



# **ESC4000 Series**

## *Configuration Guide*

E6314

First Edition V1

May 2011

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## Revision history

Revision	Revision history	Date
V1	First release of ESC4000 Series configuration guide	May 2011

# Safety information

## Electrical Safety

- Before installing or removing signal cables, ensure that the power cables for the system unit and all attached devices are unplugged.
- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing any additional devices to or from the system, contact a qualified service technician or your dealer. Ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you service.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your dealer.

## Operation Safety

- Servicing of this product or units is to be performed by trained service personnel only.
- Before operating the server, carefully read all the manuals included with the server package.
- Before using the server, make sure all cables are correctly connected and the power cables are not damaged. If any damage is detected, contact your dealer as soon as possible.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Place the server on a stable surface.



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This product is equipped with a three-wire power cable and plug for the user's safety. Use the power cable with a properly grounded electrical outlet to avoid electrical shock.

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### Lithium-Ion Battery Warning

CAUTION! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

### CD-ROM Drive Safety Warning

**CLASS 1 LASER PRODUCT**

### Heavy System

CAUTION! This server system is heavy. Ask for assistance when moving or carrying the system.

# Chapter 1

This chapter describes the key features of ESC4000 Series. It includes the product overview and general specifications.

# Product introduction

## 1.1 Key features

The ASUS ESC4000 is a high density GPU server presented in a compact 2U rack mount with support for dual Intel® Xeon® 5600 series processors, 18 DIMM slots with up to 48GB/144GB memory and 4 double-wide NVIDIA® Tesla™ GPU computing processors. It enables high-end professional applications such as life/medical sciences, engineering and sciences, financial modeling, EDA and visualization. The ESC4000 packs outstanding features, flexible design and versatile hardware, making it an ideal choice for intense parallel computing tasks.

### Leading advanced system architecture

- Features dual all-new Intel® Xeon® 5600 series processors with Intel® Core™ microarchitecture for significant performance increases
- Supports 18 DIMM slots and up to 48GB/144GB high scalability memory for intense applications. DDR3 modules deliver higher speeds and more bandwidth with lower power consumption
- Embeds up to four NVIDIA® Tesla™ M2050/M2070/M2090 GPUs on full PCI-E Gen2 x16 slots with up to 2.66 teraflops, doubling precision performance
- The NVIDIA® Tesla™ M2090 GPU Computing Module is the world's fastest parallel computing processor for HPC

### 8+1 flexible expansion

- Eight PCI-E Gen2 x16 slot design supports up to four double-deck GPU computing cards for professional graphics
- Flex-E technology allows automatic switching between one PCI-E x16 and two PCI-E x8 links
- Additional PCI-E riser module compatible with both half-length/low-profile PCI-E cards and ASUS PIKE series cards

### Intelligent system fan control

- Three independent smart system fans, two for GPU areas and one for general motherboard cooling
- Adjusts fan speed automatically according to system load to optimize cooling and energy saving

### Flexible high storage capacity

- Designed with eight hard drive bays to support SAS or SATA drives
- Optional ASUS PIKE meets the various requirements of RAID functionality

