Tongtai Yi Server TU528V3

User Manual

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Content Statement

This manual will be updated periodically due to product version upgrades or other reasons.

The specifications and information presented in this manual are subject to change as specifications are updated.

Therefore, the manufacturer is not responsible for any errors or omissions in the manual content caused by specification updates.

The information in this manual may contain technical or typographical errors.

The pictures in this manual may differ from the actual products and are for illustrative purposes only.

Tongtaiyi reserves the right to improve/modify the product without prior notice.

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summary

This document describes the relevant information about TU528V3.

Target audience

This document is primarily intended for the following personnel:

Pre-sales Engineer

Product Maintenance Engineer

prompt symbols

To ensure you use the server correctly, please pay close attention to the symbols that appear in this document and what they represent.

The special meaning of .

symbol	illustrate
Danger	Improper handling can lead to death or serious injury.
warn	Improper handling may result in moderate or minor injury.
Notice	Improper operation may result in machine damage or data loss.
illustrate	This document provides supplementary explanations of key information.
hint	Provides tips and other additional information to help you get the job done.

Version Notes

Document Version	release date	Revision Notes

Table of contents

1. Safety Instructions

1.1 General Safety Precautions

To prevent the risk of significant personal injury and property damage, please be sure to follow the following recommendations.

ÿ Do not attempt to open the system cover yourself; this should be performed by a professionally trained technician. (The triangular symbol with a lightning bolt is indicated.)

This part may contain high voltage or electric shock; please do not touch it.

ÿ Never insert any object into any opening in the system. Inserting an object may cause a short circuit in internal components, potentially leading to a fire or electric shock.

ÿ Important: Disconnect all cables before performing any maintenance. (There may be more than one cable.)

ÿ It is strictly forbidden to perform any live operations such as turning on the machine before the cover is closed.

ÿ When opening the lid, please wait for the internal equipment to cool down before proceeding, otherwise you may be burned.

ÿ Do not use this device in humid environments.

ÿ If an extension cable is to be used, please use a three-wire cable and ensure it is properly grounded.

ÿ Ensure the server is properly grounded. Different grounding methods are possible, but it must be physically connected to the ground. If you are unsure whether...

The grounding protection is already in place. Please contact the relevant organization or electrician to confirm. Please use a three-core power cord and socket with grounding protection.

Improper grounding can lead to electrical leakage, burnout, explosion, or even personal injury.

ÿ Ensure that the power outlet and power interface make a tight connection. Loose connections may pose a fire hazard.

ÿ Please use the equipment under 220V AC voltage. Operating it under an unsuitable voltage may result in electric shock, fire, or even damage.

ÿ Ensure the equipment is well-ventilated and kept away from heat sources and fire sources. Do not obstruct the cooling fan; otherwise, the equipment may overheat and emit smoke.

Danger of fire or other damage.

ÿ Please keep the power cord and plug clean and intact, otherwise there may be a risk of electric shock or fire.

ÿ Caution: Improper battery replacement may cause an explosion. Only use the same or equivalent replacement parts recommended by the manufacturer. Dispose of used batteries improperly.

The battery will cause environmental pollution. Please follow the instructions when replacing the old battery.

Keep your computer away from electromagnetic fields.

ÿ Stay away from electronic noise and interference caused by high-frequency equipment such as air conditioners, fans, motors, radio stations, television stations, and transmission towers.

ÿ Do not plug or unplug internal components or mobile devices while the device is running, as this may cause the device to crash or be damaged.

ÿ Please avoid frequent restarts or power cycles to extend the lifespan of the device.

ÿ Please keep the environment clean and avoid dust. The operating temperature of the equipment is 5ÿ~35ÿ and the humidity is 35%~80%.

Users are advised to back up important data promptly. Tongtai Information Technology Co., Ltd. is not responsible for any data loss caused by any circumstances.

1.2 Declaration of Toxic and Hazardous Substances

Within the 10-year environmentally friendly usage period, the toxic and harmful substances or elements contained in the product will not leak or cause any sudden changes under normal use conditions.

The device will not cause serious environmental pollution or serious personal injury or property damage to users.

