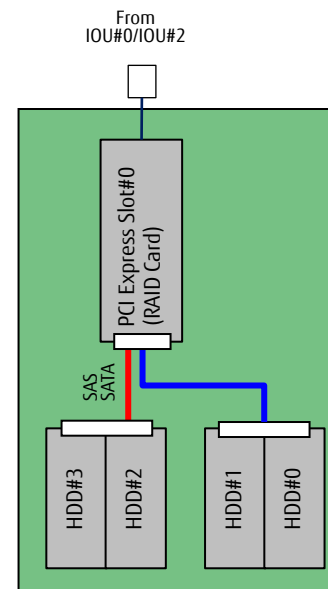
A unit in which internal storage is installed

■ Features

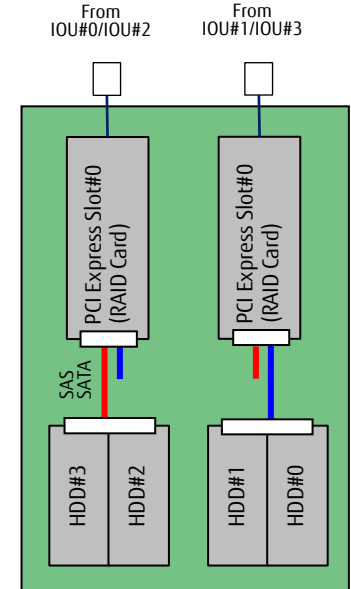
- Up to two units can be installed in a cabinet.
- Up to four 2.5-inch internal hard disk drives (HDDs) or internal solid state drives (SAS-SSDs) can be installed in a unit.
- In RAID configurations, hot replacements can be performed for internal HDDs and SAS-SSDs (excluding RAID0 and non-mirror configurations).
- RAID0, RAID1, RAID1E, RAID5, RAID6, and RAID10 are supported.
- A hot spare disk is supported.
- Up to two RAID cards can be installed in a unit.



Example with one RAID Card



Example with two RAID Cards



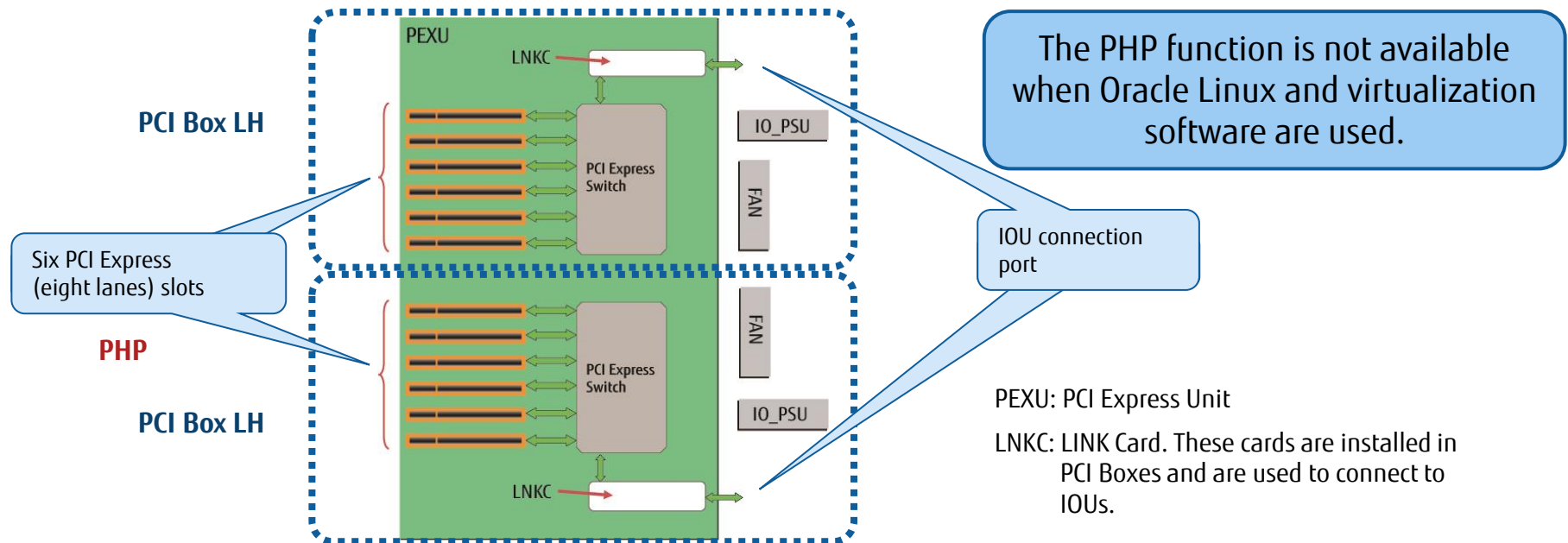
For details on RAID configurations, refer to "[3.3.4 HDD Configuration](#)".

2.6 PCI Box (1/4)

An extended I/O cabinet that is equipped with 12 PCI Express slots, each having eight PCI Express Gen3 (8Gbps) lanes

■ Features

- Up to four PCI Boxes can be connected to a cabinet.
(No PCI Box can be connected to 2800B2/2800B3.)
- The PCI Box connection card on an IOU is used to connect a PCI Box.
- PCI Hot Plug (PHP) for PCI Express cards is supported.
- A PCI Box can be divided into two partitions (PCI Box LH modules), each having six slots.
- PCI Boxes, power supply units and power cables for PCI Boxes need to be obtained separately.



PEXU: PCI Express Unit

LNKC: LINK Card. These cards are installed in PCI Boxes and are used to connect to IOUs.

👉 For details on the power supply configuration for a PCI Box, refer to "[3.5.1 Power Supply Redundancy](#)".

2.6 PCI Box (2/4)

■ IOU combinations and the available number of PCI slots

Model	Number of 1GbE IO units	Number of 10GbE IO units	Number of PCNCs	Number of PCI Boxes	Available number of slots
2400E2/2400E3 2800E2/2800E3	4	0	8	4	56
	3	1	7	3.5	50
	3	0	6	3	42
	2	2	6	3	44
	2	1	5	2.5	36
	2	0	4	2	28
	1	3	5	2.5	38
	1	2	4	2	30
	1	1	3	1.5	22
	1	0	2	1	14
	0	4	4	2	32
	0	3	3	1.5	24
	0	2	2	1	16
	0	1	1	0.5	8

Note: PCI Box connection cards (PCNCs) must be installed in IOUs to connect PCI Boxes.

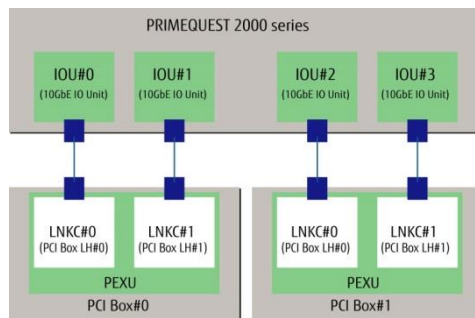
One PCI Box connection cable is bundled with each PCNC. Six of the PCI Box slots can be used with one PCNC.

2.6 PCI Box (3/4)

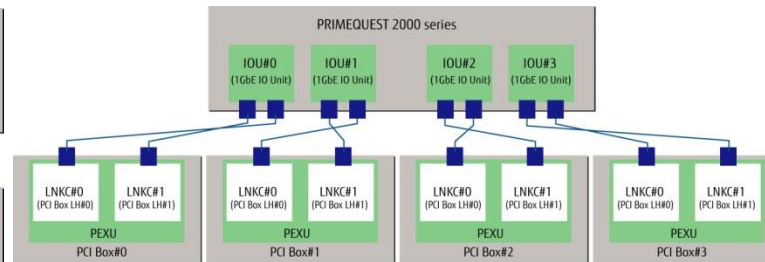
■ PCI Box Connection Conditions

Different cabinets cannot be connected to a PCI Box (PCI Boxes cannot be shared by servers).

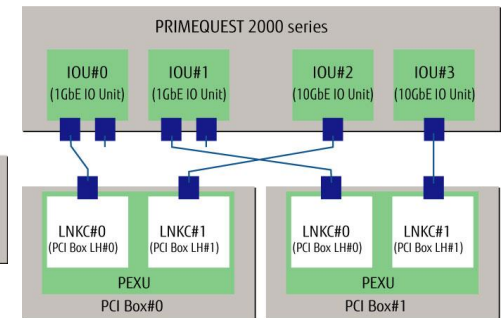
Straight Connection



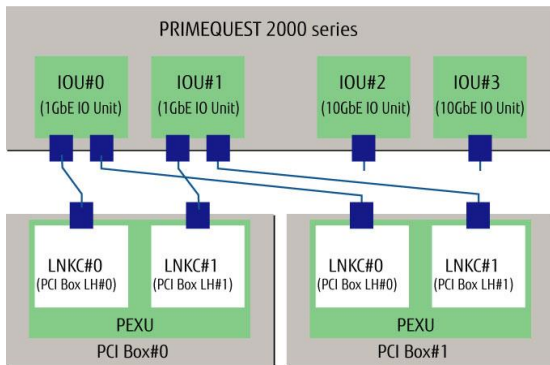
Cross Connection



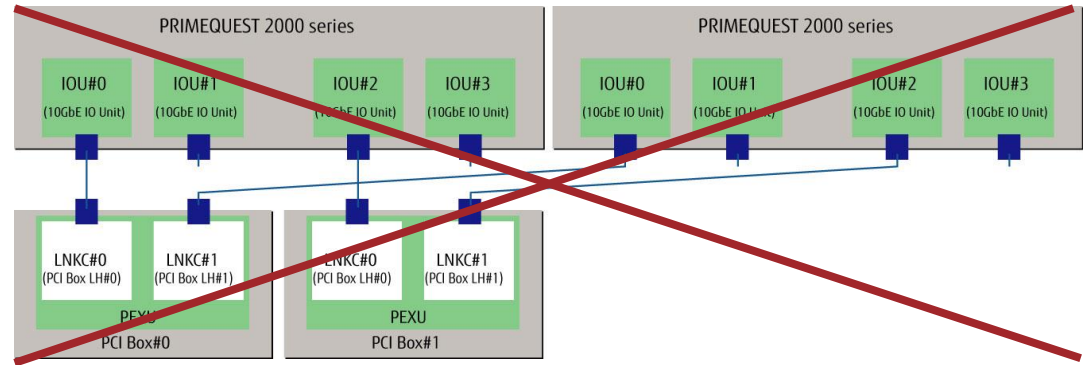
Connection from 1GbE IO Units and 10GbE IO Units



Connection to Different PCI Boxes



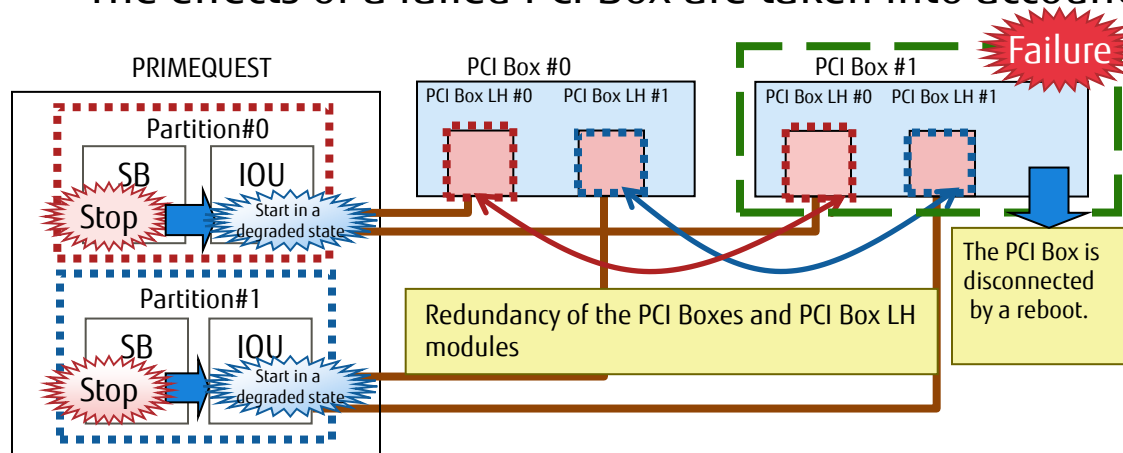
Connection from Different Cabinets to a PCI Box



* The connection configuration depends on the type of IO unit that is to be installed.

2.6 PCI Box (4/4)

- A Configuration for Redundancy of PCI Boxes and PCI Box LH modules
The effects of a failed PCI Box are taken into account.



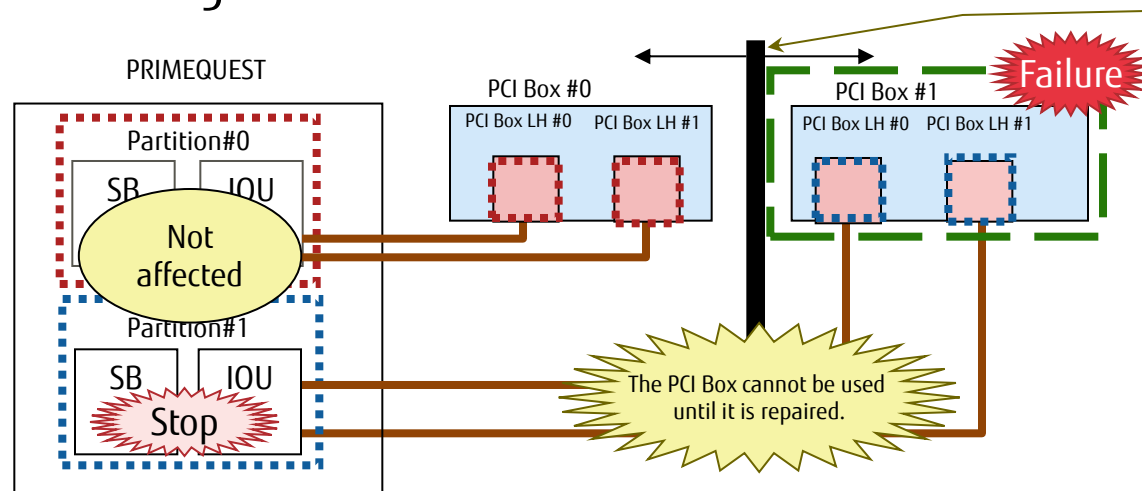
Advantage

Even if one PCI Box fails, the failed PCI Box can be disconnected by a reboot and the system can be started using the other PCI Box.

Disadvantage

Both partitions stop when a PCI Box fails.

- A Configuration for Failure Isolation of PCI Boxes



The failure in partition#1 is isolated from partition#0.

Advantage

This configuration provides failure isolation. Even if the PCI Box for a partition fails, the other partition is not affected.

Disadvantage

The PCI Box for the relevant partition cannot be used until the PCI Box is repaired.

For details on redundancy of PCI Express cards and connection destinations, refer to "[3.3.5 Network Configuration](#)".

2.7 Internal SSD (Limited Service Life Component)

Solid State Drives Installed in IOUs or PCI Boxes

■ Limited Number of Write Operations

- "Limited service life components" include the NAND flash memory which has a limited number of write operations

Depending on how SSDs are used, the NAND flash memory may reach the predetermined number of write operations before the product warranty period expires.

■ Warranty period

The product warranty period ends when the warranty period expires or when the product reaches the guaranteed predetermined write value, whichever comes first.

■ Checking the status of the allowed write value, etc.

- The status can be checked with management software or with command line tools.
- Estimate the amount of writes when designing the system. In addition, check the status regularly after system implementation.
- If there is a possibility that the guaranteed predetermined write value is reached before the system reaches the end of its service life, spare parts and procedures for moving the data to the spare parts must be prepared.

Product name	Product ID	Guaranteed write value
		DWPD
800GB PCIe SSD	MC-0JSD61 / MCX0JSD61	10 times
1.6TB PCIe SSD	MC-0JSD71 / MCX0JSD71	
2TB PCIe SSD	MC-0JSD81 / MCX0JSD81	

DWPD (Drive Writes Per Day): The average number of overwrite operations that can be performed in one day with the amount of data equivalent to the entire drive

2.8 Power Supply Unit (PSU)

A power supply unit (with FANs installed) that converts AC200V or AC100V to DC12V

☞ For details on connecting this unit, refer to "2.3 Power cable connection" in "Hardware Installation Manual".

■ Up to six PSUs can be installed in a cabinet.

☞ For details on the number of PSUs that must be installed, refer to "4.5.1 PSU Configuration" in "General Description".

■ The following three types of units are available (but cannot be installed together).

- High-efficiency power supply unit (200V): 80 PLUS® Platinum certified
- Power supply unit (200V): Equivalent to an 80 PLUS® Silver
- Power supply unit (100V): Equivalent to an 80 PLUS® Silver (2800B2/2800B3/2800E2/2800E3 does not support 100V.)

■ Power Supply Configuration

Input voltage	Power feeding method	Redundancy	2400E2/2400E3	2400E2/2400E3 with Memory Scale-up Board	2800B2/2800B3 2800E2/2800E3
200V	Single power feed	Non-redundant	2 (2 + 0)	3 (3 + 0)	3 (3 + 0)
		Redundant	3 (2 + 1)	4 (3 + 1)	4 (3 + 1)
	Dual power feed	Redundant	4 (2 x 2)	6 (3 x 2)	6 (3 x 2)
100V	Single power feed	Non-redundant	4 (4 + 0)	Not supported	Not supported
		Redundant	5 (4 + 1)		
		Redundant (for redundant UPS systems)	6 (4 + 2)		
	Dual power feed		Not supported		



2.9 FAN Unit (FANU)

A unit that contains only a FAN and can be installed in a PSU slot in which no PSU is installed.

- A total of six units between the PSUs and the FANUs must be installed.
- 👉 For details on the number of FANUs that must be installed and the installation slots, refer to "4.5.1 PSU Configuration" in "General Description".



A total of six units between the PSUs and the FANUs are installed.

2.10 Peripheral Configuration (1/4)

■ Console Unit

A PC is required to connect a console.

☞ For details, refer to "[4.1 Key Points for Console Operation](#)".

2.10 Peripheral Configuration (2/4)

Rack

☞ For details on racks that can be installed and the use of rack products, contact your sales representative.

How to Select Racks

* Racks must be secured to the floor as a countermeasure for earthquakes measuring 80 gal or more.

(1) Check whether or not racks must be secured to the floor.

Racks must be secured.

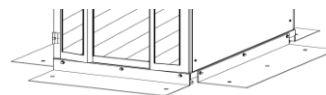
(2) Select racks.

Rack **without** a stabilizer

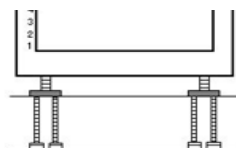


(3) Select a rack securing method.

Rack securing method using an earthquake-resistant kit



Rack securing method using leveling feet



(4) Arrange options.

Earthquake-resistant kit

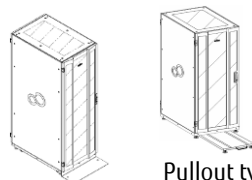
- Four sides (for a basic rack)
- Two sides (for an additional rack)



None

Racks do not need to be secured.

Rack **with** a stabilizer



Pullout type

-

None

2.10 Peripheral Configuration (3/4)

■ Notes on Using Racks

- When installing devices in a rack, install heavier devices on the bottom to lower the center of gravity and stabilize the rack.
- Attach a blank panel to the front of each unused space of the rack.

For PRIMEQUEST, it is recommended that one PRIMEQUEST unit is installed per rack.
(In some cases, two units can be installed.)

PRIMEQUEST



**x 1 unit
(recommended)**

Rack External View



PRIMERGY and ETERNUS can also be installed.