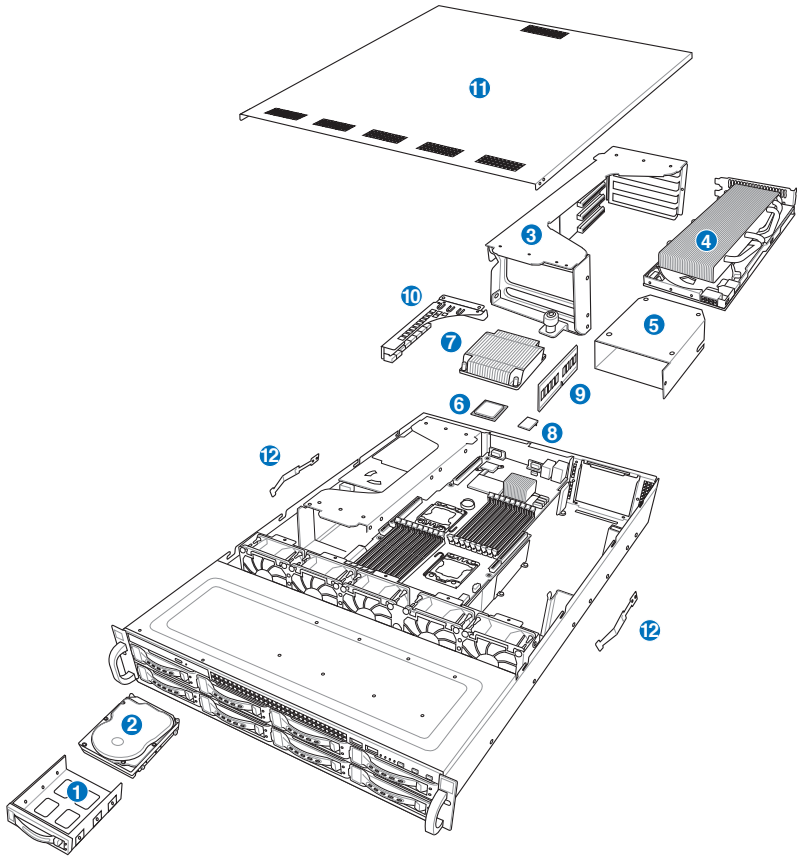
### **High reliability**

- 1400W 80+ Gold power supply delivers reliable and highly efficient power
- Hot-swap hard drive design allows downtime-free drive replacement

### **Remote control and management**

- Bundled ASMB4-iKVM module offers advanced server management
- KVM-over internet provides OS-independent manageability
- Ideal for remote office applications

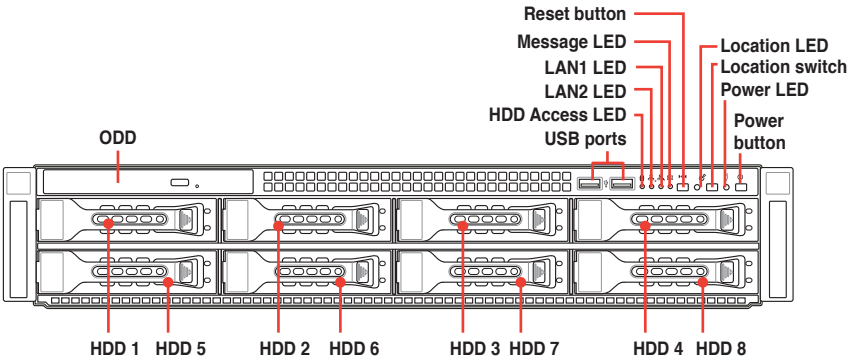
## 1.2 System overview



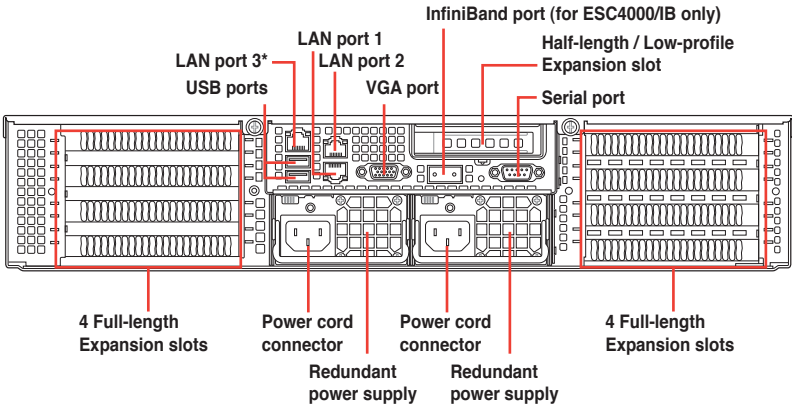
Items	Items
1. Hard disk drive bay	2. Hard disk drive
3. Computing module bracket	4. Computing module
5. Computing module airduct	6. CPU
7. CPU heatsink	8. ASMB4-iKVM controller card
9. DDR3 DIMM	10. PCI-E x16 riser card
11. Top cover	12. Rackmount rail kit



# 1.3 Front panel features



# 1.4 Rear panel features



\*The port is for ASUS ASMB4-iKVM controller card only.