Component Name	harmful substances					
	Lead and Mercury		cadmium	Hexavalent chromium	polybrominated biphenyls and	polybrominated diphenyl ethers
	(Pb)	(Hg)	(Cd)	(Cr VI)	(PBB)	(PBDE)
Chassis/Baffle	X	O	O	O	O	O
Mechanical components (fans, heat sinks, motors, etc.) X	O	O	O	O	O	O
Printed Circuit Components - PCA*	X	O	O	O	O	O
Cables/Wires/Connectors	X	O	O	O	O	O
Hard Drive	X	O	O	O	O	O
Media reading/storage devices (optical discs, etc.)	X	O	O	O	O	O
Power supply equipment/power adapter	X	O	O	O	O	O
power supply	X	O	O	O	O	O
Point-of-use devices (such as mice)	X	O	O	O	O	O
keyboard	X	O	O	O	O	O
Complete rack/rail products	X	X	O	O	O	O

• indicates that the content of the toxic and hazardous substance in all homogeneous materials of this component is within the limits specified in GB/T26572-2011 "Restricted Use of Toxic and Hazardous Substances in Electrical and Electronic Products".

The limits are as specified in the "Limit Requirements for Substances".

× indicates that the content of the toxic or hazardous substance in at least one homogeneous material of the component exceeds the limits specified in GB/T26572-2011 "Electronic and Electrical Products".

The limits are set by the "Limits for Restricted Substances in China". However, it complies with the EU RoHS Directive (including its exemptions).

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This table lists the toxic and hazardous substances contained in all possible components used in this equipment. Customers can refer to this table for information.

Check the contents of each component of the purchased product to ensure it contains toxic or harmful substances.

1.3 Warning Notice

Warning: Running this device in a residential environment may cause radio interference.

Location restrictions: This device is not suitable for use in areas where children may be present.

Fan warning: Keep your body away from the fan blades when the fan is running.

运动风扇叶片

风扇旋转时，身体部位远离风扇叶片
Hazardous moving parts, keep away
from moving fan blades.

1.4 Climate and Environmental Requirements

temperature	
Operating temperature	The temperature gradient ranges from 5°C to 35°C, with a maximum temperature gradient of 10°C per hour.
Continuous operating temperature range (At an altitude below 950 meters or 3117 feet)	The equipment should be kept at a temperature between 5°C and 35°C without direct sunlight.
Storage temperature range	-40ÿ to 65ÿ.
humidity	
storage	At a maximum dew point of 33°C and a relative humidity of 5% to 95%, the air must remain non-condensing.
Continuous operation humidity percentage range	When the maximum dew point is 26°C, the relative humidity is 10% to 80%.

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Some configurations have been validated for performance at 40°C and 90% (29°C maximum dew point) humidity.

Notice

ÿ If the environment where the equipment is used has inadequate or no lightning protection, please turn off the equipment and unplug it during thunderstorms.

Disconnect power cords, network cables, telephone lines, etc., that are connected to the equipment.

Please use genuine operating systems and software, and configure them correctly. Tongtaiyi Information Technology Co., Ltd.

We are not responsible for maintaining servers that fail due to operating system or software issues.

ÿ Please do not disassemble the server chassis or add/remove server hardware configurations yourself. Tongtai Information Technology Co., Ltd. is not responsible for this.

Responsible for any resulting hardware and data damage.

ÿ When equipment malfunctions, please first consult this manual to identify and troubleshoot common problems. For example...

If you are unsure of the cause of the malfunction, please contact technical support for assistance.

Choosing a suitable environment for your computer can help it run stably and extend its lifespan.

Service life.

1.5 Other Important Descriptions

If the equipment bears this label, it means that the equipment with this label was only designed and assessed for safety at an altitude of 2000m. Therefore,

It is only suitable for safe use below 2000m altitude. There may be safety hazards when using it above 2000m altitude.

If the equipment bears this label, it means that the equipment with this label was designed and assessed for safety only under non-tropical climate conditions.

Therefore, this product is only suitable for safe use in non-tropical climates. There may be safety hazards when used in tropical climates.

2. Product Introduction

2.1 System Introduction

The Tongtai TU528V3 is a versatile 2U dual-socket general-purpose server based on fourth or fifth generation Intel® Xeon® processors.

With an expanded processor and an E-ATX standard form factor motherboard, this product boasts superior computing performance and excellent cost-effectiveness, making it suitable for cloud computing.

Applications include computing, virtualization, distributed storage, and hyperconvergence.

2.2 Product Features

Balanced configuration and high cost performance

Supports two 4th or 5th generation Intel® Xeon® Scalable processors with a maximum TDP of 385W, delivering powerful computing performance;

Supports up to 16 DDR5 memory modules with frequencies up to 5600MHz, increasing memory bandwidth by 75%;

Based on the E-ATX standard board design, it offers excellent cost performance while meeting mainstream load requirements.

Flexible configuration and strong scalability

Excellent scalability, supporting up to 6 standard PCIe 5.0 expansion slots; flexible storage module options, compatible with 3.5" and 2.5" sizes.

Supports NVMe/SAS/SATA options;

Supports up to 6 U.2 NVMe ports to meet the needs of mainstream applications;

ÿ Onboard dual gigabit network.