PRIMERGY



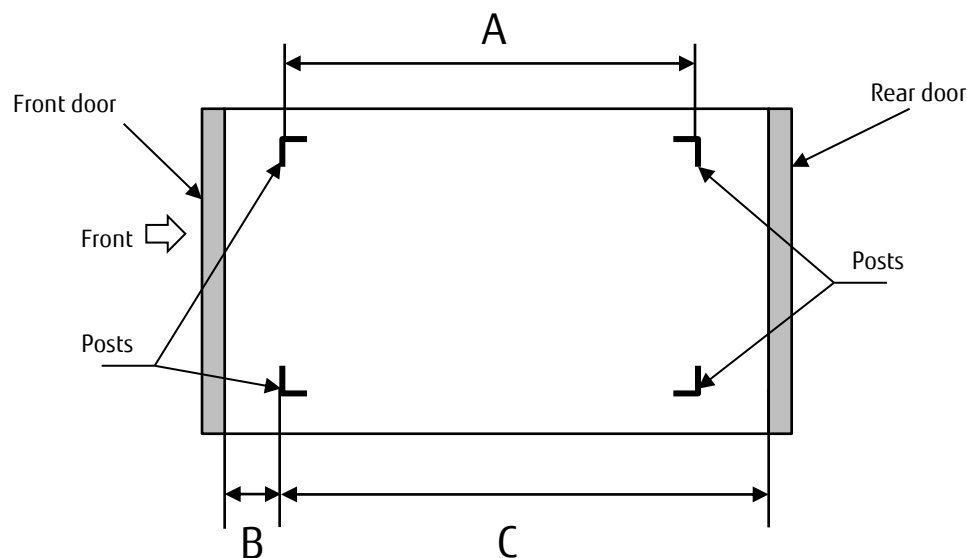
ETERNUS



2.10 Peripheral Configuration (4/4)

■ Rack Installation Requirements

- A. Allowable spacing between posts: 685 to 790mm
- B. Distance from the inside of the front door to the outside of the front rack posts: 60mm or more
- C. Distance from the outside of the front rack posts to the inside of the rear door: 860mm or more



 For details on rack installation conditions, refer to "Hardware Installation Manual".

3. Hardware Configuration Design

This chapter describes the key points for designing hardware configurations.

3.1 Key Points for MMB Design

- When focusing on reliability, install two MMBs to create a redundant configuration
- Considerations Before Setting an MMB
 - IP address, host name, subnet mask, and gateway address
 - User accounts
 - Name of the PRIMEQUEST system (this is also used as the SNMP system name.)
 - Management VLAN (virtual IP addresses, etc.) environment
- 👉 For details, refer to "2.2 Key Points for the MMB Settings" in "Linux (RHEL) Installation Guide" and "3.3 Connection and Setting of MMB" in "Installation Manual".

3.2 Key Points for Hardware Partitioning Design

Key Points for Configuring PPAR blocks

■ Partitioning Design Rules

- ☞ For details, refer to "[3.2.1 Partitioning Design Rules](#)".
 - Key points for partitioning design
 - Partition granularity and configuration conditions
 - The total numbers of system boards/Memory Scale-up Boards and CPUs per partition

■ Functions That are Used for Partition Configuration

- ☞ For details, refer to "[3.2.2 Functions That are Used for Partition Configuration](#)".
 - Home SB
 - Reserved SB function
 - Dynamic Reconfiguration function

■ Switching Reserved SB Rules

- ☞ For details, refer to "[3.2.3 Switching Reserved SB Rules](#)".

■ Configuration Example

- ☞ For details, refer to "[3.2.4 Configuration Example](#)".
 - Guidelines for selecting a partition configuration
 - Configuration examples for each model

3.2.1 Partitioning Design Rules (1/2)

- One or more usable SBs and one or more usable IOUs are required in one partition.
- For essential operations, it is recommended to set them in a partition with the lowest partition number and also incorporate SBs with lower SB numbers in the partition.
- It is recommended that the SB with the lowest SB number is specified as the Home SB.
- When including DUs and PCI Boxes in a partition, include the IOU for connecting these components in the same partition.
- Note that the performance and the number of software licenses may vary if Reserved SB switching occurs or the system configuration is changed.

Partition Granularity and Configuration Conditions

Component name	Minimum	Maximum	Configuration conditions
SB	1 board	4 boards in total	None
Memory Scale-up Board	0 boards		None
IOU	1 unit	4 units	None
Half of a DU: RAID card slot x 1, HDD bay x 2	0 units	The number of IOUs	Must be connected to an IOU
PCI Box LH (half of a PCI Box: LINKC x 1, PCI Express slot x 6)	0 units	The number of IOUs	Must be connected to an IOU

* If an upper component is degraded, the lower components also cannot be used.
(If an IOU is degraded, the DUs and PCI Boxes that are connected to the IOU are also degraded.)

3.2.1 Partitioning Design Rules (2/2)

- The Total Numbers of System Boards/Memory Scale-up Boards and CPUs per Partition
 - When multiple SBs are used to configure a partition:
 - For the 2800B2/2800B3/2800E2/2800E3, two CPUs must be installed in each SB.
 - For the 2400E2/2400E3, the same number of CPUs must be installed between the SBs.
 - When 128GB DIMMs are used, a single partition can only be configured with one SB. A single partition cannot be configured with multiple SBs.
 - In a default configuration, an SB with two CPUs and an SB with one CPU in one partition (2SB-3CPU) cannot be installed.

Partition configuration (Number of SBs per partition)	Total number of CPUs	2800B2/2800B3	2400E2/2400E3	2400E2/2400E3 with Memory Scale-up Board	2800E2/2800E3
One SB	1	-	Yes	-	Yes
	2	Yes	Yes	Yes (up to three Memory Scale-up Boards)	Yes
Two SBs	2	-	Yes	-	-
	3	-	-	-	-
	4	Yes	Yes	Yes (up to two Memory Scale-up Boards)	Yes
Three SBs	6	Yes	-	-	Yes
Four SBs	8	Yes	-	-	Yes

Yes: Possible -: Not possible

■ Home SB

The main SB among the SBs that are used to configure a PPAR block.

■ Functions That Are Enabled on the Home SB

- PCH (*1)

Onboard I/O is enabled, and USB ports and a VGA port can be used only on the Home SB.

- Reference clock source

The clock source of the Home SB becomes the clock source in the partition.

■ Selection of the Home SB

Specify the Home SB by using the MMB Web-UI.

If the Home SB is not specified directly, the first SB that is incorporated in the partition is specified as the Home SB.

* If the Home SB is removed from the partition or is degraded, the SB with the lowest number in the partition is specified as the Home SB.

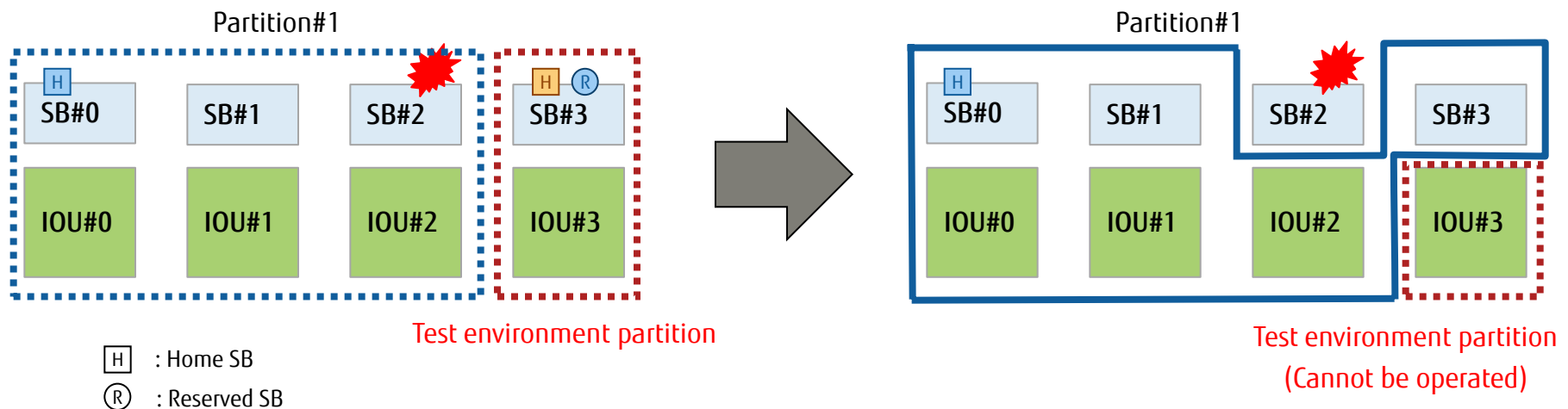
(*1) PCH: An Intel C600 series with built-in controllers such as USB controllers, APIC, and RTC

■ Reserved SB Function

- This function automatically disconnects a failed SB, incorporates a spare SB that has been implemented in advance, and restarts the PPAR block.
 - The SB resources are not degraded, and the partition can be recovered quickly.
 - In a partition that has only one SB, even if the SB fails (or it is degraded), the partition can be recovered.
- During operation of a partition, an SB in the partition can be specified as a Reserved SB.

An SB that is used in a partition of a test environment during normal operation can be incorporated in a partition of the production environment as a Reserved SB if a failure occurs.
- 2800B2/2800B3 is not supported.

Operation Example in Which an SB in a Test Environment Partition Is Changed to a Reserved SB



■ Wait Time for Reserved SB Switching

From 0 to 99 minutes can be set for the shutdown wait time when a Reserved SB that is used in another partition is switched by using the MMB Web-UI (the default setting is 10 minutes).

If the partition cannot be shut down after a specified time has passed, the Reserved SB is forced to be activated.

■ Saving the Partition Configuration Information

Before Reserved SB switching is performed, the partition configuration information for the entire cabinet is automatically saved to the MMB.

- The latest partition configuration information overwrites the existing information right before a Reserved SB replaces the failed SB (before the system reboots).
- The saved information can be viewed from the MMB Web-UI.

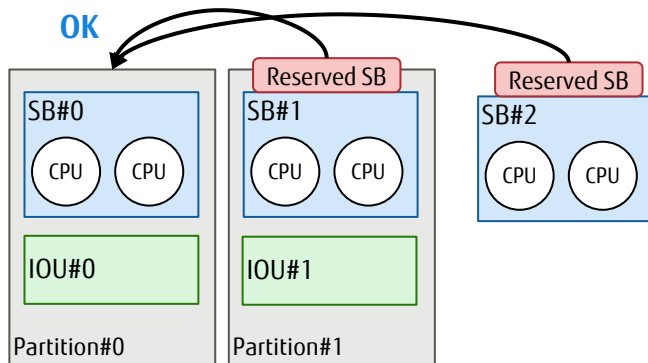
■ Memory Scale-up Board

Memory Scale-up Boards cannot be used as the source or the target of Reserved SB switching.

■ Reserved SB Setting Rules (1/4)

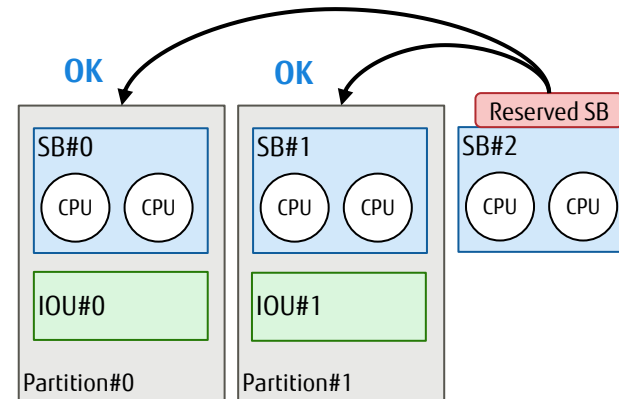
Consider the priority of partitions and do not specify SBs in different partitions with each other as Reserved SBs when multiple partitions are used or do not perform any loop settings for Reserved SBs.

Any SB that does not belong to the local partition can be set as a Reserved SB.

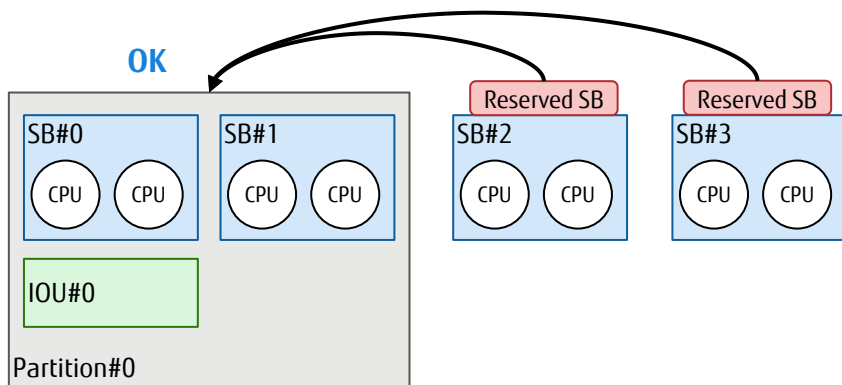


The SBs that are incorporated in a partition can also be set as Reserved SBs.

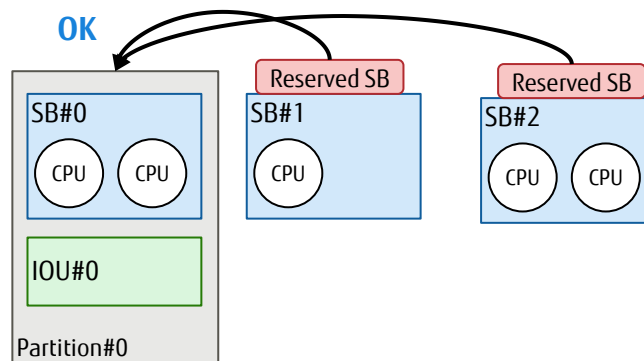
An SB can be set as a Reserved SB for multiple partitions.



For a single partition, multiple Reserved SBs can be set.

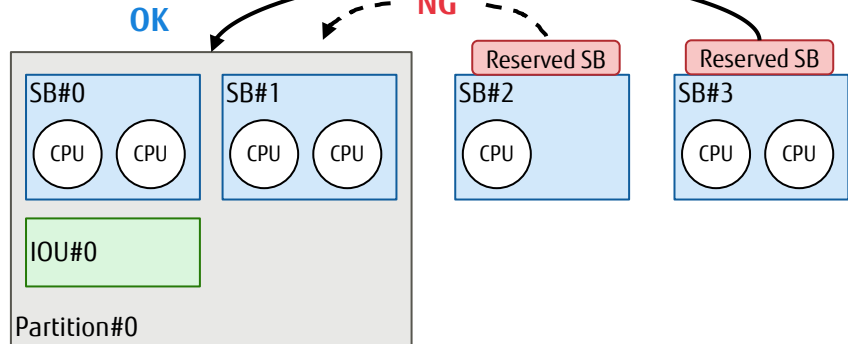


For a partition that consists of one SB, an SB with one or two CPUs can be set as a Reserved SB.



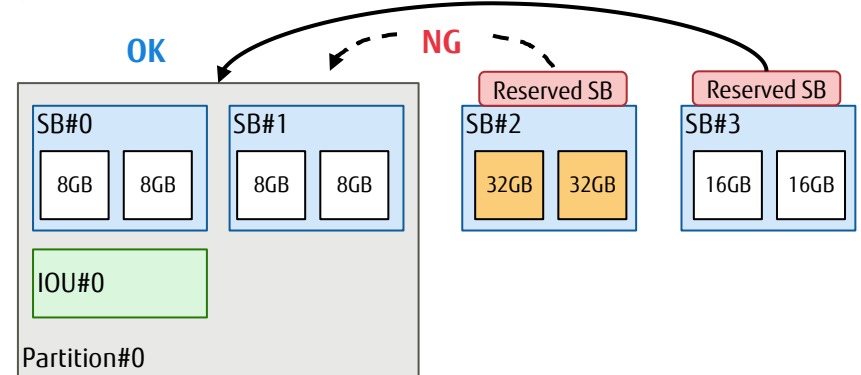
■ Reserved SB Setting Rules (2/4)

For a partition that consists of multiple SBs, only an SB with the same number of CPUs as the SBs in the partition can be set as a Reserved SB.



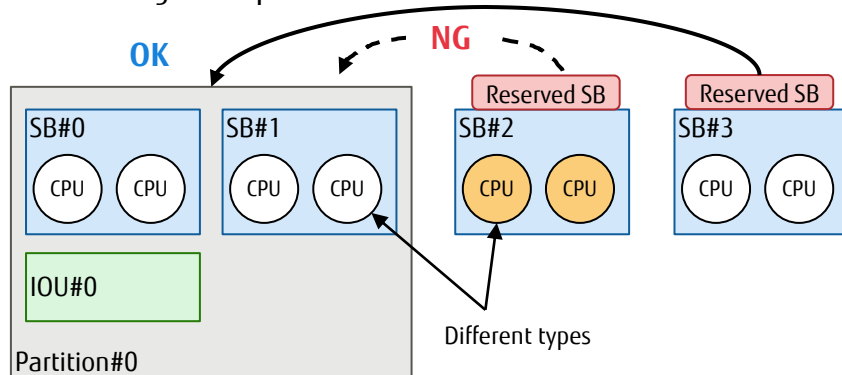
Reserved SB settings that make a configuration violate the CPU installation rules after an SB is replaced with a Reserved SB are not supported.

Only an SB that has the same DIMM installation conditions as the partition can be set as a Reserved SB.



Reserved SB settings that make a configuration violate the rules for installing different types of memory modules after an SB is replaced with a Reserved SB are not supported.

Only an SB that satisfies the "Conditions for Installing Different CPUs" in regard to partitions can be set as the Reserved SB.

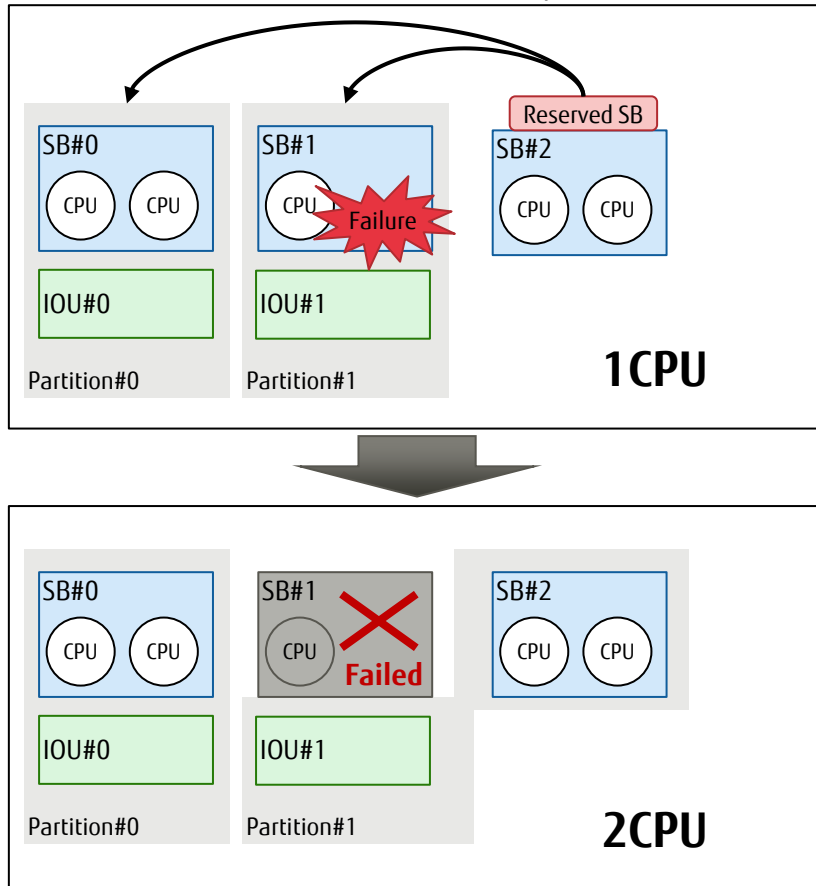


Reserved SB settings that make a configuration violate the rules for installing different types of CPUs after an SB is replaced with a Reserved SB are not supported.

■ Reserved SB Setting Rules (3/4)

- In some SB configurations, the amount of resources (the number of CPUs and/or the number of memory modules (memory capacity)) decreases or increases after switching. It is necessary to check the estimated performance and the estimated number of software licenses in advance.

* If a volume license or package product is used in a Windows OS or if the SB being used is not an SB that was purchased together with the enable kit, license authentication may be demanded after Reserved SB switching occurs.



A Reserved SB (CPU x 2) is set for the following partitions:

Partition#0 (CPU x 2)

Partition#1 (CPU x 1)

When the Reserved SB is incorporated in partition#1, the number of CPUs increases.

Two CPU licenses are required for partition#1.

■ Reserved SB Setting Rules (4/4)

- When using Reserved SBs, use NTP for time synchronization that is performed after switching.
- If devices are connected to the external (VGA and USB) ports on the Home SB and the Home SB is replaced, those devices must be connected to the newly replaced Home SB.

■ Dynamic Reconfiguration Function

This function allows changing the hardware configuration of a partition while the OS is running, without a restart.

This function can be used in the following conditions.

■ Supported Models

2400E2/2400E3/2800E2/2800E3

■ Supported OSs

RHEL 6.6 or later and RHEL 7.1 or later

■ Supported Functions

Hot addition:

Hot addition of SBs and IOUs with PCI Box LH modules is possible with supported OSs and models.

Hot removal:

Hot removal of IOUs with PCI Box LH modules is possible with supported OSs and models.