# 1.5 System specifications

<b>Model Name</b>		<b>ESC4000 Series</b>
<b>Processor / System Bus</b>		2 x Socket LGA1366
		Six/Quad-Core Intel® Xeon® X5600 Series (130W/95W)
		Quad-Core Intel® Xeon® X5500 Series (95W)
		Quad-Core Intel® Xeon® E5500 Series (80W) Quad-Core Intel® Xeon® L5500 Series (60W/38W)
<b>Core Logic</b>		QPI 4.8 / 5.86 / 6.4 GT/s Intel® 5520 IOH Intel® ICH10R I/O Controller NVIDIA® nForce® 200 x 2
<b>ASUS Features</b>	Fan Speed Control	√
	ASWM 2.0	√
<b>Memory</b>	Total Slots	18 (3-channel per CPU, 3 DIMMs per channel)
	Capacity	Maximum up to 144GB (RDIMM) Maximum up to 48GB (UDIMM)
	Memory Type	DDR3 1333 / 1066 / 800 Reg DIMM / Unbuffered DIMM with ECC
	Memory Size	1GB, 2GB, 4GB and 8GB (RDIMM) 1GB, 2GB and 4GB (UDIMM)
<b>Expansion Slots</b>	Total PCI/PCI-X/PCI-E Slots	9
	Slot Type	Full-length - 8 x PCI-E x16 (4 at Gen2 x16 Link or 8 at Gen2 x8 Link) (Slot 1, 3, 5, 7 auto switch to x8 Link if slot 2, 4, 6, 8 is occupied)  Half-length / Low-profile - 1 x PCI-E x16 (Gen1 x4 Link) (PIKE SAS Card for Storage Enhancement)
	Additional Slot	PIKE Riser Card
	SATA Controller	<b>Intel® ICH10R:</b> - 6 x SATA2 300MB/s ports - Intel® Matrix Storage (for Windows only) - Supports software RAID 0, 1, 5 & 10 <b>LSI MegaRAID (for Linux / Windows):</b> - Supports software RAID 0, 1 & 10
<b>Storage</b>	SAS Controller	Optional: ASUS PIKE 1068E 8-port SAS RAID card ASUS PIKE 1078 8-port SAS HW RAID card ASUS PIKE 6480 8-port SAS RAID card ASUS PIKE 2008 8-port SAS2 6G RAID card ASUS PIKE 2008/IMR 8-port SAS2 6G RAID card ASUS PIKE 2108 8-port SAS2 6G H/W RAID card

(continued on the next page)

<b>HDD Bays</b>	I = Internal A or S will be hot-swappable	8 x Hot-swap 3.5" SATAII/SAS HDD Bays
<b>Networking</b>	LAN	2 x Intel 82574L + 1 x Mgmt LAN
<b>Graphic</b>	VGA	Aspeed AST2050 / 8MB
<b>Auxiliary Storage Device Bay (Floppy / Optical Device)</b>		1 x slim-type Optical Device Bay (Options: No Device / DVD-RW)
<b>Onboard I/O</b>		1 x External Serial Port 3 x RJ-45 ports (1 for ASMB4-iKVM) 4 x USB 2.0 ports (Front x 2, Rear x 2) 1 x Internal A Type USB Port 1 x VGA port 1 x QSFP Port for Infiniband QDR (@ DDR speed, for ESC4000/IB only)
<b>OS Support</b>		Windows® Server 2008 R2 Windows® Server 2008 Enterprise 32 / 64-bit Windows® Server 2003 R2 Enterprise 32 / 64-bit RedHat® Enterprise Linux AS5.5 32 / 64-bit SuSE® Linux Enterprise Server 11 32 / 64-bit (Subject to change without any notice)
<b>Anti-virus Software</b>		Optional Anti-virus Software CD
<b>Management Solution</b>	Out of Band Remote Hardware	ASMB4-iKVM for KVM-over-IP support (Bundled)
	Software	ASUS ASWM 2.0
<b>Dimension (HH x WW x DD)</b>		750mm x 444mm x 88mm (2U)
<b>Net Weight Kg (CPU, DRAM &amp; HDD not inclu ded)</b>		18 Kg
<b>Power Supply</b>		1400W (80+) 1+1 Redundant Power Supply (Default with one Power Supply Module)
<b>Power Rating</b>		Input: 100—140/180—240 Vac, 12—9.5A/9.5A—7A, 50—60Hz Class 1
<b>Environment</b>		Operation temperature: 10°C—35°C / Non operation temperature: -40°C—70°C Non operation humidity: 20%—90% ( Non- condensing)

\*Specifications are subject to change without notice.



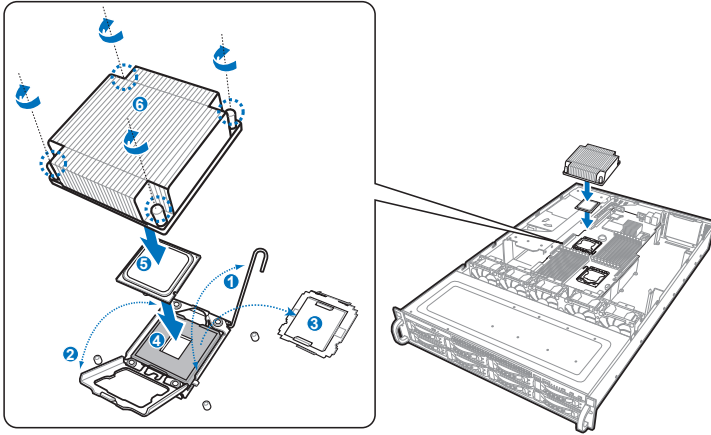
# Chapter 2

This chapter lists the key components and optional accessories for the server system.

# Components

## 2.1 Upgrading CPU and CPU heatsink

ASUS ESC4000 Series supports two Intel® LGA1366 Xeon® processors per Node.



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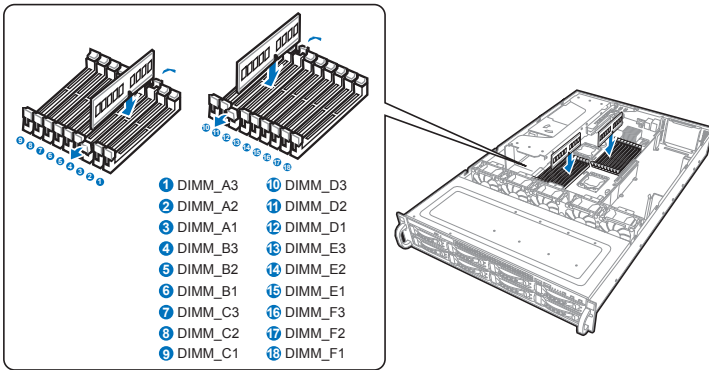
We recommend to install CPUs with the same frequency.