Notes on hot removal of SBs:

2400E2/2800E2 supports hot removal of SBs for RHEL 7.1 or later.

2400E3/2800E3 supports hot removal of SBs for RHEL 7.2 or later.

3.2.3 Switching Reserved SB Rules (1/5)

■ Switching Conditions

An SB that is incorporated in a partition is switched to a Reserved SB when one of the following events occurs (*1).

- SB degradation (Memory Scale-up Boards are not supported by the Reserved SB function.)
- CPU core degradation
- DIMM degradation (even if one DIMM fails)
- Detection of partial corruption in the memory of the mirroring pair (*2)
- Detection of QPI lane degradation (*2)
- Detection of SMI2 lane switchover (*2)
- Detection of PCI Express lane/speed degradation (between a CPU and an IOU) (*2)


(*1) Actual Reserved SB switching occurs when the partition is started after a condition for Reserved SB switching is met.

(*2) Because the partition operation continues, Reserved SB switching occurs when the partition is rebooted manually.

■ When the Home SB is Switched

When the Home SB is switched to a Reserved SB, the SB with the lowest SB number among SBs including Reserved SBs is changed to the Home SB.

* The same rule applies even if a degradation occurs.

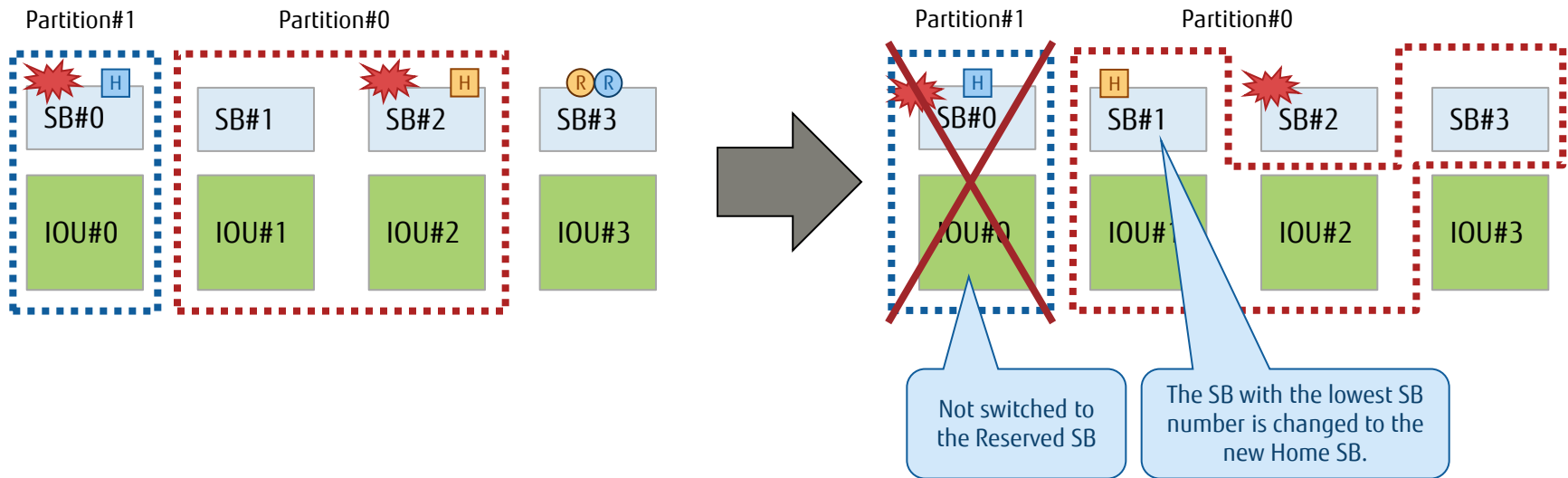
 For details on switching conditions, refer to "3.2.4 Reserved SB" in "Administration Manual".

3.2.3 Switching Reserved SB Rules (2/5)

■ When an SB Is Set as a Reserved SB for Multiple Partitions

If multiple SBs in different partitions fail simultaneously, the Reserved SB is used to replace the failed SB in the partition with the lowest partition number.

[Example] An SB is Set as a Reserved SB for Two Partitions.
(If SB#0 and SB#2 Fail Simultaneously)



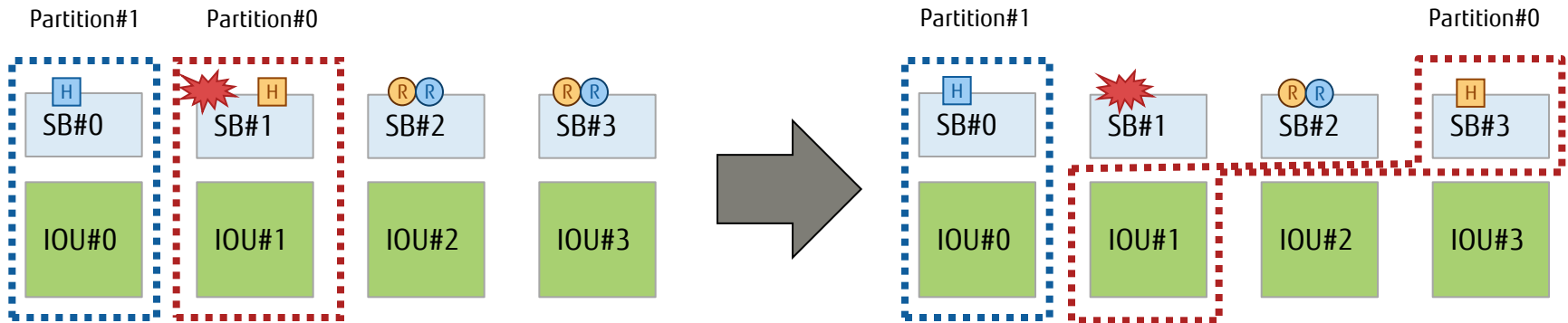
* The setting of SB#3 as the Reserved SB for partition#1 is automatically cancelled when Reserved SB switching occurs.

3.2.3 Switching Reserved SB Rules (3/5)

■ When Multiple Reserved SBs Are Set for a Partition

When there are Reserved SBs that do not belong to any partition, the Reserved SB with the highest SB number is used first.

[Example] Multiple SBs (SB#2 and SB#3) are Set as Reserved SBs for Partition#0.
(If SB#1 Fails)



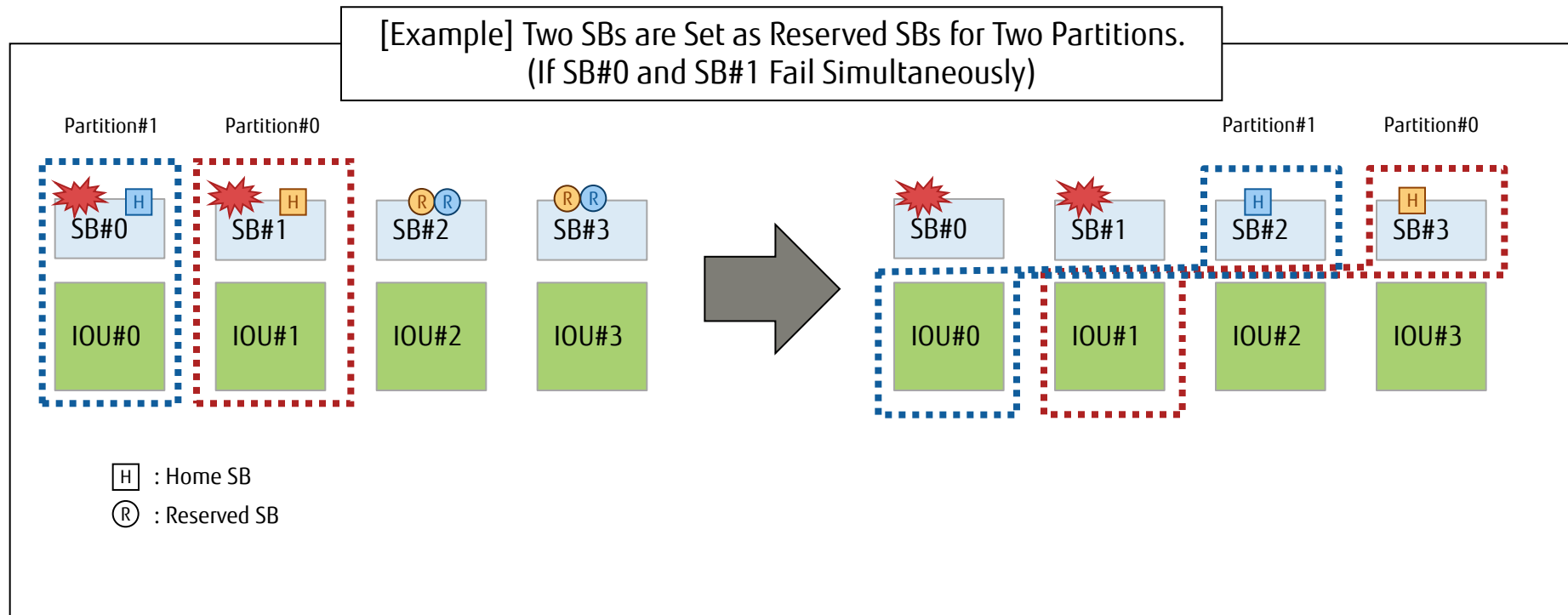
[H] : Home SB
[R] : Reserved SB

3.2.3 Switching Reserved SB Rules (4/5)

■ When Multiple Reserved SBs Are Set for Multiple Partitions

The switching priority order is determined by the following conditions.

- The partition with the lowest partition number is selected as the priority partition for which a Reserved SB is used.
- The Reserved SB with the highest SB number is used first.



3.2.3 Switching Reserved SB Rules (5/5)

■ When Each Reserved SB Is Incorporated in a Partition

■ If One or More Partitions Are Powered Off

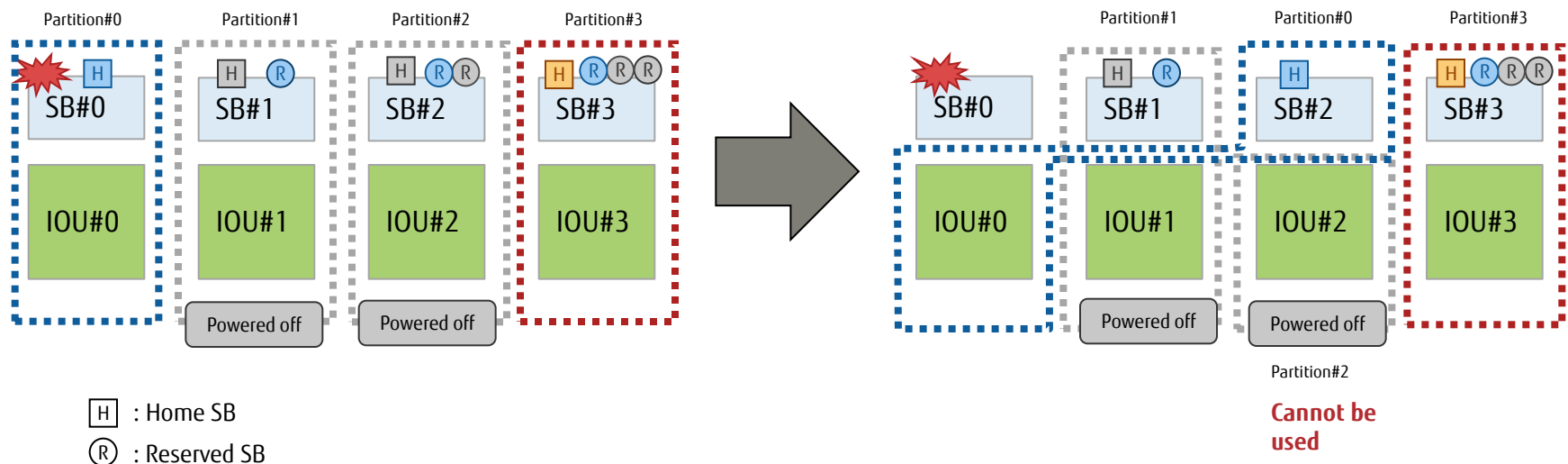
Among the powered-off Reserved SBs, the Reserved SB with the highest SB number is used first.

■ If All Partitions Are Powered On

The Reserved SB with the highest SB number is used first.

=> Then, the partition with this Reserved SB is stopped.

[Example] When the Reserved SBs (SB#1, SB#2, and SB#3) for Partition#0 Belong to Other Partitions (If SB#0 Fails)



3.2.4 Configuration Example - Guidelines

■ Prerequisites

This section assumes that the following items are predetermined.

- The number of partitions
- The number of CPUs and the number of cores
- The lowest memory capacity

■ Guidelines for Model Selection

- When I/O scalability is highly important and the Dynamic Reconfiguration function is used, the 2400E2/2400E3/2800E2/2800E3 is recommended.
- When I/O redundancy is highly important, the 2400E2/2400E3 is recommended.
- When higher CPU performance per partition is required, the 2800E2/2800E3 is recommended.

Item	2800B2/2800B3	2400E2/2400E3	2800E2/2800E3
A guideline of the number of cores per partition	4 to 192 cores	4 to 96 cores	4 to 192 cores
A guideline of the memory capacity per partition	Maximum 12TB	Maximum 12TB With Memory Scale-up Boards: Maximum 15TB	Maximum 24TB
A guideline of the number of partitions	1 partition	1 to 2 partitions	2 partitions or more
Work details	Aggregation of PC servers and higher reliability	Core system reconfiguration (open MF), UNIX server replacement, and DB server/ERP infrastructure	

3.2.4 Configuration Example - Pattern Overview

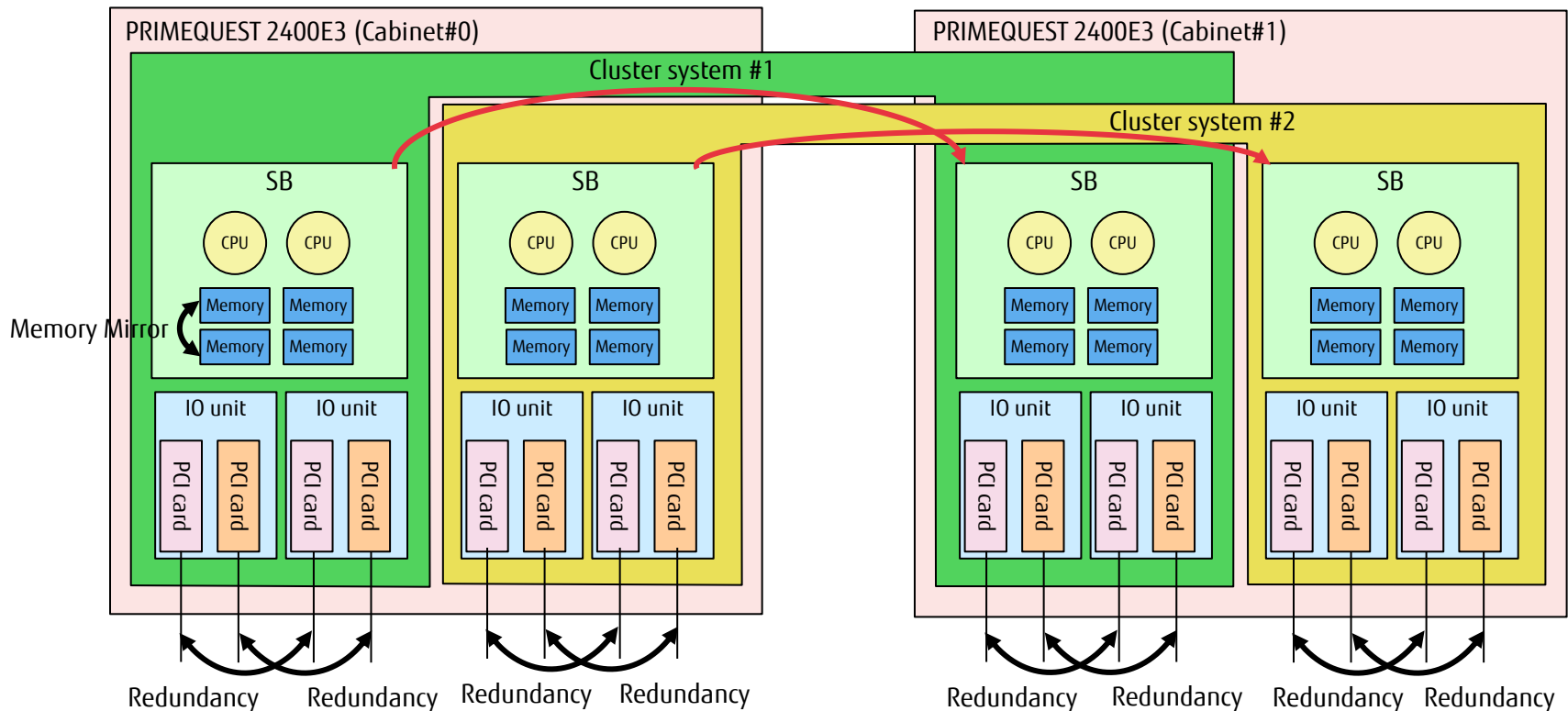
■ Examples of Determining Partition Configurations

- Focusing on Reducing the Downtime at a Failure (A, B, or C)
 - For a cluster configuration, a few seconds to a few minutes (a guideline for a two-node configuration)
 - When the Reserved SB function is used, switching time + OS startup time (approximately 10 minutes or longer)
- Focusing on Extensibility
 - Focusing on performance: Multiple CPUs (up to 8 CPUs), 192 cores (D)
 - Focusing on functions: The maximum number of connectable PCI-Express cards internally is 16, and 56 with PCI expansion boxes. (E)
- Server Integration
 - Physical Partitioning (PPAR): Reserved SB switching can also be used. (F)
 - Extended Partitioning (Ext.Par.): Division unit consists of one CPU core, 1GB of memory, and one I/O PCI card. (G)

Purpose		High availability			High performance, high functionality		Server integration	
		A	B	C	D	E	F	G
Configuration example		Inter-cabinet cluster	Intra-cabinet cluster	Reserved SB switching	Multiple CPUs	Many PCI-Express cards	Physical partitioning (PPAR)	Extended partitioning (Ext.Par.)
Target model		Two cabinets of the same model	2400E2/E3 2800E2/E3	2400E2/E3 2800E2/E3	2800E2/E3	2400E2/E3 2800E2/E3	2400E2/E3 2800E2/E3	2400E2/E3 2800E2/E3
Features		Elimination of single points of failure	Minimization of single points of failure	Low management cost	Up to 8 CPUs, 192 cores	Up to 56 PCI cards	Up to 4 partitions	Up to 8 partitions
In one partition	CPU	1 to 8	1 to 4	1 to 6	Max. 8	1 to 8	1 to 6	1 or more cores
	Memory	1.5TB (1 CPU) to 12TB (8 CPUs)	1.5TB (1 CPU) to 6TB (4 CPUs)	1.5TB (1 CPU) to 9TB (6 CPUs)	Max. 12TB	1.5TB (1 CPU) to 12TB (8 CPUs)	1.5TB (1 CPU) to 9TB (6 CPUs)	Min. 1GB/Ext.Par.