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Order P/N	Description
90-S000U0BS0T	Six Core Intel Xeon X5690, 3.46GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U08Z0T	Six Core Intel Xeon X5680, 3.33GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U0BT0T	Six Core Intel Xeon X5675, 3.06GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U08Y0T	Six Core Intel Xeon X5670, 2.93GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U08X0T	Six Core Intel Xeon X5660, 2.80GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U08W0T	Six Core Intel Xeon X5650, 2.66GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U0BU0T	Quad Core Intel Xeon E5649, 2.53GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U0BV0T	Quad Core Intel Xeon E5645, 2.40GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U08V0T	Quad Core Intel Xeon E5640, 2.66GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U08U0T	Quad Core Intel Xeon E5630, 2.53GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U08T0T	Quad Core Intel Xeon E5620, 2.40GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U0BW0T	Quad Core Intel Xeon E5607, 2.26GHz, QPI 4.8GT/s, 8MB L2, Single Pack with 1U Heatsink
90-S000U0BX0T	Quad Core Intel Xeon E5606, 2.13GHz, QPI 4.8GT/s, 8MB L2, Single Pack with 1U Heatsink
90-S000U0BY0T	Quad Core Intel Xeon E5603, 1.60GHz, QPI 4.8GT/s, 4MB L2, Single Pack with 1U Heatsink
90-S000U0BZ0T	Quad Core Intel Xeon X5687, 3.60GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U0990T	Quad Core Intel Xeon X5677, 3.46GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U0C10T	Quad Core Intel Xeon X5672, 3.20GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U09A0T	Quad Core Intel Xeon X5667, 3.06GHz, QPI 6.4GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U0C20T	Quad Core Intel Xeon X5647, 2.93GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U09Q0T	Six Core Intel Xeon L5640, 2.26GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U09B0T	Quad Core Intel Xeon L5630, 2.13GHz, QPI 5.86GT/s, 12MB L2, Single Pack with 1U Heatsink
90-S000U09C0T	Quad Core Intel Xeon L5609, 1.86GHz, QPI 4.8GT/s, 12MB L2, Single Pack with 1U Heatsink

## 2.2 Upgrading system memory

The motherboard comes with eighteen (18) Double Data Rate 3 (DDR3) Dual Inline Memory Modules (DIMM) sockets.



You may install 1 GB, 2 GB, 4 GB and 8 GB registered DDR3 DIMMs with ECC or 1GB, 2GB and 4GB unbuffered DDR3 DIMMs with ECC into the DIMM sockets using the memory configurations in this section.



- Always install DIMMs with the same CAS latency. For optimum compatibility, it is recommended that you obtain memory modules from the same vendor.
- For CPU1 configuraton, when installing only one DIMM, install it to the orange slots labeled DIMM\_A1, DIMM\_B1, or DIMM\_C1.
- For CPU2 configuraton, when installing only one DIMM, install it to the orange slots labeled DIMM\_D1, DIMM\_E1, or DIMM\_F1.

Order P/N	Description
90-S000I05K0T	DDR3 1333 ECC REG 2G 240P SINGLE PACK
90-S000I05M0T	DDR3 1333 ECC UNB 2G 240P SINGLE PACK
90-S000I0570T	DDR3 1333 ECC UNB 4G 240P SINGLE PACK
90-S000I05H0T	DDR3 1333 ECC REG 4G 240P SINGLE PACK
90-S000I05I0T	DDR3 1066 ECC REG 8G 240P 4RANK SINGLE PACK



## Memory population table

For UDIMM and Quad Ranks RDIMM:

CPU 1 Configuration									
	DIMM_A3	DIMM_A2	DIMM_A1	DIMM_B3	DIMM_B2	DIMM_B1	DIMM_C3	DIMM_C2	DIMM_C1
1 DIMM	--	--	●	--	--	--	--	--	--
2 DIMMs	--	--	●	--	--	●	--	--	--
3 DIMMs	--	--	●	--	--	●	--	--	●
4 DIMMs	--	●	●	--	--	●	--	--	●
5 DIMMs	--	●	●	--	●	●	--	--	●
6 DIMMs	--	●	●	--	●	●	--	●	●

CPU 2 Configuration									
	DIMM_D3	DIMM_D2	DIMM_D1	DIMM_E3	DIMM_E2	DIMM_E1	DIMM_F3	DIMM_F2	DIMM_F1
1 DIMM	--	--	●	--	--	--	--	--	--
2 DIMMs	--	--	●	--	--	●	--	--	--
3 DIMMs	--	--	●	--	--	●	--	--	●
4 DIMMs	--	●	●	--	--	●	--	--	●
5 DIMMs	--	●	●	--	●	●	--	--	●
6 DIMMs	--	●	●	--	●	●	--	●	●

For RDIMM (Single Rank, Dual Ranks):

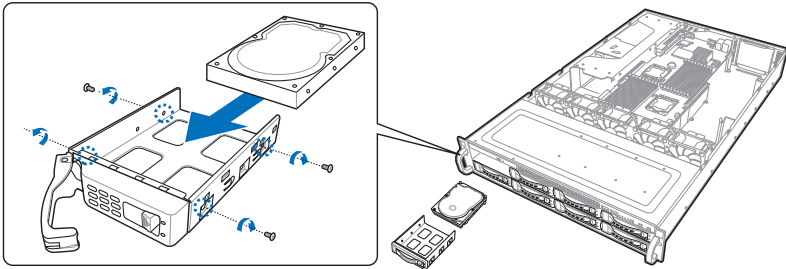
CPU 1 Configuration									
	DIMM_A3	DIMM_A2	DIMM_A1	DIMM_B3	DIMM_B2	DIMM_B1	DIMM_C3	DIMM_C2	DIMM_C1
1 DIMM	--	--	●	--	--	--	--	--	--
2 DIMMs	--	--	●	--	--	●	--	--	--
3 DIMMs	--	--	●	--	--	●	--	--	●
4 DIMMs	--	●	●	--	--	●	--	--	●
5 DIMMs	--	●	●	--	●	●	--	--	●
6 DIMMs	--	●	●	--	●	●	--	●	●
7 DIMMs	●	●	●	--	●	●	--	●	●
8 DIMMs	●	●	●	●	●	●	--	●	●
9 DIMMs	●	●	●	●	●	●	●	●	●

CPU 2 Configuration									
	DIMM_D3	DIMM_D2	DIMM_D1	DIMM_E3	DIMM_E2	DIMM_E1	DIMM_F3	DIMM_F2	DIMM_F1
1 DIMM	--	--	●	--	--	--	--	--	--
2 DIMMs	--	--	●	--	--	●	--	--	--
3 DIMMs	--	--	●	--	--	●	--	--	●
4 DIMMs	--	●	●	--	--	●	--	--	●
5 DIMMs	--	●	●	--	●	●	--	--	●
6 DIMMs	--	●	●	--	●	●	--	●	●
7 DIMMs	●	●	●	--	●	●	--	●	●
8 DIMMs	●	●	●	●	●	●	--	●	●
9 DIMMs	●	●	●	●	●	●	●	●	●

## 2.3 Upgrading hard disk drives

The system supports eight hot-swap SATAII/SAS hard disk drives.