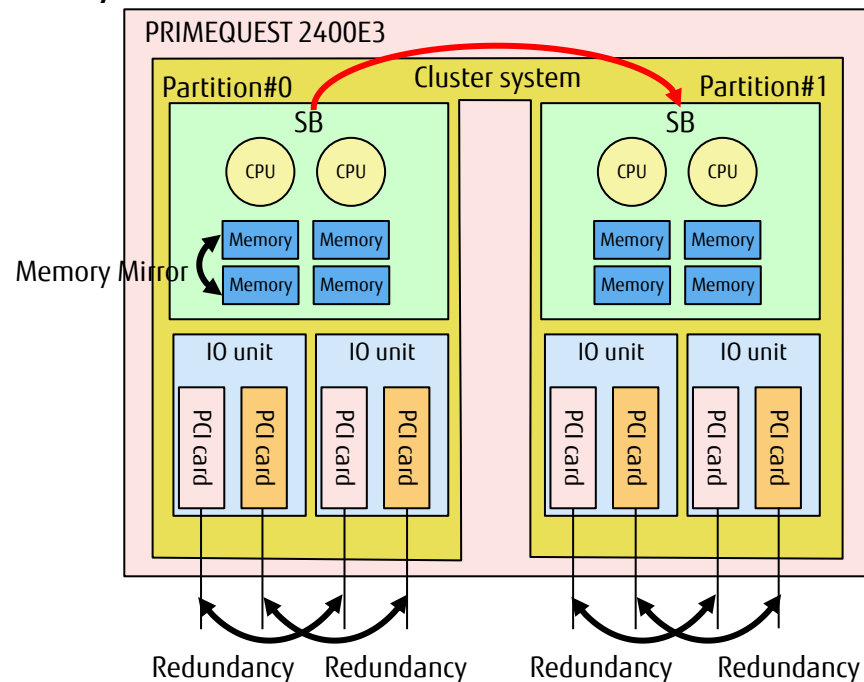
3.2.4 Configuration Example (A) - Inter-Cabinet Cluster

- Complete elimination of both single points of failure and shared components
- Cluster configuration between two cabinets with the same specifications, Memory Mirror configuration
- Clustering between Cabinet#0 and Cabinet#1: If a failure occurs, node switching occurs immediately and the system operation continues.
- Example: High-reliability database for a large number of users that is installed in multiple cabinets



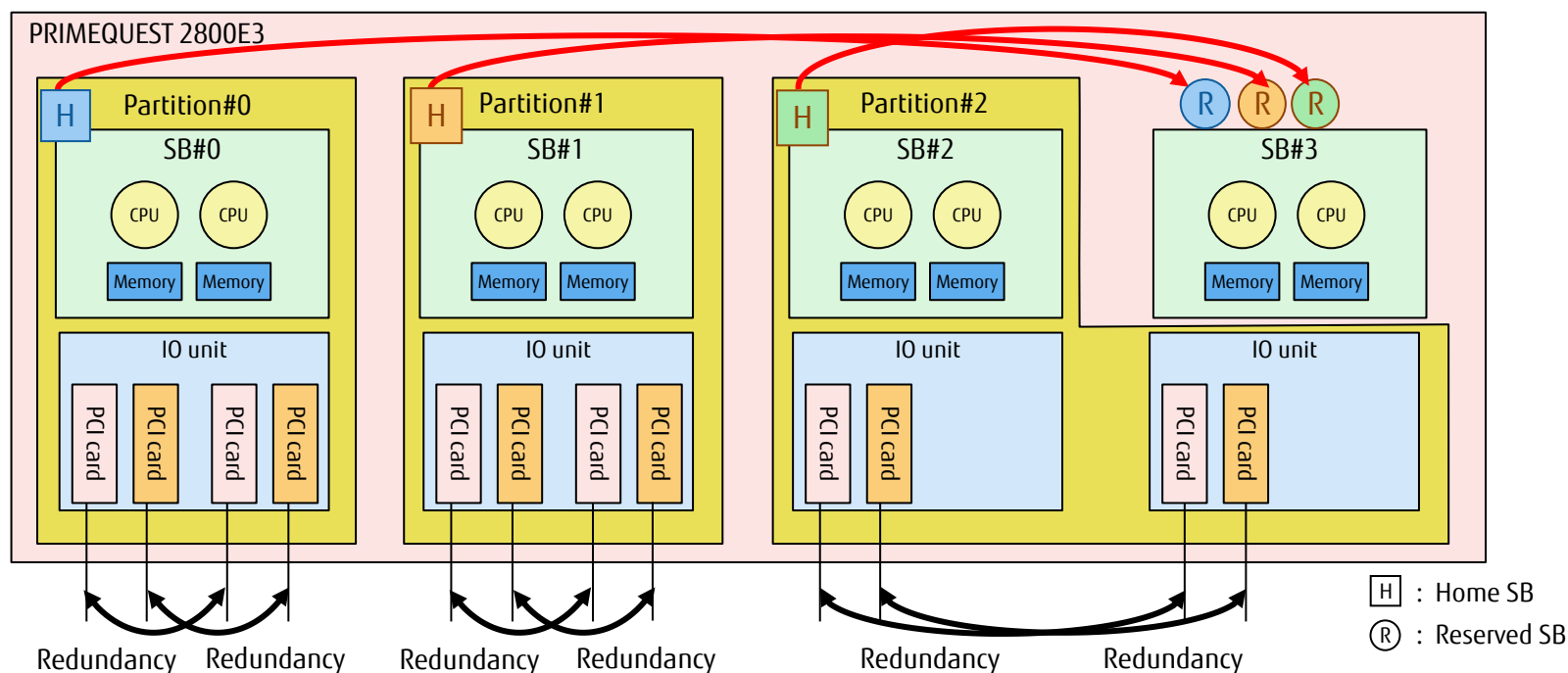
3.2.4 Configuration Example (B) - Intra-Cabinet Cluster **FUJITSU**

- Minimization of single points of failure
(The cabinet and the midplane are single points of failure. However, the possibility of failure is very small because no electronic parts are contained.)
- Cluster configuration between PPAR blocks with the same specifications in a cabinet, Memory Mirror configuration
- Clustering between PPAR#0 and PPAR#1: If a failure occurs, node switching occurs immediately and the system operation continues.
- Cluster configuration for small-sized installation (installation of one PRIMEQUEST)
- Example: High-reliability database for a user base that is small to medium sized, vSphereHA.



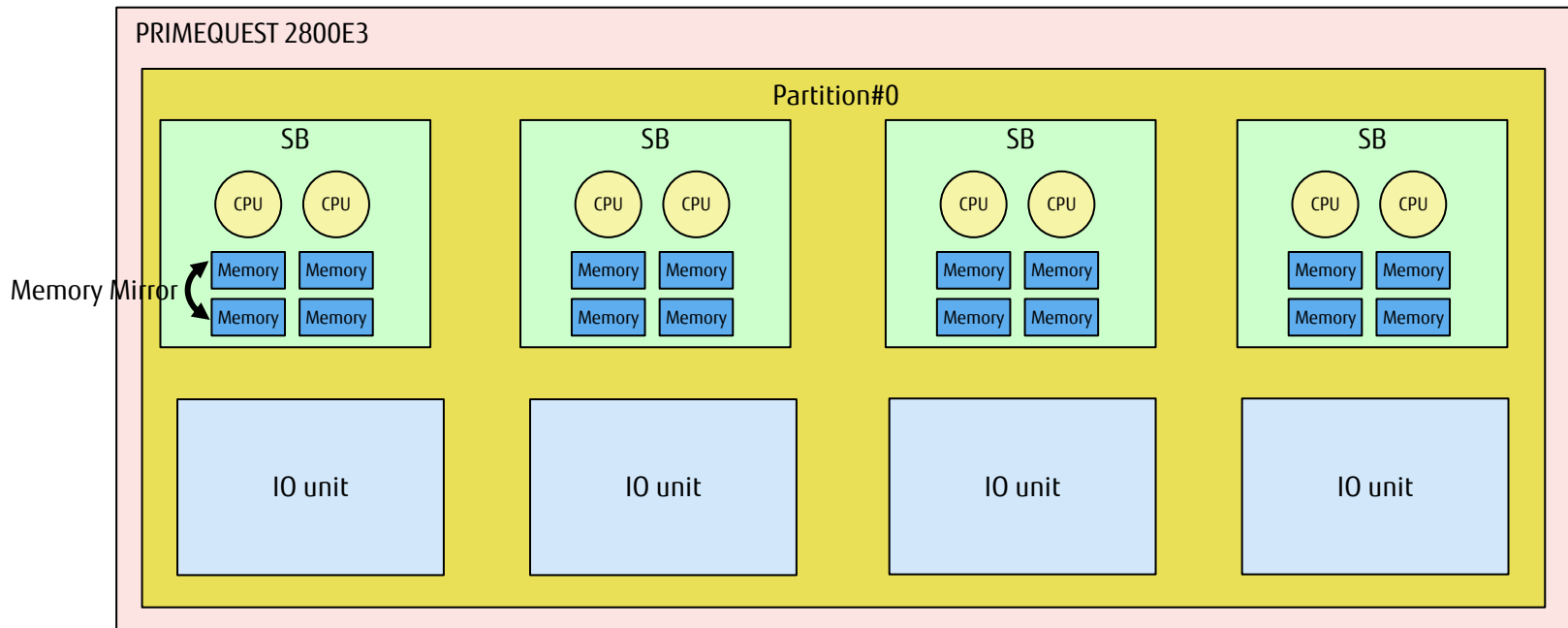
3.2.4 Configuration Example (C) - Reserved SB Switching

- Redundant configuration that is based on a spare system board (Reserved SB)
- SB#3 is set as a Reserved SB for PPAR#0, PPAR#1, and PPAR#2.
- If a failure occurs on the SB of a PPAR block, the system continues its operation by disconnecting the failed SB, incorporating the spare SB, and then restarting the PPAR block.
- Configuration and management costs can be reduced.
 - No additional software is required because the availability is based on hardware.
 - Without additional hardware or special settings, configurations and operations can be achieved just by setting the firmware.
- Example: Small-to-medium-sized high availability system, FT server replacement (excluding nonstop systems)



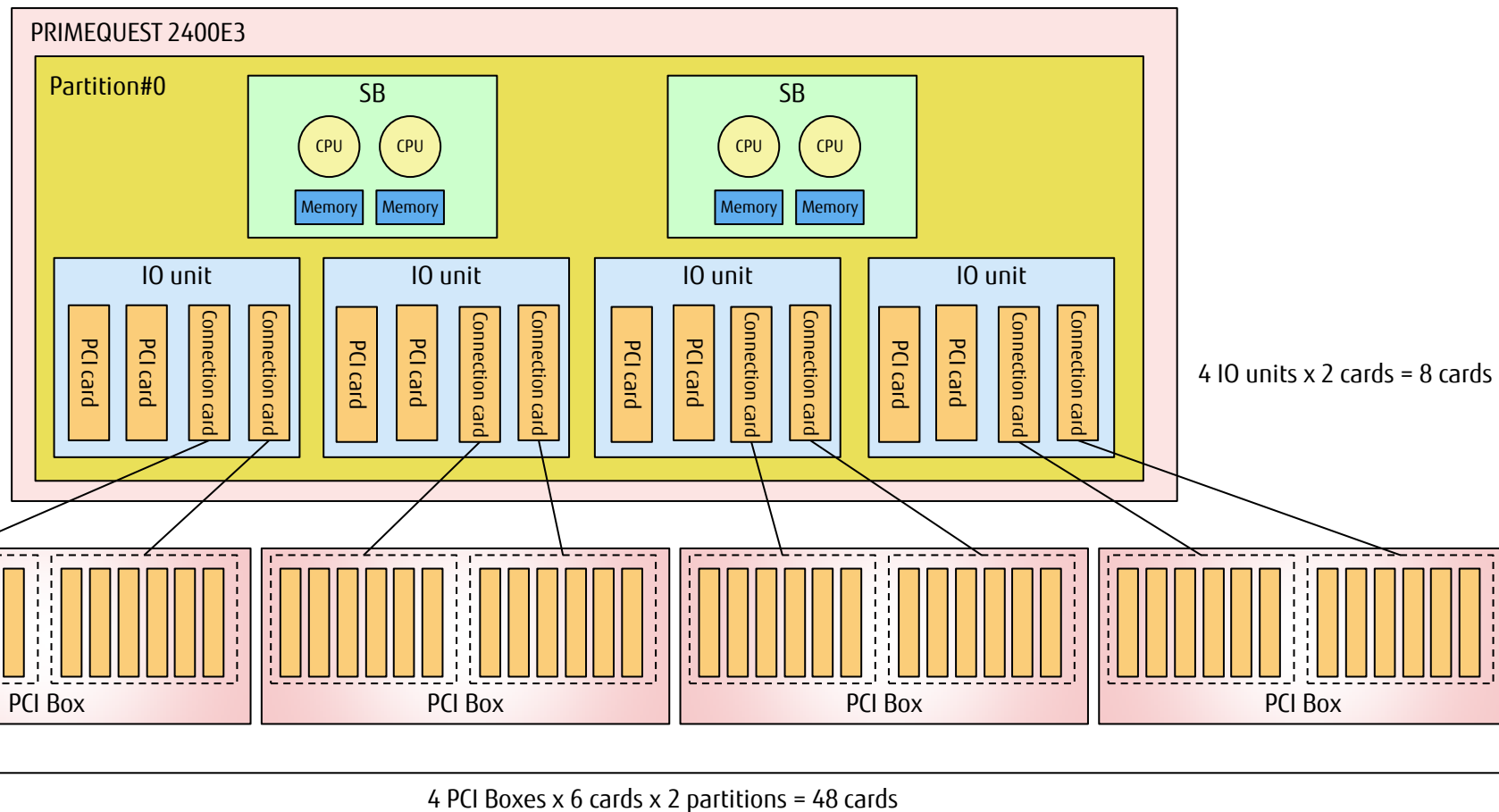
3.2.4 Configuration Example (D) - High Performance Multiple CPUs

- High-performance configuration: Up to 8 CPUs and 192 cores per partition
- Behavior at a CPU failure
 - If a core failure occurs, then the system degrades the core, restarts the partition, and continues the operation.
 - If a failure other than a core failure occurs, then the system disconnects the SB that contains the failed part, restarts the partition with 6-CPU configuration, and continues the operation.
- Example: In-memory high performance database, SAP HANA



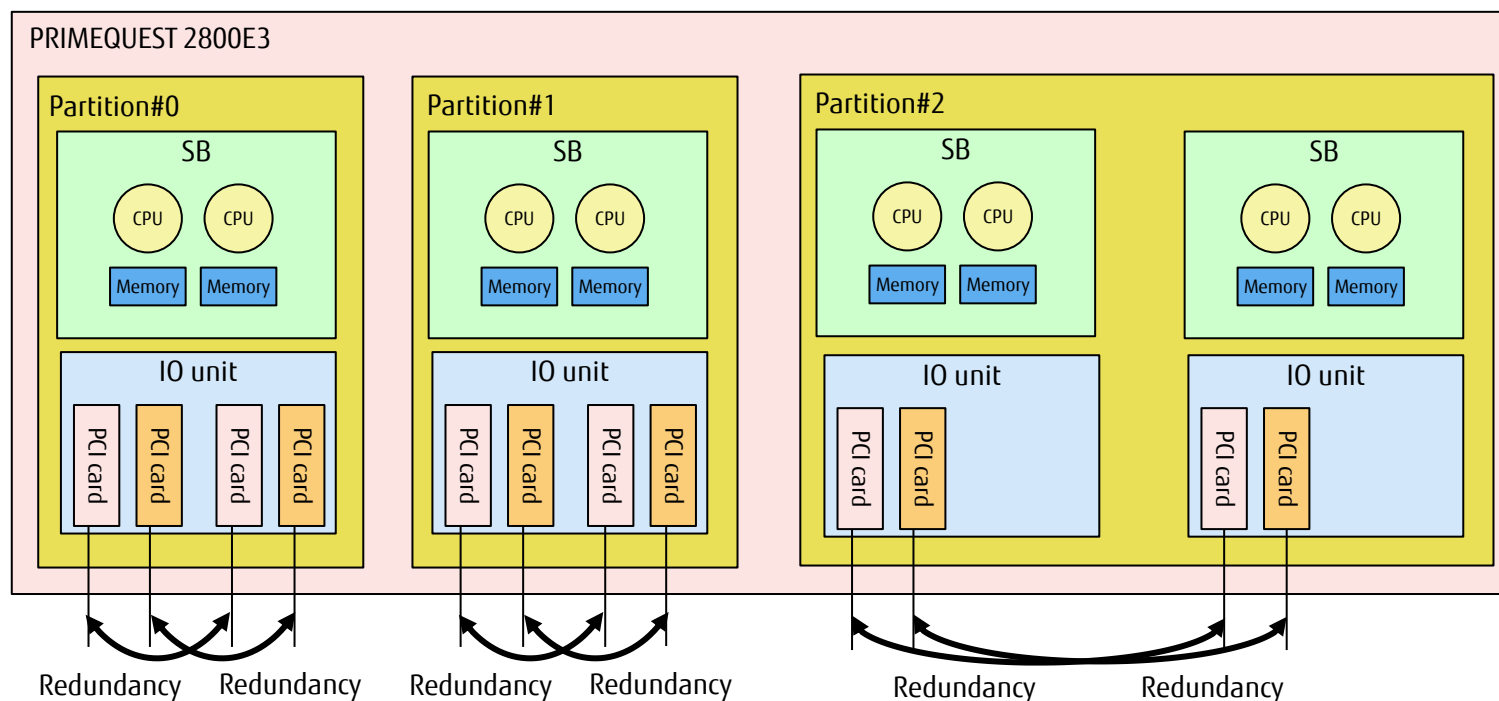
3.2.4 Configuration Example (E) - High Functionality Multiple I/Os

- Up to 16 PCI-Express cards can be added in a cabinet.
- When more I/Os are required, by connecting PCI Boxes, up to 56 PCI-Express cards can be installed.
- Example: Communication HUB server, desktop virtualization server



3.2.4 Configuration Example (F) - Physical Partitioning

- System boards and IO units in a cabinet are combined and divided into PPAR blocks.
- PPAR blocks are independent of each other. The hardware configuration and OS can be different between the PPAR blocks.
- Each PPAR block consists of at least one SB, at most four SBs (for 2800E2/2800E3) or two SBs (for 2400E2/2400E3), and at least one IOU.
- After the initial build, the configuration can be modified based on the operation condition.
 - * When Dynamic Reconfiguration is not used, the PPAR block to be modified must be stopped.
- Example: Server integration, enhancement of the future scale-up range of a server

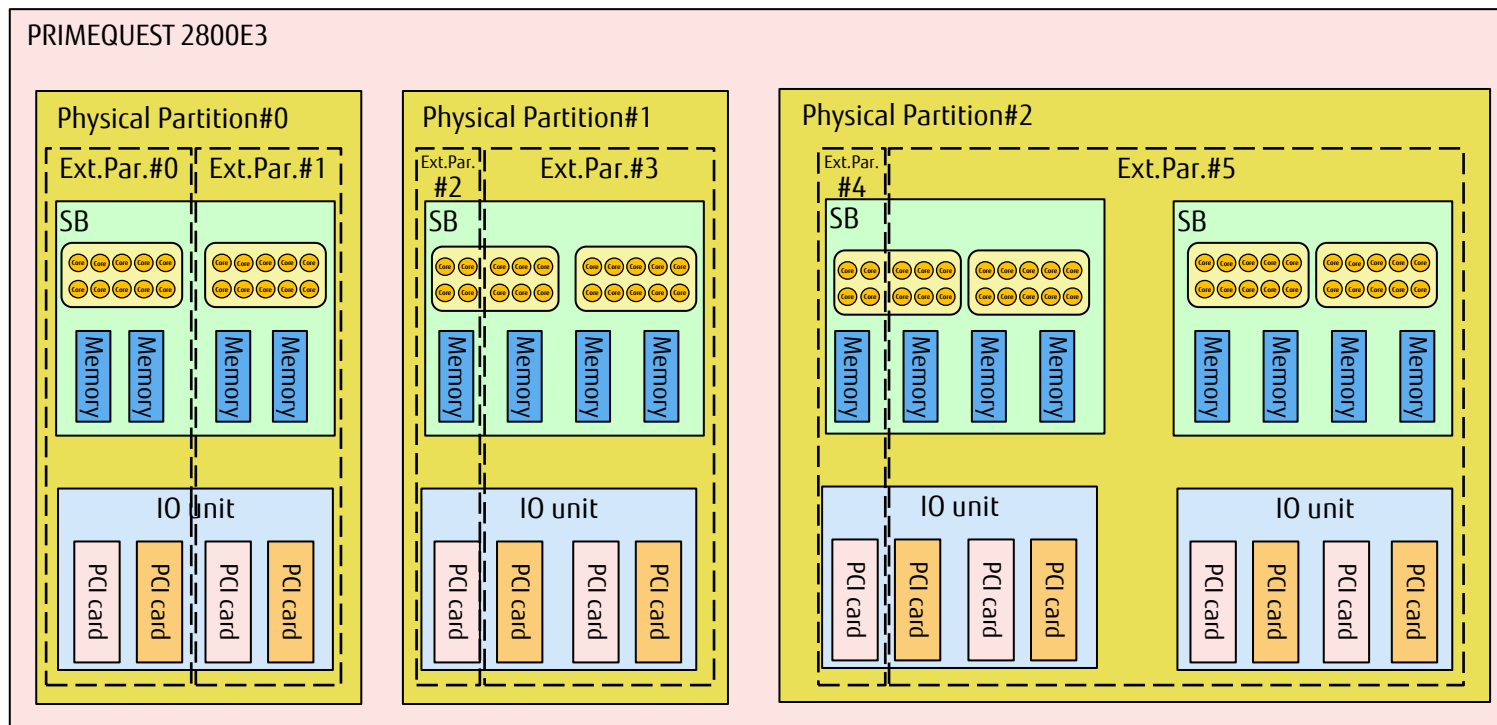


3.2.4 Configuration Example (G) - Extended Partitioning

- Each physical partition is divided into smaller partitions.
- Partitions are independent of each other. The hardware configuration and OS can be different between the partitions.
- The minimum division unit consists of one CPU core, 1GB of memory, and one I/O PCI card.
- After the initial build, the configuration can be modified based on the operation condition.