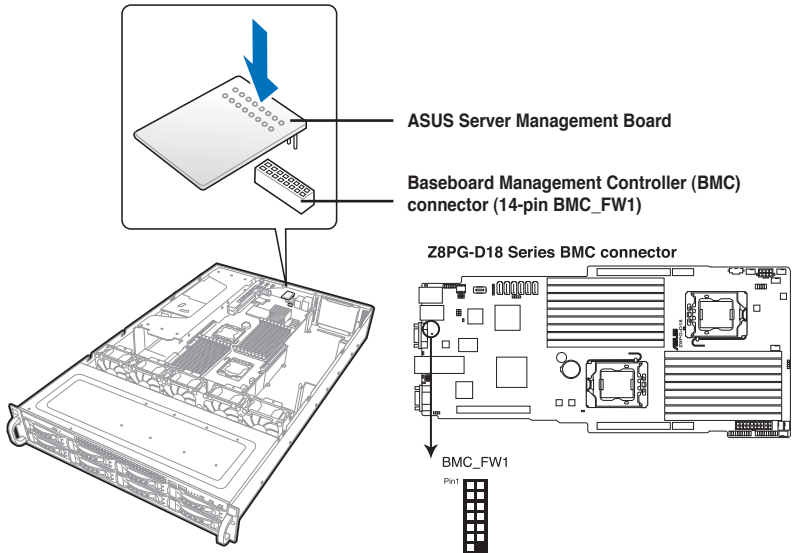


We recommend that you install identical drives of the same model and capacity for RAID configuration.

Order P/N	Description
90-S000H65D1T	SATA3 500G 7200rpm with tray (single pack)
90-S000H65C1T	SATA3 750G 7200rpm with tray (single pack)
90-S000H65B1T	SATA3 1TB 7200rpm with tray (single pack)
90-S000H64R0T	SAS 6G 300G 15Krpm with tray (single pack)
90-S000H64S0T	SAS 6G 450G 15Krpm with tray (single pack)
90-S000H64T0T	SAS 6G 600G 15Krpm with tray (single pack)

## 2.4 Installing ASUS Server Management Board

ASUS Server Management Board is an Intelligent Platform Management Interface (IPMI) 2.0-compliant board that allows users to monitor, control and manage a remote server from the local or central server in local area network (LAN).

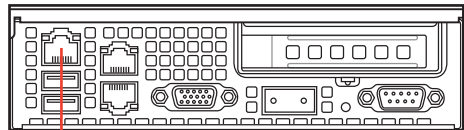


### ASMB4-iKVM

- Monitor the running status of major components via LAN or Serial Port, such as CPU and memory utilization, storage capacity and networking transfer rate.
- Advanced server management functions including “remote power on/off/reset”, “remote control via SOL (Serial-over LAN)” and “remote SEL (system event log reading when the system is out-of-band)”.
- Support Dynamic Host Configuration Protocol (DHCP), which avoids manually assigning IP address by setting DHCP mode to receive IP address automatically.



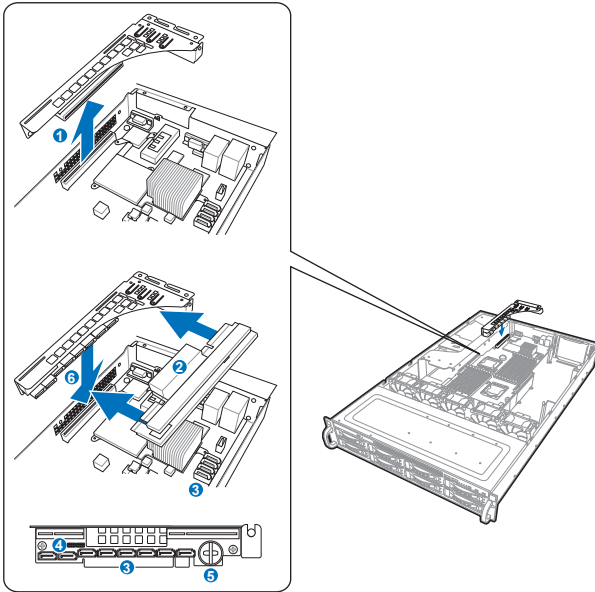
Use the LAN3 port for server management.



LAN3 port

## 2.5 Installing ASUS PIKE RAID module

The ASUS PIKE RAID module allows users to create RAID function from SAS hard disk drives connected to the SAS connectors on the motherboard.