Note: Memory Scale-up Boards can be used, however Dynamic Reconfiguration cannot be used.

- Example: Physical integration of small-sized servers



3.3 Key Points for I/O Configuration Design

■ Boot Type Selection

 For details, refer to "[3.3.1 Boot Type Selection](#)".

■ Guidelines for Selecting Internal Storage

 For details, refer to "[3.3.2 Guidelines for Selecting Internal Storage](#)".

■ Obtaining RAID Cards and FBUs

 For details, refer to "[3.3.3 Obtaining RAID Cards and FBUs](#)".

■ HDD Configuration

 For details, refer to "[3.3.4 HDD Configuration](#)".

■ Guidelines for Selecting a RAID Configuration for HDDs

- Software RAID
- Hardware RAID
- SAN boot

■ Memory Dump Function

■ Network Configuration

 For details, refer to "[3.3.5 Network Configuration](#)".

- Network Types and Usage
- Network Redundancy

■ I/O Space Settings for PCI Devices

 For details, refer to "[3.3.6 Setting I/O Space for PCI Devices](#)".

I/O space assignment setting

3.3.1 Boot Type Selection

Boot type	Boot devices	Usage
Internal HDD or SAS-SSD (*1)	DU Internal disk for an SB	Boot an OS that is installed in an internal HDD.
External HDD cabinet	JX40 S2 with a SAS card for connection	Boot an OS that is installed in an external HDD cabinet.
FC boot in an external file unit (SAN environment)	FC card	Boot an OS that is installed in an external disk array device.
FCoE boot in an external file unit (SAN environment)	CNA	Boot an OS that is installed in an external disk array device.
iSCSI boot in an external file unit (SAN environment)	LAN card, and LAN port on an IOU	Boot an OS that is installed in an external disk array device.
Preboot eXecution Environment (PXE)	LAN card, and LAN port on an IOU	Boot via remote operation.
Boot from a virtual media	Device or file that is set as a virtual media	Boot from a device or file that is set as a virtual media.
Boot from a device connected to the front USB port on the Home SB	USB connected device (e.g. CD and DVD)	Boot from a USB connected device that is used temporarily for operations such as system configuration. (This operation is not available when the front bezel is removed.)

(*1) For details on the internal storage in the cabinet, refer to "[3.3.2 Guidelines for Selecting Internal Storage](#)".

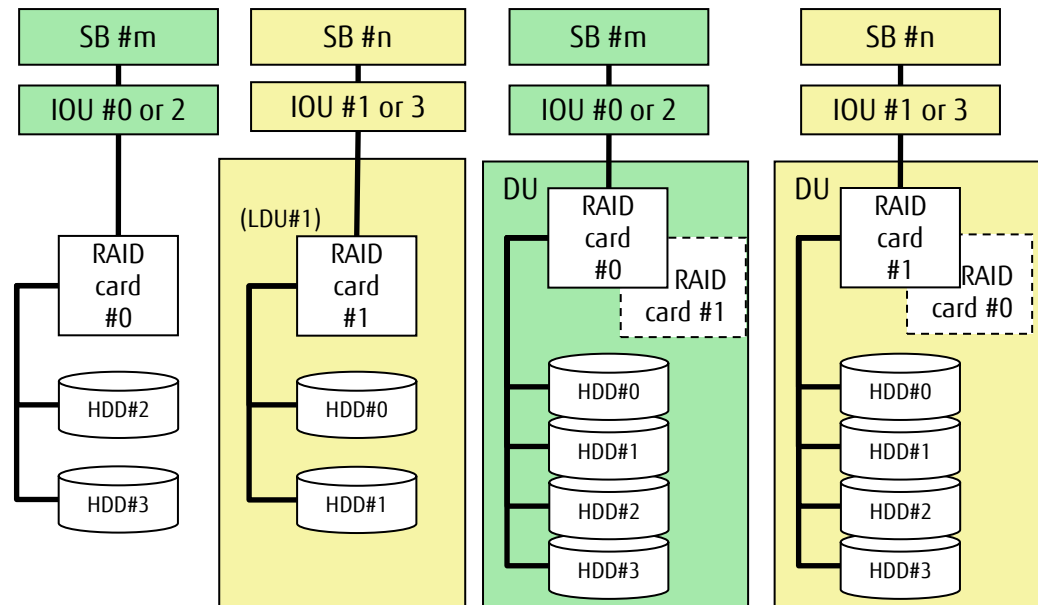
- It is recommended to use a redundant HDD (hardware RAID or software RAID) as a boot HDD.
- When an internal disk is used as a boot device, RAID is configured at the same time as the OS installation using ServerView Installation Manager (SVIM).

3.3.2 Guidelines for Selecting Internal Storage

■ RAID Cards or HDDs/SAS-SSDs in DUs and SBs

Item	Installed in DUs (shared between partitions)	Installed in DUs (not shared between partitions)	Installed in SBs
Supported models	All models		2400E2/E3, 2800E2/E3
Number of RAID cards	2	1	Up to 1
Number of HDDs	Up to 2 per RAID card	UP to 4	Up to 4
When a Reserved SB switching occurs	Internal storage is automatically connected to the switched partition		Internal storage is isolated (unavailable)
Intra-cabinet cluster configuration	The number of partitions that are used (up to 2) must be stopped at the same time when maintenance is being performed		No partitions need to be stopped at the same time because internal storage is not shared between the partitions

Connection source	Shared	Not shared
IOU#0	DU#0 RAID#0 HDD #2/3	DU#0 RAID#0 HDD #0/1/2/3
IOU#1	DU#0 RAID#1 HDD #0/1	DU#0 RAID#1 HDD #0/1/2/3
IOU#2	DU#1 RAID#0 HDD #2/3	DU#1 RAID#0 HDD #0/1/2/3
IOU#3	DU#1 RAID#1 HDD #0/1	DU#1 RAID#1 HDD #0/1/2/3



3.3.3 Obtaining RAID Cards and FBUs

■ RAID Cards in SBs

- A SAS array controller card installation kit is required
- Obtain FBUs (Flash Backup Unit) (optional)
- Obtain RAID software licenses (optional)

■ RAID Cards in DUs

- Obtain FBUs (optional) for each RAID card
- Obtain RAID software licenses (optional)

■ RAID Cards in 1GbE IO Units (for JX40 S2 Connection)

- Obtain FBUs (optional) for each RAID card (installed in Slot#1 and Slot#2)
- Obtain FBUs (optional) (different from the FBUs for SBs/DUs)
- Obtain an FBU installation kit (this kit uses Slot#0 exclusively)

FBUs cannot be connected to RAID cards that are installed in 10GbE IO units, PCI Boxes, or Slot#3 on 1GbE IO units.

3.3.4 HDD Configuration (1/5)

■ Guidelines for Selecting a RAID Configuration for HDDs

Redundancy with "SAN boot + multipath driver" is recommended for reliability.

Item	Software RAID		Hardware RAID		SAN boot + multipath driver
	OS standard	PRIMECLUSTER GDS	Inside of an SB or DU (*1)	External hard disk cabinet (JX40 S2)	
OS	(*2)	Supported with RHEL	Supported	Supported	Supported
High-speed access	Relatively slow	Relatively slow	Supported	Supported	Supported
Card duplication	Supported	Supported	Not supported	Not supported	Supported
Path duplication	Supported	Supported	Not supported	Not supported	Supported
RAID level	Depends on the software	1	1, 1E, 5, 6, 10	Available at the RAID levels that are supported by the SAS array controller card that is connected to JX40 S2	Available at the RAID level of the storage device being used
Device duplication at boot time	Not supported	Supported	Supported	Supported	Supported

(*1) For details, refer to "[3.3.2 Guidelines for Selecting Internal Storage](#)".

(*2) For details on the supported OSs or virtualization software, refer to the related documents of the OS or virtualization software.

■ Notes (1/2)

- If an unpredictable power supply problem occurs, data in the cache (*) that is equipped in a hardware RAID or disk may be lost.

To avoid such a problem, make sure to consider installing a redundant power supply or dual power feed option as well as a CVCF or UPS.

(*) A hardware RAID uses the cache on the hardware when Write Back or Always Write Back is specified.
A disk uses the cache on the hardware when the disk cache is enabled.

3.3.4 HDD Configuration (2/5)

■ Notes (2/2)

- When internal HDDs are used, the hardware RAID controller may fail to fully detect failures on a hard disk, and a system slowdown may occur.

[Additional Notes]

If intermittent media errors occur on a HDD, a slowdown may occur on rare occasions.

This problem may occur for example due to many scratches in a wide area on the HDD. The RAID controller tries to replace the media error area and salvage data using RAID parity. Therefore, if intermittent media errors occur over a long time, the salvage processing takes a longer time and the conventional media access processing is delayed.

If there are restrictions in operation, the following options are recommended.

- Use ETERNUS.
 - Replace the HDD with a SAS-SSD.
- When using an internal SSD for a PCI slot, note the following points.
 - The SSD cannot be used as a boot drive.
 - When a failed SSD is replaced, the integrity of the data in the drive cannot be guaranteed. Reliability design including recovery from a regular backup and software RAID configuration is required to prepare for possible risks.
 - When using an internal HDD in an SB, note the following points.

When the HDD is used as a boot drive or a data disk and the Reserved SB function is used, the HDD cannot be started or operated.

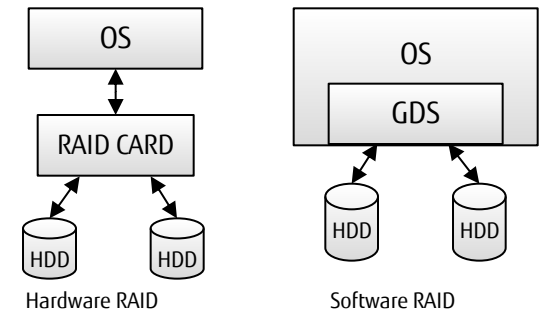
3.3.4 HDD Configuration (3/5)

■ Software RAID

- RHEL standard RAID function
 - 👉 For details, refer to "Linux (RHEL) Design Guide".
- Mirroring with PRIMECLUSTER GDS is supported.
 - 👉 For details on support information, refer to "Linux (RHEL) Design Guide".

■ Hardware RAID

- Hard disk redundancy for disk units and SBs
 - A RAID card is included by default in a DU to support RAID configurations.
 - RAID0, RAID1, RAID1E, RAID5, RAID6, and RAID10 can be configured.
 - Hot swapping internal HDDs is supported (excluding RAID0 and non-mirror configurations).
 - RAID management tool "ServerView RAID Manager" is supported. (This tool is bundled with the main server unit by default).
- Hard disk redundancy on an external file unit
 - A RAID configuration can be created in the file unit on an external storage device (such as ETERNUS).
 - 👉 For details, refer to the manual for the file unit.
 - RAID0, RAID1, RAID1E, RAID5, RAID6, RAID10, RAID50, and RAID60 can be configured.
 - Hot swapping internal HDDs is supported (excluding RAID0 and non-mirror configurations).
 - RAID management tool "ServerView RAID Manager" is supported. (This tool is bundled with the main server unit by default).
 - 👉 For details, refer to "SAS3 12 Gb/s MegaRAID® SAS Software User Guide" and "FUJITSU Software ServerView Suite ServerView RAID Manager User Guide".



■ SAN Boot

An OS is started from a boot disk that is set in an external storage.

3.3.4 HDD Configuration (4/5)

■ Memory Dump Function for Windows (OS Standard Function)

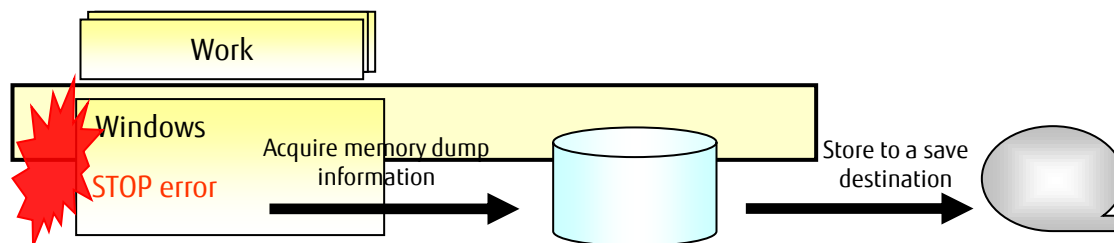
If a fatal system error occurs, data in the physical memory is output to a file.


■ Dump Types and Estimated Sizes

Dump type	Description	Dump file size
Complete memory dump	Records all data that exists in the physical memory when the system stops.	Physical memory size + 300MB
Kernel memory dump	Records the information only in the kernel memory space.	Depends on the memory space during system operation.
Minimum memory dump	Records the minimum information that is useful for identifying the problem.	128KB or 256KB
Automatic memory dump	Records information that is equivalent to the conventional kernel memory dump. The following points are different from the kernel memory dump. <ul style="list-style-type: none">• The initial value of the paging file size is smaller than the kernel memory dump size.• If part of the information in the kernel memory space cannot be recorded, the page file size is automatically extended after the next startup. (If part of the information in the kernel memory space cannot be recorded, acquisition of memory dump information may fail.)	

■ Mechanism for Acquiring Dump Information

1. If a system failure occurs, dump information is output to the paging file in the boot volume.
2. After the OS is restarted, a tentative paging file is created, and the acquired dump information is moved to the specified save destination.



 For details, refer to "13.4.3 Setting up the dump environment (Windows)" in "Administration Manual".

3.3.4 HDD Configuration (5/5)

■ Memory Dump Function for RHEL

If a fatal system error occurs, data in the physical memory is output to a file.

■ Dump Types and Estimated Sizes

kdump (OS standard function)

sadump (a dedicated tool for PRIMEQUEST)

**Dump acquisition area
(Dump device for sadump)
(Temporary data storage
area)**

Internal disk => OK
External disk => OK
Cluster sharing is not allowed.

Save data to a disk
that is not
managed with GDS

Acquisition

**Acquisition area
for kdump**

When creating a dedicated disk
partition (such as /var/crash) for
saving dump data, increase the
acquisition area size for kdump by
10% in consideration of the file
system management area.

$(\text{Installed memory capacity} + 1\text{GB}) / 0.9$
(1st generation) * Required

$(\text{Installed memory capacity} + 1\text{GB}) / 0.9$
(2nd generation)

:

Error

Error

Installed memory capacity + 512MB
* Required

Alternative area that is used
if a device error occurs
(Installed memory capacity + 512MB)

:

Save data to a disk
that is not managed
with GDS
(RAW device)

N areas

* Non-Fujitsu storage devices cannot be used for
dump areas for sadump.

3.3.5 Network Configuration (1/5)

■ Network Types

Connect with different types of networks for various intended purposes to achieve security and load balancing.

■ Operation LAN

The LAN that is used by the customer

■ Management LAN

The LAN for connecting each partition and MMB to external servers such as the operation management server

■ Cluster LAN

(Cluster interconnect or private network)

- The LAN that allows mutual status monitoring between nodes in a cluster configuration
- Use a subnet that is different from the one for other LANs (such as the operation LAN).

☞ For details, refer to "[3.4 Key Points for Cluster Configurations](#)".

■ Internal LAN

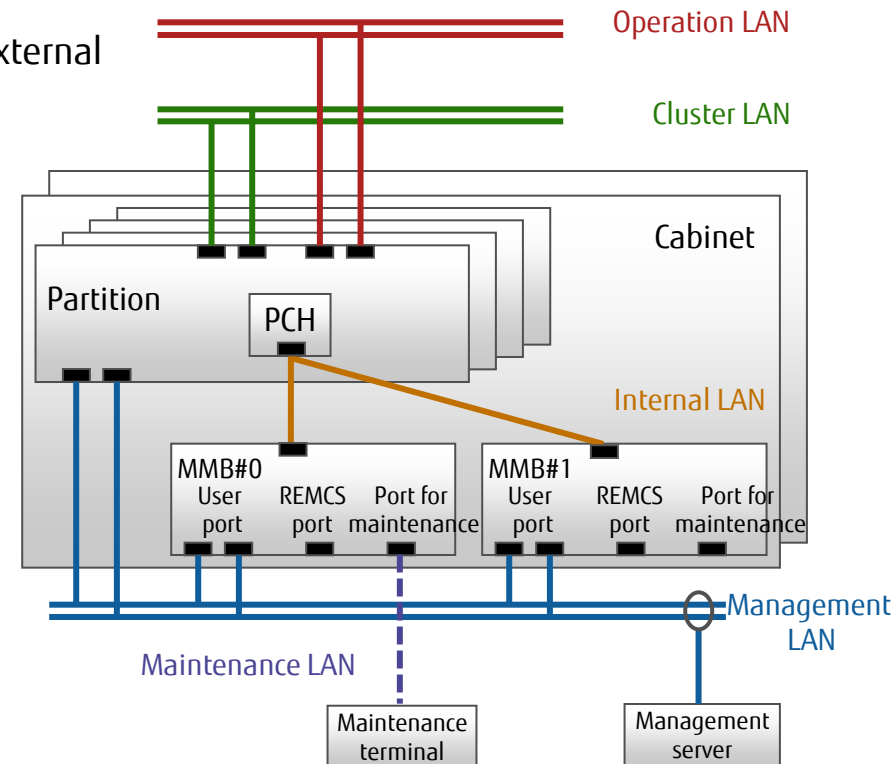
The LAN for connecting each partition to MMBs for internal communication

■ Maintenance LAN

The LAN that is used for maintenance

- For connecting a maintenance terminal (port for maintenance)

On the external switching hub device for connecting to the management LAN for MMBs, select [Disable] for the spanning tree protocol function.



* Specify different subnets for the management LAN, cluster LAN, internal LAN, and maintenance LAN.

* When counting the number of LAN ports that are required for a partition, consider that two ports are used for the management LAN.

3.3.5 Network Configuration (2/5)

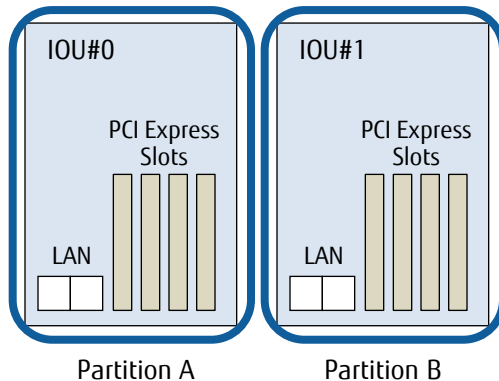
■ Redundancy of Internal Ports

Concepts of Reliable Configurations

When configuring partitions with multiple components, install internal ports on different components.

Example of IOUs

Separate IOUs from each other.



3.3.5 Network Configuration (3/5)

■ Configuration That Focuses on Redundancy

Multiple channel ports on a PCI Express card are used effectively.

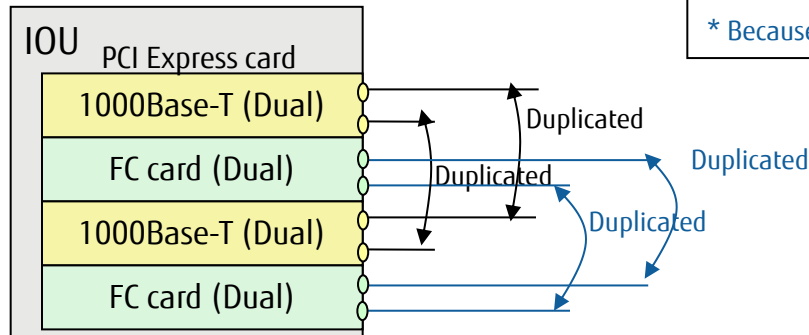
- FC card (Single)
=> FC card (multiple channels)
- Unused 1000Base-T ports are used.



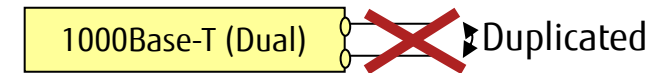
Advantage: The numbers of extended I/O cabinets and PCI Boxes can be reduced.

Disadvantage: If the PCI Express card fails, multiple ports cannot be used.

* Because the card is duplicated, the system can continue to operate safely.



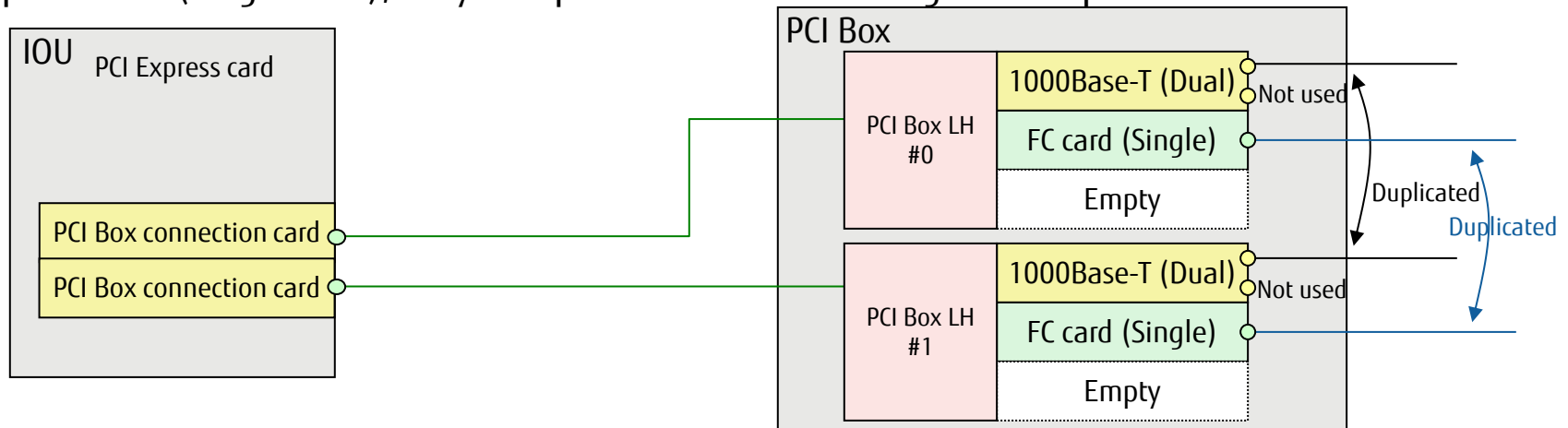
Incorrect Example



This configuration is not correct because the duplication does not make sense if the PCI Express card fails.

■ Configuration That Focuses on Hot Swap

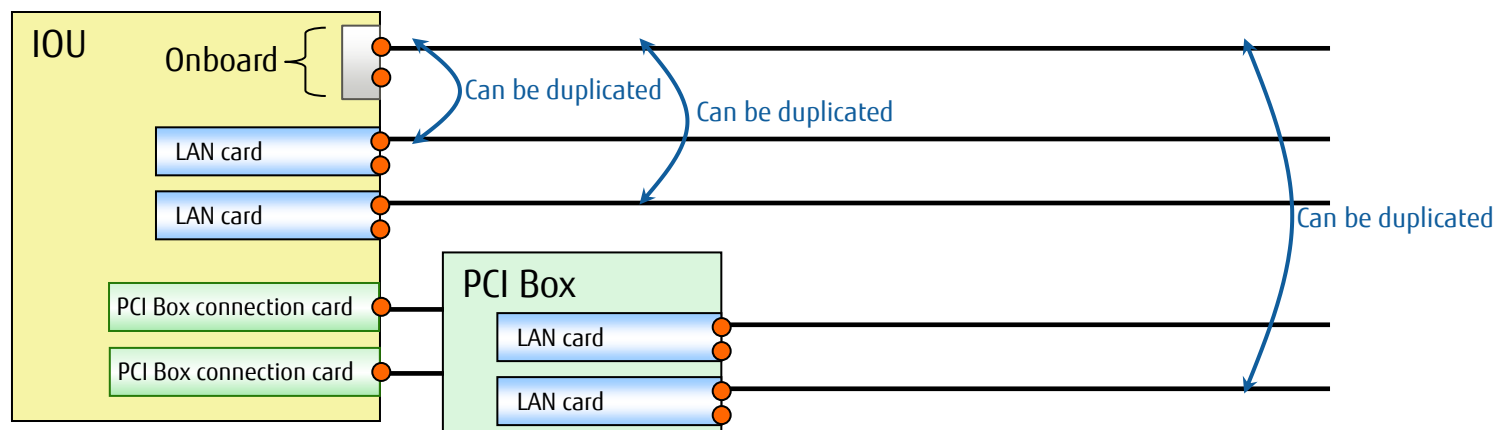
Considering the range of impact during a PCI Express card failure, for connections with a PCI Express card (single card), only one port is used when using a multi-port card.



3.3.5 Network Configuration (4/5)

■ Network Configuration Redundancy with an Onboard LAN

A network configuration can be duplicated by using an Onboard LAN.



* When an onboard LAN is used, before maintenance is performed on an IOU, all partitions that use the IOU must be stopped.

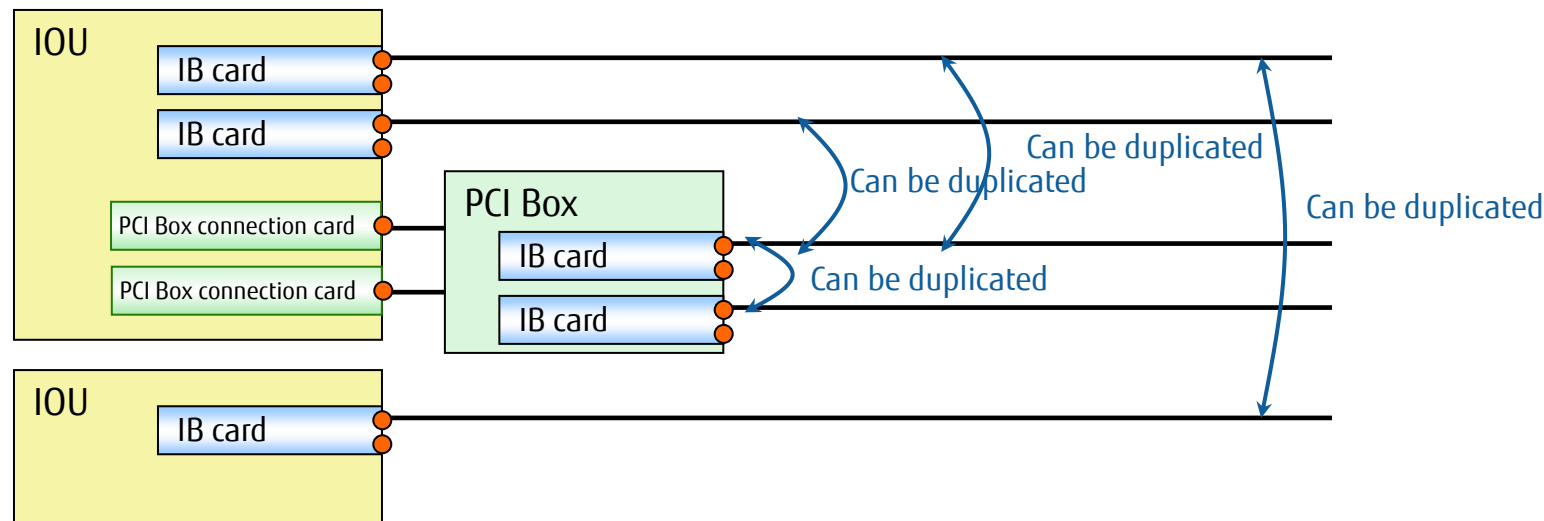
■ Redundant Configuration for the Management LAN

- The management LAN can be recovered when an error occurs by creating a redundant configuration of the user ports on the MMBs that are connected to the management LAN with tools such as the bonding driver, PRIMECLUSTER GLS, and Intel® PROSet.
- When MMBs are duplicated but user ports are not, the active MMB must be switched manually if an MMB fails.

👉 For details, refer to "1.3.3 Redundant configuration of the management LAN" in "Administration Manual".

3.3.5 Network Configuration (5/5)

■ InfiniBand Network Configuration Redundancy



■ Replacement of an Ethernet Environment with InfiniBand Cards

- InfiniBand cards with a wide bandwidth of 40Gbps or 56Gbps can accommodate more networks than when a 10GbE environment is used.
- InfiniBand cards can be used for the paths to synchronize databases.
Use of InfiniBand cards with PCIe SSDs can provide better results within the network.

3.3.6 Setting I/O Space for PCI Devices (1/2)

To perform a boot in a legacy BIOS environment, it is necessary to assign the I/O space to the boot device.

- The size of the I/O space is 64KB for all models.
- A 4KB area of the I/O space can be assigned per device.
- The assignment is possible for up to 15 devices (that is, 16 devices in total including one device that is reserved for a PCH).

The following devices can be assigned:

- Onboard LANs
- RAID cards in SBs
- RAID cards in DUs
- PCI Express slots on IOUs
- PCI Boxes

3.3.6 Setting I/O Space for PCI Devices (2/2)

- Select one of the following two assignment types and set the assignment in the "Device Manager menu" of the UEFI.
 - * When auto assignment is used for some devices and forced assignment is used for other devices in the same system, auto assignment is performed after forced assignment is set (and a system reset is performed).
 - Forced assignment of the I/O space
 - Reserve an I/O resource for each device (including onboard devices such as IOUs) for I/O resources and PCI Express cards that are included in a partition.
 - This type of assignment is useful for assigning I/O space to specific devices and cards if there are more than 16 devices that require the I/O space.
 - Auto assignment of the I/O space
 - This type of assignment is easy to use and can be implemented when the partition configuration is relatively small and 16 or less devices require the I/O space.

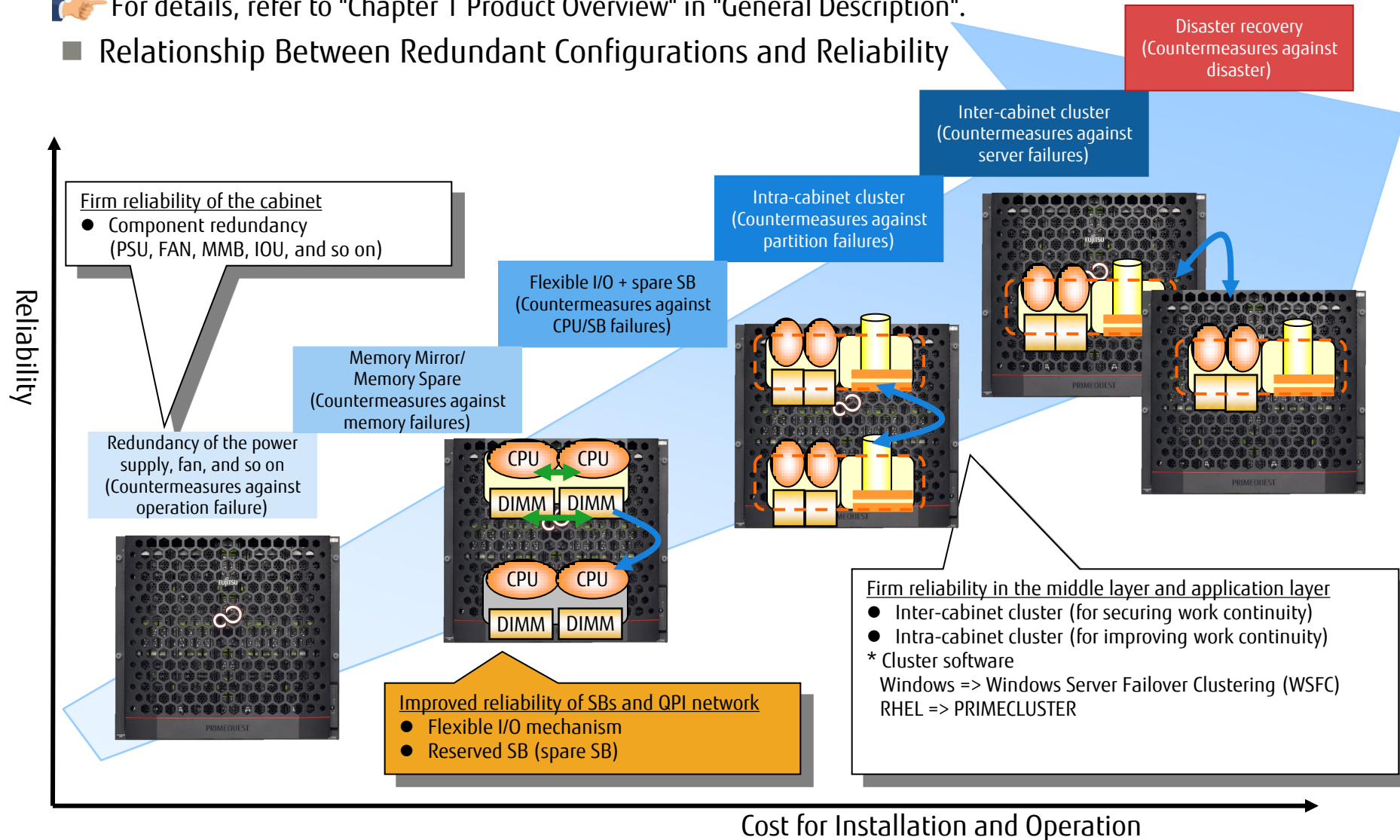
 For details, refer to "3.4 [Device Manager] Menu" in "Tool Reference".

3.4 Key Points for Cluster Configurations (1/4)

Cluster operation with cluster operation software is supported to increase the system availability.

☞ For details, refer to "Chapter 1 Product Overview" in "General Description".

■ Relationship Between Redundant Configurations and Reliability



■ Cluster System Overview

- A dedicated LAN for inter-node communication is used to connect between nodes.
 - Private network is used for Windows.
 - Cluster interconnect is used for Linux.
- Inter-node communication is performed periodically to monitor for problems.
- There are two types of cluster systems: inter-cabinet cluster and intra-cabinet cluster.

👉 For details, refer to "[3.4.1 Inter-Cabinet Cluster](#)" and "[3.4.2 Intra-Cabinet Cluster](#)".

- Windows

Clustering with Windows Server Failover Clustering (OS standard function) is recommended.

* A server for Active Directory (AD server) is required separately.

- RHEL

Clustering with PRIMECLUSTER is recommended.

3.4 Key Points for Cluster Configurations (3/4)

- Possible Combinations of PRIMEQUEST Cluster Configurations (1/2)
 - Inter-Cabinet Cluster
 - Clustering between different models is not supported.
 - Each node consists of the same model in the same configuration (in the number of CPUs, CPU frequency, memory capacity, HDD capacity, and number of HDDs).
 - Intra-Cabinet Cluster
 - All nodes have the same configuration (in the number of CPUs, CPU frequency, memory capacity, HDD capacity, and number of HDDs).
 - If an IOU fails, the redundancy of the system is lost and components such as the midplane become single points of failure.

3.4 Key Points for Cluster Configurations (4/4)

■ Possible Combinations of PRIMEQUEST Cluster Configurations (2/2)

The following table shows whether OracleDB is supported as the cluster management DB software.

OS	Cluster software	Configuration	2800B2/2800B3	2400E2/2400E3	2800E2/2800E3
RHEL	PRIMECLUSTER (excluding RAC)	Intra-cabinet	No	Yes*	Yes
		Inter-cabinet	Yes*	Yes*	Yes*
	PRIMECLUSTER (RAC)	Intra-cabinet/ inter-cabinet	No	No	No
	Oracle Clusterware (SE2-RAC)	Intra-cabinet	No	No	No
		Inter-cabinet	No	No	No
	Oracle Clusterware (EE-RAC)	Intra-cabinet	Yes*	Yes*	Yes*
		Inter-cabinet	Yes*	Yes*	Yes*
Windows	WSFC (excluding RAC)	Intra-cabinet	No	Yes*	Yes
		Inter-cabinet	Yes*	Yes*	Yes*
	WSFC (RAC)	Intra-cabinet/ inter-cabinet	No	No	No
	Oracle Clusterware (SE2-RAC)	Intra-cabinet	No	No	No
		Inter-cabinet	No	No	No
	Oracle Clusterware (EE-RAC)	Intra-cabinet	Yes*	Yes*	Yes*
		Inter-cabinet	Yes*	Yes*	Yes*

RAC: Oracle Real Application Clusters
WSFC: Windows Server Failover Clustering

Yes*: Supported and recommended (IOU redundancy configuration is allowed)
Yes: Supported and recommended
No: Not supported

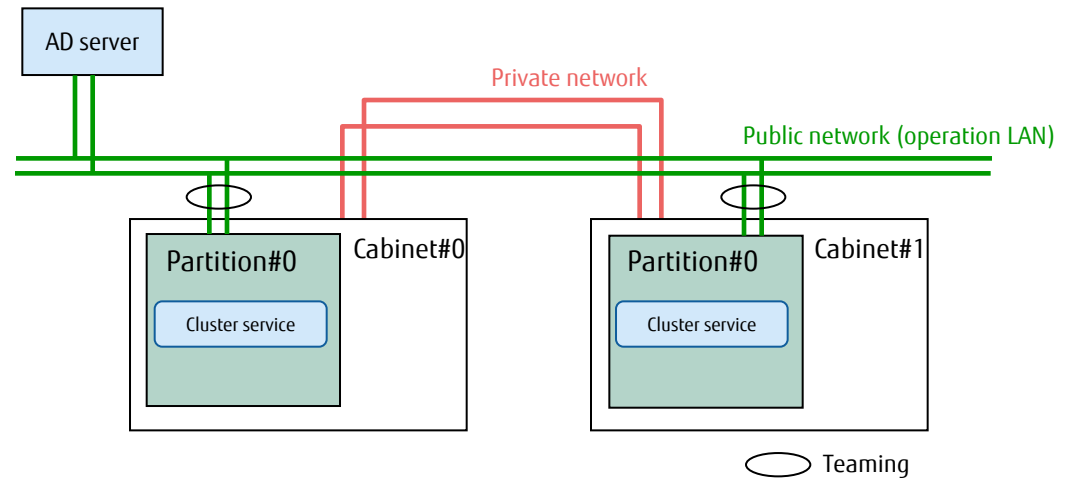
Note: When RAC is used, PRIMECLUSTER and WSFC cannot be used together with RAC. Use Oracle Clusterware.

3.4.1 Inter-Cabinet Cluster

- A cluster configuration for communication between PRIMEQUEST nodes (cabinets)

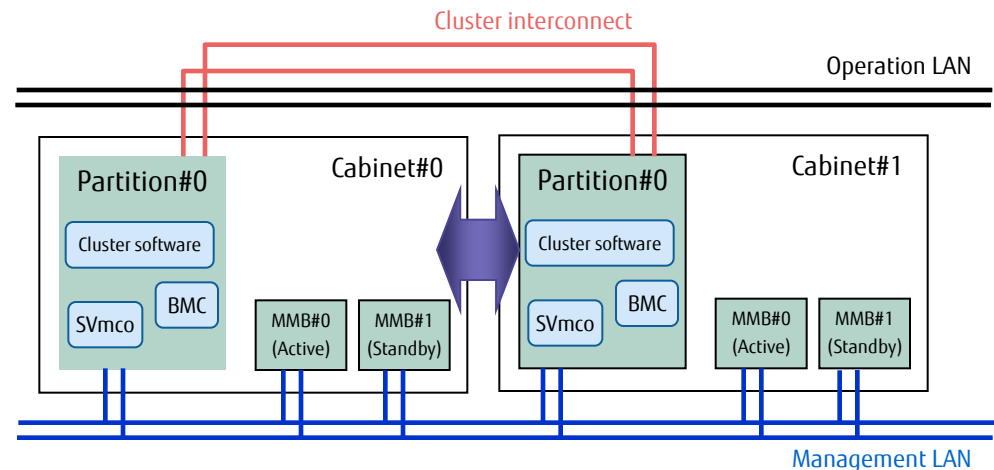
Windows

The private network is configured separately from the public network (operation LAN).