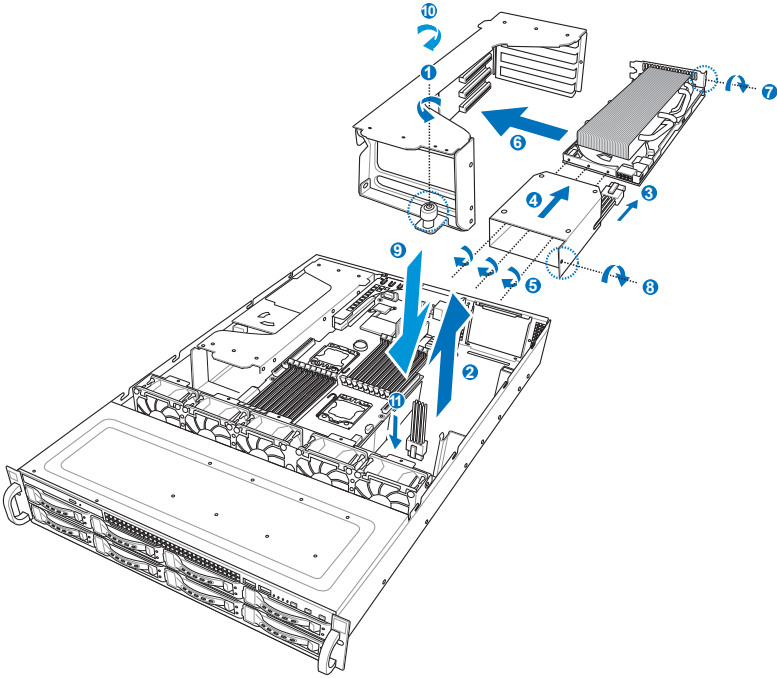


1. Firmly hold the riser card bracket, and then pull it up to detach it from the PCI Express x16 slot on the motherboard.
2. Align and insert the golden fingers of the PIKE SAS RAID card into the card slot on the PIKE raiser card. Ensure the card is completely seated on the slot.
3. Remove the SATA/SAS cables from the onboard SATA connectors and connect the SATA/SAS cables to the SAS1–8 connectors on the PIKE riser card.
4. Connect the SGPIO2 cable (with a green label) to the SGPIO1 connector and the SGPIO3 cable (without a label) to the SGPIO2 connector on the PIKE riser card.
5. Install the i Button\*.
  - \* PIKE 1078 module won't function if the i Button is not installed.
6. Align the riser card bracket to the PCI Express x16 slot on the motherboard and press the riser card bracket until the golden fingers completely fit the slot and the bracket aligns with the rear panel.

Order P/N	Description
90-C1SE10-00UAY20Z	PIKE 2008 8-port SAS 6G RAID Kit (RAID 0, 1, 1E)
90-C1SE15-00UAY00Z	PIKE 2008/IMR 8-port SAS 6G RAID Kit (RAID 0, 1, 5)
90-C1SEF0-00UAY00Z	PIKE 2008 8-port SAS 6G RAID Kit (RAID 0, 1, 5, 6, 10, 50, 60)

## 2.6 NVIDIA® Tesla™ GPU computing modules

Follow the steps below to install the optional NVIDIA® Tesla™ GPU computing modules to the system.



Order P/N	Description
90-S000R1E00T	TESLA C2050 3GB GPU CARD Single Pack
90-S000R1F00T	TESLA C2070 6GB GPU CARD Single Pack
90-S000R1G00T	TESLA M2070 6GB GPU CARD Single Pack
90-S000R1H00T	TESLA M2050 3GB GPU CARD Single Pack

## 2.7 OS support list

OS support list
Windows Server 2008 Enterprise Edition SP2 x86
Windows Server 2008 Enterprise Edition SP2 x64
Windows Server 2008 Standard Edition R2 x64
Windows 7 x86
Windows 7 x64
Red Hat Enterprise Linux AS 5.5 x86
Red Hat Enterprise Linux AS 5.5 x64
SuSE Linux Enterprise Server 11 SP1 x86
SuSE Linux Enterprise Server 11 SP1 x64
Cent OS 5.5 x86
Cent OS 5.5 x64