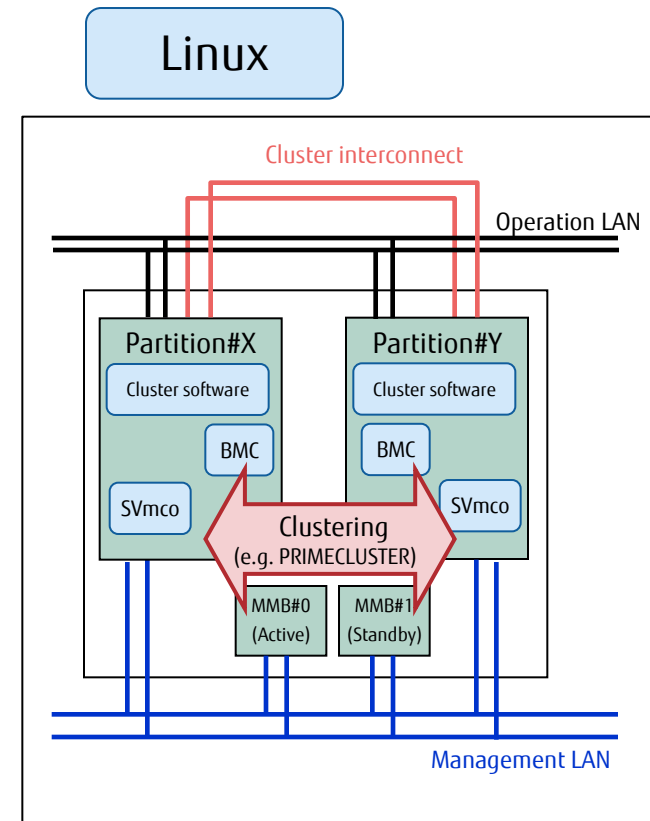
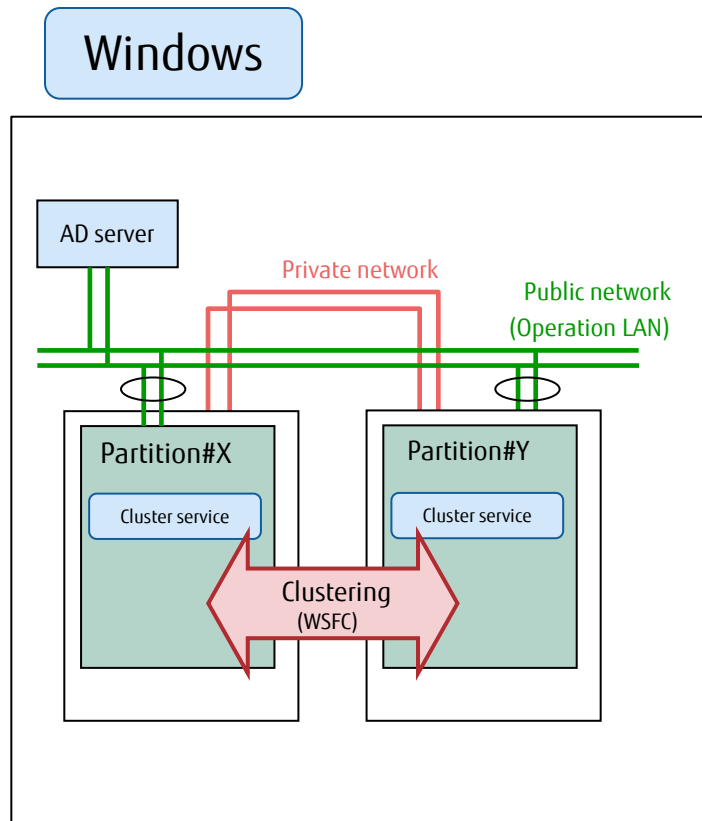
Linux

The cluster interconnect is configured separately from the operation LAN and management LAN.



3.4.2 Intra-Cabinet Cluster

- A cluster configuration for communication between nodes (partitions) that are created in a cabinet
- By configuring both active and standby systems in a cabinet, availability of the entire system including the software layer is ensured.



3.5 Key Points for Power Supply

■ Power Supply Redundancy

☞ For details, refer to "[3.5.1 Power Supply Redundancy](#)".

Examples of single power feed and dual power feed

■ UPS Redundancy

☞ For details, refer to "[3.5.2 UPS Redundancy](#)".

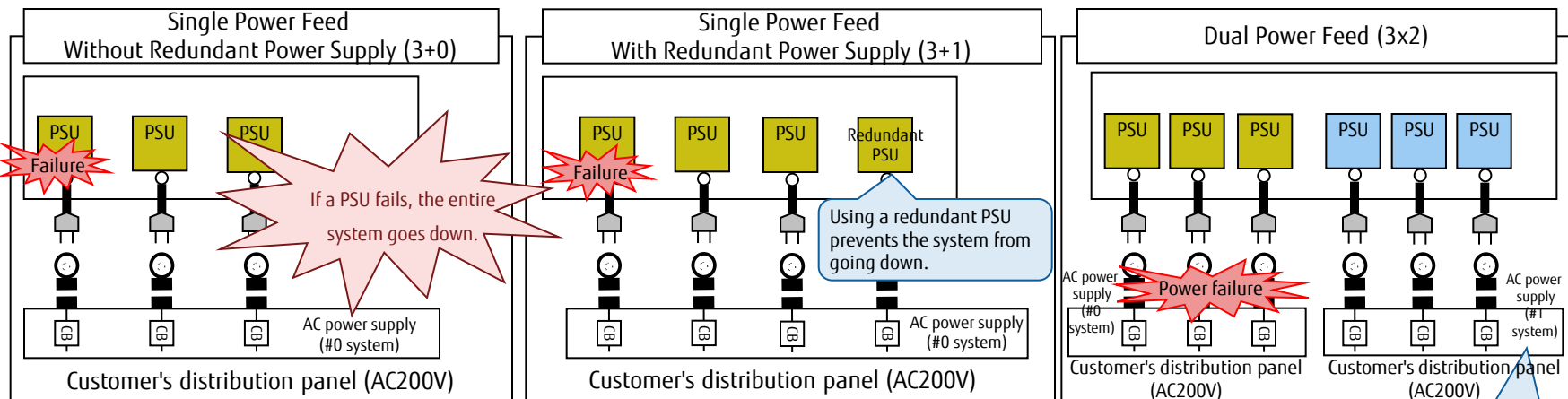
■ Guidelines for Selecting a 200V Power Distribution Box

☞ For details, refer to "[3.5.3 Guidelines for Selecting a 200V Power Distribution Box](#)".

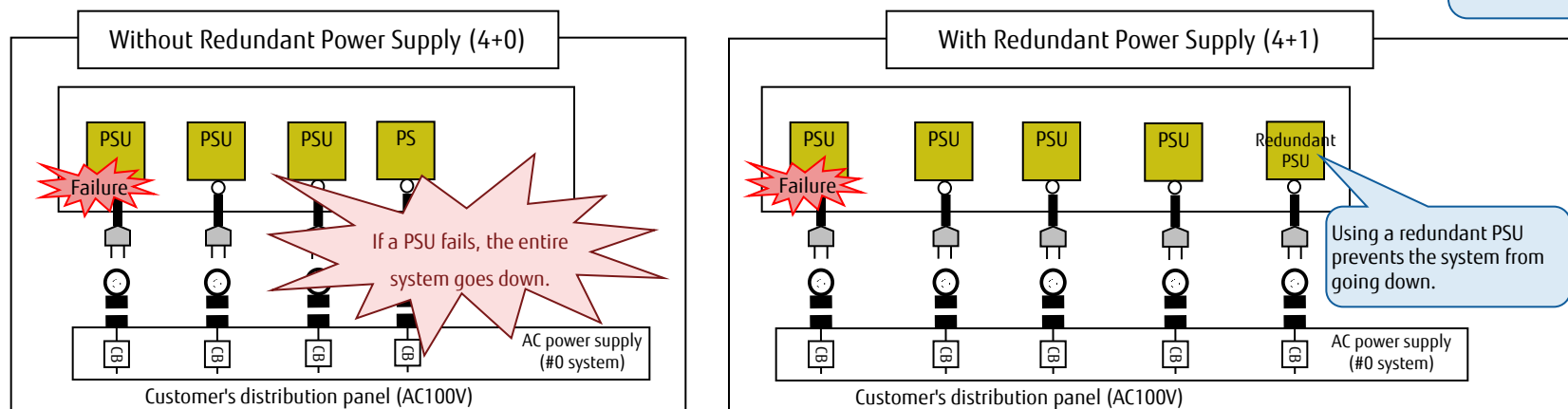
- AC200V Power Distribution Box Brief Specifications
- Guidelines on the Number of AC200V Power Distribution Boxes

3.5.1 Power Supply Redundancy

■ Examples of 200V (for 2800B2/2800B3/2800E2/2800E3)



■ Examples of 100V (for 2400E2/2400E3)



Using dual power feed prevents the system from going down.

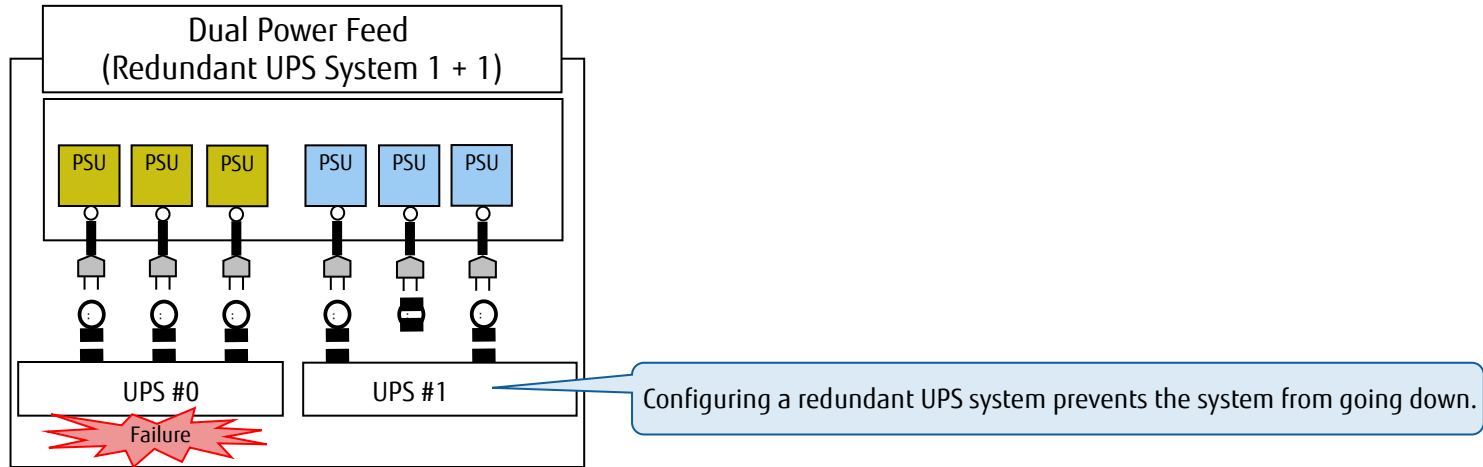
Using a redundant PSU prevents the system from going down.

* When using a redundant configuration or dual power feed for the main unit, also use the same power supply configuration for the PCI Boxes.

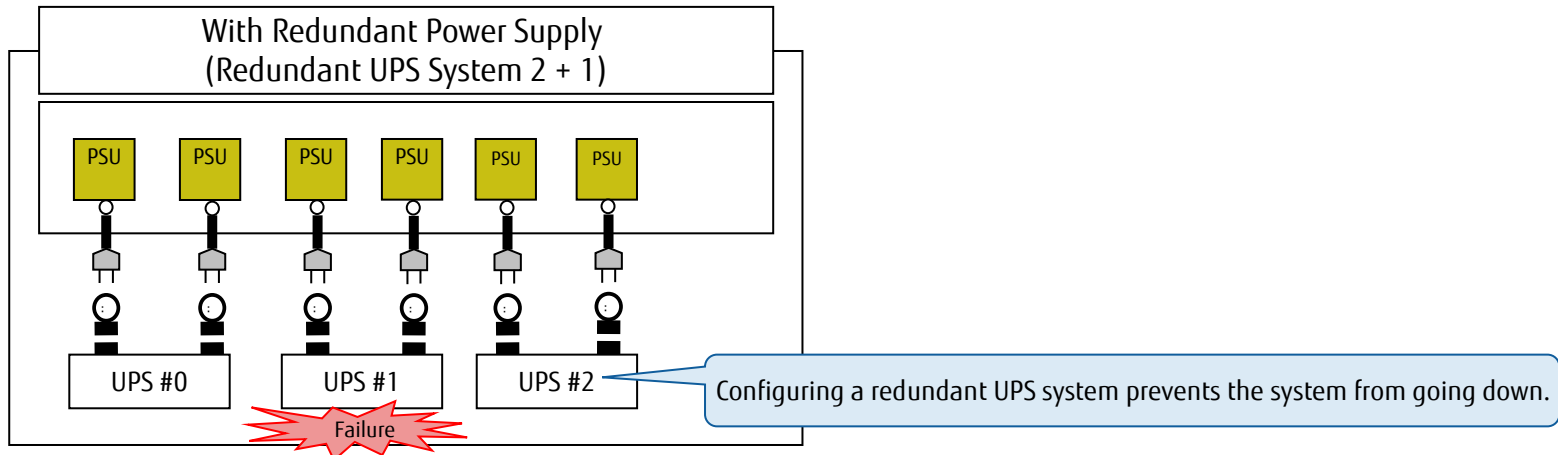
👉 For details on PSU configurations, refer to "[2.8 Power Supply Unit \(PSU\)](#)".

3.5.2 UPS Redundancy

■ Examples of 200V (for 2800B2/2800B3/2800E2/2800E3)



■ Examples of 100V (for 2400E2/2400E3)



👉 For details on PSU configurations, refer to "[2.8 Power Supply Unit \(PSU\)](#)".

3.5.3 Guidelines for Selecting a 200V Power Distribution Box

■ AC200V Power Distribution Box Brief Specifications

U number	Voltage	Input	Output		Output current	
1U	200V	NEMA L6-30P	IEC320 C19	3	24A/BOX	16A per box
0U	200V	NEMA L6-30P	IEC320 C19	3	24A/BOX	16A per box

■ Guidelines on the Number of AC200V Power Distribution Boxes

Model	200V non-redundant configuration	200V redundant configuration	200V dual power feed configuration
2400E2/2400E3	1	1	2
2400E2/2400E3 with Memory Scale-up Board	1	2	2
2800E2/2800E3	2	2	4
2800E2/2800E3, 2800B2/2800B3 (*1) (4,500VA or less)	1	2	2

(*1) Calculate the required number of power distribution boxes according to the maximum apparent power. The maximum apparent power can be calculated by using the Power Calculator ("Tool").
As the above example shows, if the maximum apparent power is 4,500VA or less , the number of power distribution boxes can be reduced.

4. Operation Management Design

This chapter describes the key points for designing operation management.

For details, refer to "Administration Manual".

4.1 Key Points for Console Operation (1/2)

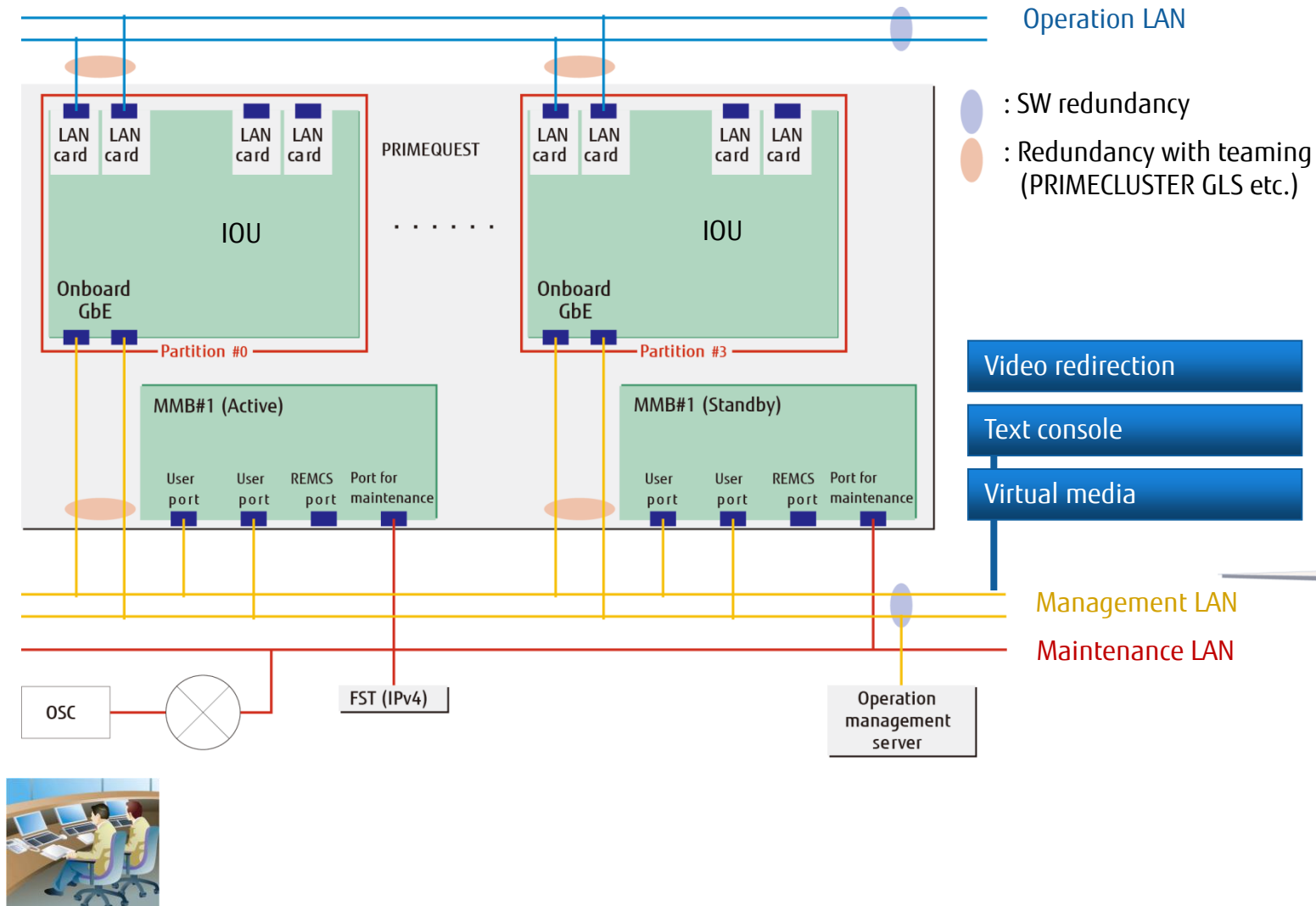
■ Functions of Consoles

Connection type	Console type	Intended purposes	Connection target	Remarks
Remote	Video redirection	Control and management of the OS in a partition (using images)	Management LAN	<ul style="list-style-type: none">• It is difficult to acquire operation logs or automate operations (log acquisition can be performed by using an application with a log acquisition function).• A PC in which JRE is installed must be connected to the management LAN.• If the resolution on the server is 800 x 600, part of the screen may not be displayed or trails of the mouse pointer may appear.
	Text console	Maintenance	Management LAN	

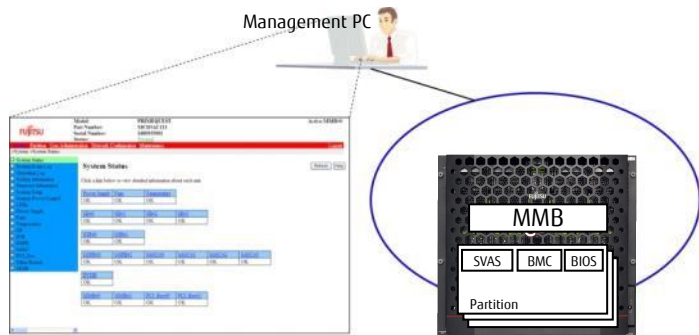
- Action That Is Required When Reserved SB Switching Occurs
- If switching by the Reserved SB function occurs, the console connection must be changed.

4.1 Key Points for Console Operation (2/2)

■ Console Connection Configuration



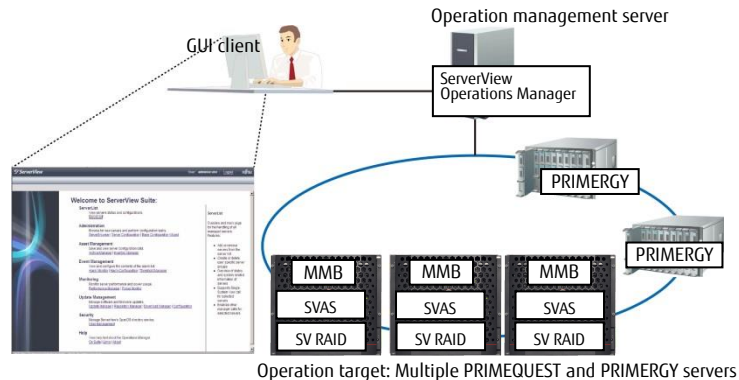
4.2 Key Points for Server Operation Management (1/2)



Operation target: One PRIMEQUEST server

Hardware management of a PRIMEQUEST server through the MMB Web-UI (agentless management)

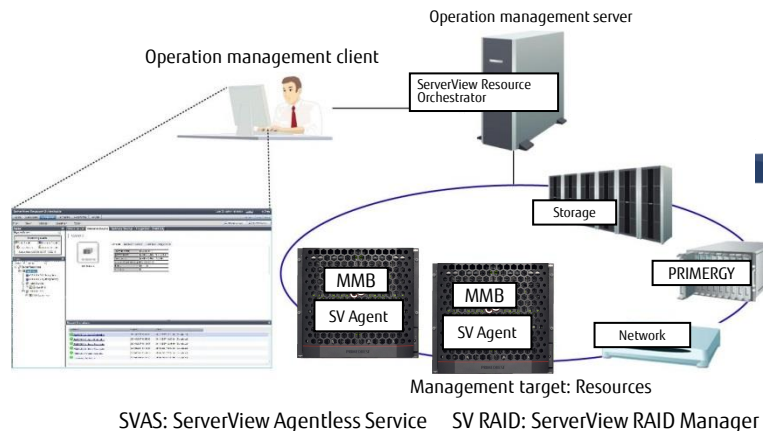
- Hardware status monitoring
- Hardware setting
- Power supply operation (turning on/off) etc. on a partition basis



Operation target: Multiple PRIMEQUEST and PRIMERGY servers

Hardware management of multiple PRIMEQUEST and PRIMERGY servers through ServerView Suite

- <http://www.fujitsu.com/global/products/computing/servers/mission-critical/primequest/technology/server-view.html>
- Consolidated management and operability of multiple PRIMEQUEST servers in an integrated screen
- Functions for supporting the entire system life cycle that are provided to the managed servers
- Power supply operation and reboot operation for a partition that can be performed from a GUI



Management target: Resources

Integrated management of different models through ServerView Resource Orchestrator V3 (optional)

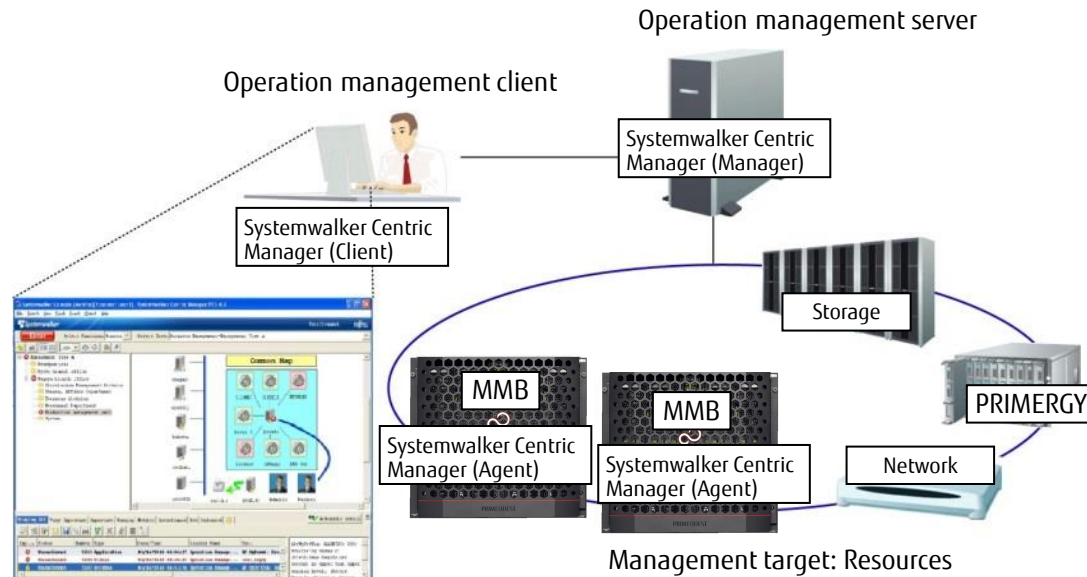
- <http://www.fujitsu.com/global/products/software/infrastructure-software/resource-management/serverview-resource-orchestrator/>
- A single screen for displaying server information in which different operations and monitoring between platforms are integrated
- Server operations (start, stop, and reboot operations) through the screen (Automation with a CLI is also possible.)
- Functions for supporting the entire virtual environment operation (Integrated management of physical servers and virtual servers, simplified and visualized operation of virtual servers, and simplified maintenance)


4.2 Key Points for Server Operation Management (2/2) **FUJITSU**

■ Operation Management of the Entire System with Systemwalker Centric Manager


Operation management including work management, network management, and storage management

- Failure statuses can be checked easily through an integrated monitoring screen.
- ServerView Suite functions can be used through web call linkage.
- Duplicated operation management server
If a problem occurs on the primary management server, monitoring can be continued by switching to the secondary management server.
- Operations on the monitoring screen are restricted to prevent unintended operations and unauthorized access.



 For details, refer to "Appendix J Systemwalker Centric Manager Linkage" in "Administration Manual".

■ Backup and Restoration of Configuration Information

 For details, refer to "10.1 Backing Up and Restoring Configuration Information" in "Administration Manual".

■ Backup Mechanism

- Configuration information is stored in the System FRU (I2C EEPROM) on the OPL.
(This processing is performed regularly or when MMB firmware is updated.)
- The same information is stored also in the flash memory of the MMB.
- When duplicated MMBs are used, the same information is always stored in both MMBs.

■ Backup Contents

- Firmware setting information
- Device identification information

■ Backup and Restoration of System Disks

■ OS Standard Commands and Tools

Command or tool name	OS	
	Windows	Linux
Windows Server Backup	Yes	-
dump and restore commands	-	Yes

Yes: Available
-: Not available

■ Optional Products

Tool name	OS		Options that can be added
	Windows (*1)	Linux (*2)	
ServerView Resource Orchestrator V3	Yes	Yes	-
SystemcastWizard Professional	Yes	Yes	-
PRIMECLUSTER GDS Snapshot	-	Yes	-
ETERNUS SF AdvancedCopy Manager	Yes (*3)	Yes (*3)	-
NetVault Backup 11 (*4)	-	Yes	NetVault Backup 11 BMR Single Offline Only Client
NetVault Backup 11 for Windows (*4)	Yes	-	NetVault Backup 11 for Windows BMR Single Offline Only Client NetVault Backup 11 for Windows BMR Single Client for Windows
Arcserve Backup for Windows	Yes	-	Arcserve Backup for Windows Disaster Recovery Option

(*1) For details on support information for Windows Server 2012, visit our web site:
<http://www.fujitsu.com/global/products/computing/servers/mission-critical/primequest/software/>.

Yes: Available, -: Not available

(*2) For details on support information for Oracle Linux support, contact your sales representative.

(*3) Only for a SAN boot configuration with an ETERNUS disk storage system

(*4) For supported configurations, contact your sales representative.



For details, refer to "Linux (RHEL) Design Guide".

* Floppy disk drives cannot be connected to the PRIMEQUEST 2000 series.
Select a method that does not require direct connection of a floppy disk drive.
* The software support information is as of June 2016. For the latest software information, contact your sales representative.

4.4 Key Points for NTP Operation

- The NTP should be used when the Reserved SB function is used or when a partition is configured with two or more SBs

■ Time Setting Targets

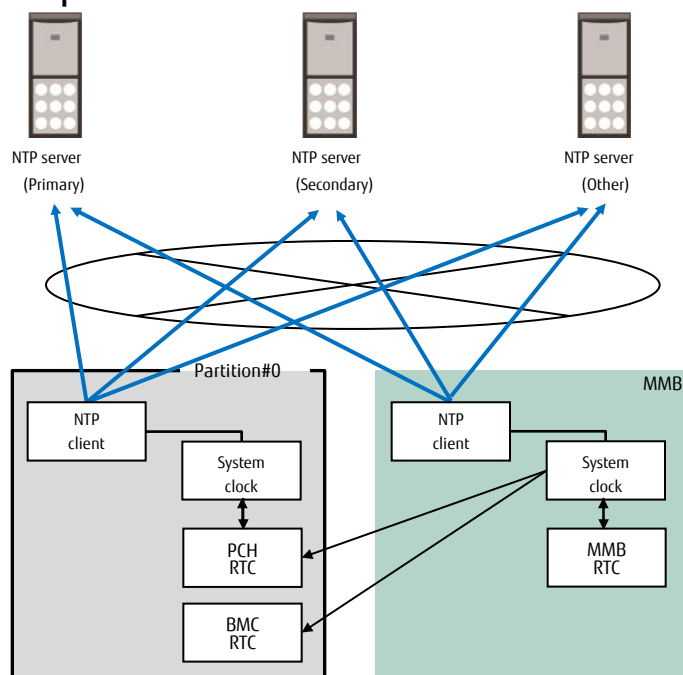
☞ For details on settings, refer to "Installation Manual" and "4.4 Key Points for Time Correction" in "Linux (RHEL) Design Guide".

■ MMB

The MMB works as an NTP client that is connected to external NTP servers to synchronize time.

■ Each partition

Each partition works as an NTP client that is connected to external NTP servers.



* To ensure the stability of the NTP operation, specify multiple NTP servers from each NTP client.

* Select NTP servers that have a high-precision clock in the Internet or intranet.

5. OS/Support

This chapter describes information on the OS.

5.1 Arrangement Information

- For details on the types of OSs and support, contact your sales representative.
- For details on OS specifications, refer to "[Appendix B OS Specifications](#)" and the website of each vendor.

Appendices

■ Software Bundled with Hardware

The "ServerView Suite" DVD is bundled with the main unit by default.

👉 For details, refer to "3.3 Bundled software" in "General Description".

Tool	Windows	RHEL	SLES	Oracle Linux	Oracle VM	VMware
DSNAP	Yes	-	-	-	-	-
Software Support Guide	Yes	-	-	-	-	-
ServerView Operations Manager	Yes	Yes	Yes	-	-	-
ServerView Agentless Service	Yes	Yes	Yes	Yes	Yes	-
ServerView Agent	Yes	Yes	Yes	Yes	Yes	-
ServerView RAID Manager	Yes	Yes	Yes	Yes	Yes	-
ServerView CIM Provider	-	-	-	-	-	Yes
SVMco	-	Yes	-	-	-	-
HBA blockage function	-	Yes	-	-	-	-
Dynamic Reconfiguration utility	-	Yes	Yes (*1)	-	-	-

(*1) SLES 12 SP1

Yes: Supported, -: Not supported

■ Drivers

■ Windows

Drivers are provided with ServerView Suite.

For the latest versions, contact your sales representative.

■ Related Software

■ Server Management Software

👉 For details, refer to "1.5.3 Server management software" in "General Description".

Appendix B OS Specifications (1/8)

The following OS specification information is applied to the PRIMEQUEST 2000 series. For details on the specifications including maximum values on each OS, refer to the information that is provided by each vendor.

■ Windows Server 2012: Comparison of Specifications

OS type		R2 Datacenter / R2 Standard	Datacenter / Standard
CPU	Maximum number of sockets	8	
	Maximum number of cores	192	
	Maximum number of logical CPUs	384 (when Hyper-V is enabled) 320 (when Hyper-V is disabled)	
Memory	Maximum memory capacity	4TB	
Disk (*1)	Number of partitions in a disk	MBR format (Primary + Extended): 3+124, 4+0 GPT format: 128+0	
	Maximum LUN capacity	MBR format: 2TB GPT format: 256TB (Upper limit in the file system)	
PCI	Maximum number of PCI slots	All slots can be used.	
	PCI Hot Plug	PCI Box is supported. No IOU is supported. (Specification of the main unit)	
Firmware	UEFI support	Supported	

(*1) The upper limits of the file system size and the file size in each file system are as follows:

FAT Maximum size: 2TB, maximum file size: 2TB

NTFS Maximum size: 16TB (4KB cluster)/256TB (64KB cluster) (implementation restrictions, the logical maximum value is 16EB)

Maximum file size: 16TB (implementation restrictions, the logical maximum value is 2⁶⁴-1 clusters)

ReFS, which is the latest file system for Windows Server 2012, can be used for data areas, but ReFS is not recommended because its use has not been proven well.

Appendix B OS Specifications (2/8)

■ RHEL: Comparison of Specifications

OS type		RHEL 6 (for Intel64)	RHEL 7 (for Intel64)
CPU	Maximum number of sockets	8 (4 system boards)	
	Maximum number of cores	192	
	Maximum number of logical CPUs	240	
Memory	Maximum memory capacity	12TB	
Disk	Number of partitions in a disk	MBR format (Primary + Extended): 4+0, 3+1 (up to 11 logical partitions in the extended partition) GPT format: 15	
	Maximum LUN capacity	The ext4 file system (MAX16TB) MBR format: 2TB (The maximum value for MBR) GPT format: 240TB (ext4 x 15 partitions equivalent)	The XFS file system MBR format: 2TB GPT format: 7,500TB (The maximum file system size x 15 partitions equivalent)
	Maximum number of volumes	18,278 * Tested up to 8,192 by Red Hat	No limit * Tested up to 10,000 by Red Hat
	Maximum number of LUNs (default value/maximum value) (*1)	SCSI common layer: 512/4,294,967,296 Fusion-MPT SAS (mptsas driver): 16,896/16,896 Fusion-MPT SCSI (mptspi driver): 256/256 Emulex Fibre Channel (lpfc driver): 256/65,536 MegaRAID SAS (megaraid_sas driver): 8/8	
PCI	Maximum number of PCI slots	All slots can be used.	
	PCI Hot Plug	PCI Box is supported. No IOU is supported. (Specification of the main unit)	
	MSI support (OS/driver) (Common between x86 and Intel64)	Kernel: MSI and MSI-X are supported. / FusionMPT: MSI is supported, but MSI-X is not supported. INTx is used by default. LPFC: MSI and MSI-X are supported. INTx is used by default. / e1000e: MSI and MSI-X are supported. MSI is used by default. igb: MSI and MSI-X are supported. MSI-X is used by default. / ixgbe: MSI and MSI-X are supported. MSI-X is used by default. * To specify an option other than the default for a driver, use the option parameter of the driver.	
Firmware	UEFI support	Supported	

(*1) - In actual operation, the values are restricted by the maximum number of volumes.

- The number of LUNs for each of the lower-level drivers (mptsas, mptspi, lpfc, and megaraid_sas) cannot exceed the value that is set for the SCSI common layer.
- To specify a non-default value, use the option parameter of each driver.

■ SLES: Comparison of Specifications

For details, refer to the following URLs:

👉 SLES 11: https://www.suse.com/releasenotes/x86_64/SUSE-SLES/11/#rnotes-technical

SLES 12: https://www.suse.com/releasenotes/x86_64/SUSE-SLES/12/#TechInfo

OS type		SLES 11 SP4	SLES 12 SP1
CPU	Maximum number of logical CPUs	4,096	8,192
Memory	Maximum memory capacity	24TB	
Disk	Maximum file system size	16TB (ext3)	1EB (ext4)
	Maximum file size	2TB (ext3)	1EB (ext4)
PCI	Maximum number of PCI slots	All slots can be used.	
	PCI Hot Plug	PCI Box is supported. No IOU is supported. (Specification of the main unit)	
Firmware	UEFI support	Supported	

■ Oracle Linux: Comparison of Specifications

For details, refer to the following URL:

 http://docs.oracle.com/cd/E52668_01/E67200/html/section-xv3-gvd-kn.html

OS type		Oracle Linux 7 Update 2
CPU	Maximum number of logical CPUs	2,048
Memory	Maximum memory capacity	64TB
Disk	Maximum LUN capacity	50TB
	Maximum file system size	btrfs: 50TB ext4: 50TB XFS: 500TB
	Maximum file size	btrfs: 50TB ext4: 50TB XFS: 16TB
PCI	Maximum number of PCI slots	All slots can be used.
	PCI Hot Plug	Not supported
Firmware	UEFI support	Supported

■ Oracle VM: Comparison of Specifications

The configuration maximums vary depending on actual environment.

☞ For details, refer to "Configuration Limits for Release 3.4" in the following URL.

http://docs.oracle.com/cd/E64076_01/E64077/html/vmrns-limits.html

OS type		Oracle VM 3.4
CPU	Maximum number of logical CPUs	288
	Number of vCPUs per virtual machine	PVM: 128 HVM: 128
Memory	Maximum memory capacity	6TB
Disk (in OCFS2)	Maximum number of LUNs	1000
	Maximum volume capacity	64TB
PCI	Virtual NICs	PVM: 31 HVM: 8
	Maximum number of physical NIC ports	For details, refer to "Network Maximums" in "Chapter 6 Configuration Limits for Release 3.4".
Firmware	UEFI support	Not supported

Appendix B OS Specifications (6/8)

■ VMware vSphere 5.5: Comparison of Specifications

The configuration maximums vary depending on actual environment.

👉 For details, refer to "Configuration Maximums" in the following URL:

<https://www.vmware.com/pdf/vsphere5/r55/vsphere-55-configuration-maximums.pdf>

Edition of vSphere 5		Essentials	Essentials Plus	Standard	Enterprise	Enterprise Plus
CPU	Maximum number of logical CPUs	320				
	Number of vCPUs per virtual machine	64Way				
Memory	Maximum memory capacity	4TB				
Disk (in VMFS)	Maximum number of LUNs	256				
	Maximum volume capacity	64TB				
PCI	Maximum number of FC-HBAs	8				
	Maximum number of physical NIC ports	For details, refer to "Networking Maximums" in "Configuration Maximums".				
Firmware	UEFI support	vSphere 5.5 GA/update1: Supported vSphere 5.5 update2/update3: Not supported				

Note: The number of LAN ports for the partition must include a port (1Gbps/1 port) for communication between the partition and the MMBs.
In addition, make sure to include the number of onboard LAN ports (2 ports per IOU).

Appendix B OS Specifications (7/8)

■ VMware vSphere 6: Comparison of Specifications

The configuration maximums vary depending on actual environment.

☞ For details, refer to "Configuration Maximums" in the following URL:

<https://www.vmware.com/pdf/vsphere6/r60/vsphere-60-configuration-maximums.pdf>

Edition of vSphere 6		Essentials	Essentials Plus	Standard	Enterprise	Enterprise Plus
CPU	Maximum number of logical CPUs	480				
	Number of vCPUs per virtual machine	128Way				
Memory	Maximum memory capacity	6TB				
Disk (in VMFS)	Maximum number of LUNs	256				
	Maximum volume capacity	64TB				
PCI	Maximum number of FC-HBAs	8				
	Maximum number of physical NIC ports	For details, refer to "Networking Maximums" in "Configuration Maximums".				
Firmware	UEFI support	Supported				

Note: The number of LAN ports for the partition must include a port (1Gbps/1 port) for communication between the partition and the MMBs.
In addition, make sure to include the number of onboard LAN ports (2 ports per IOU).

Appendix B OS Specifications (8/8)

■ VMware vSphere 6.5: Comparison of Specifications

The configuration maximums vary depending on actual environment.

☞ For details, refer to "Configuration Maximums" in the following URL:

<https://www.vmware.com/pdf/vsphere6/r65/vsphere-65-configuration-maximums.pdf>

Edition of vSphere 6		Essentials	Essentials Plus	Standard	Enterprise	Enterprise Plus
CPU	Maximum number of logical CPUs	576				
	Number of vCPUs per virtual machine	128Way				
Memory	Maximum memory capacity	12TB				
Disk (in VMFS)	Maximum number of LUNs	512				
	Maximum volume capacity	64TB				
PCI	Maximum number of FC-HBAs	8				
	Maximum number of physical NIC ports	For details, refer to "Networking Maximums" in "Configuration Maximums".				
Firmware	UEFI support	Supported				

Note: The number of LAN ports for the partition must include a port (1Gbps/1 port) for communication between the partition and the MMBs.
In addition, make sure to include the number of onboard LAN ports (2 ports per IOU).

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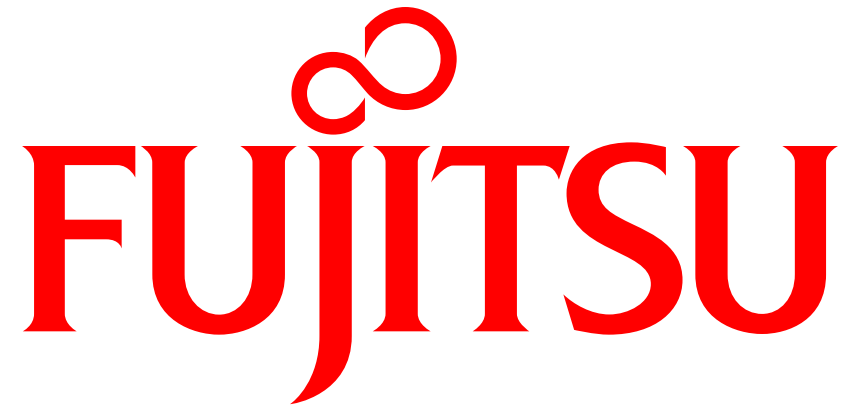
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