Stable, reliable, and intelligent management

Key system components are designed with redundancy and hot-swappability, and support tool-less assembly and disassembly, improving fault maintenance efficiency and system reliability.

Sexual use;

ÿ Integrated intelligent management chip, providing an open management platform that supports IPMI 2.0, SOL, KVM, virtual media and other functions;

It supports various management functions such as remote KVM, virtual media, critical component status monitoring, and anomaly alarms, realizing comprehensive remote system management.

Level-3 intelligent management.

2.3 Product Technical Specifications

For detailed technical specifications of the TU528V3, please refer to the TTY TU528V3 product brochure.

2.4 System Topology Diagram
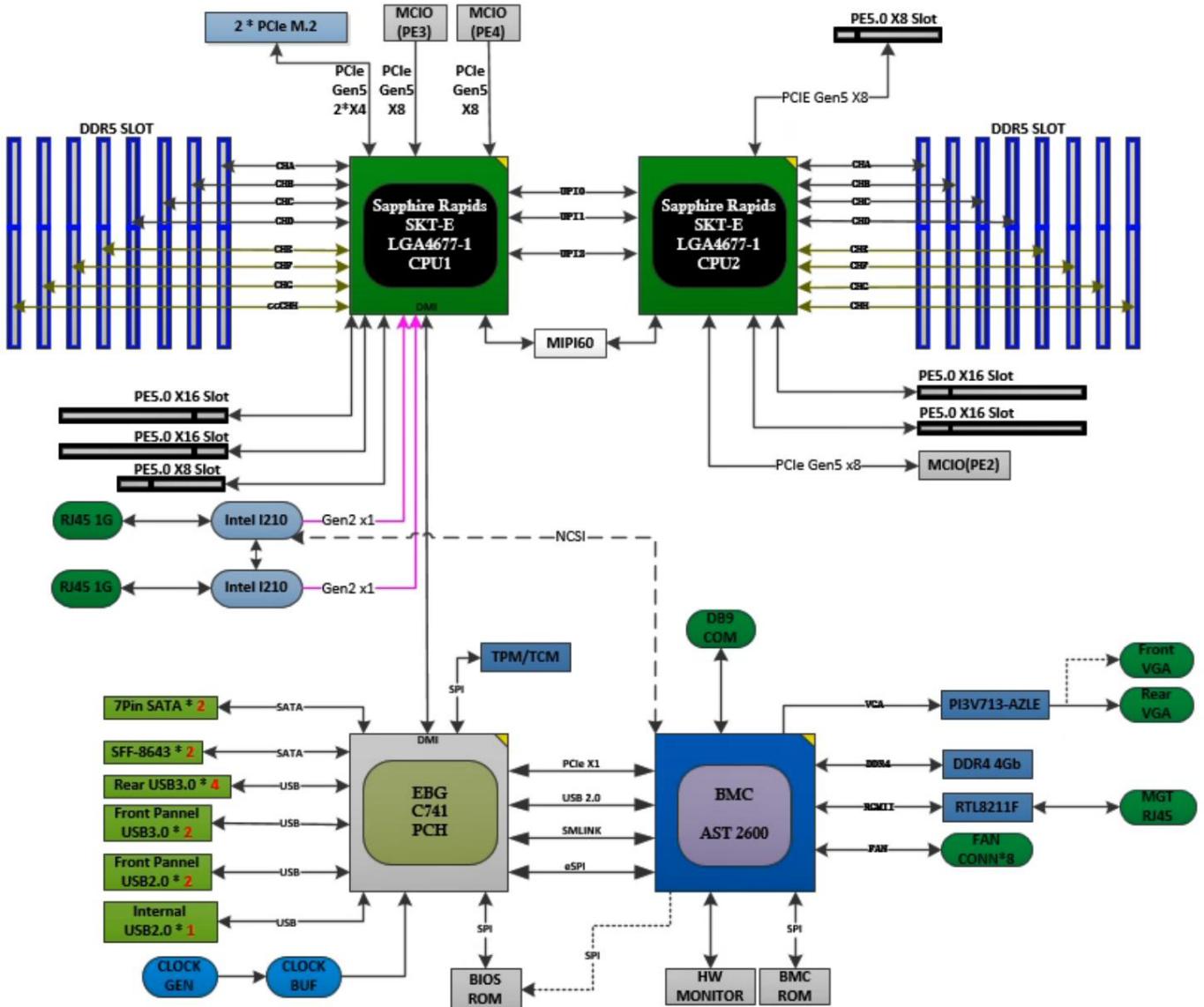
3 System Components

3.1 Front Panel Components

ÿ 2U 8-bay 3.5-inch drive unit
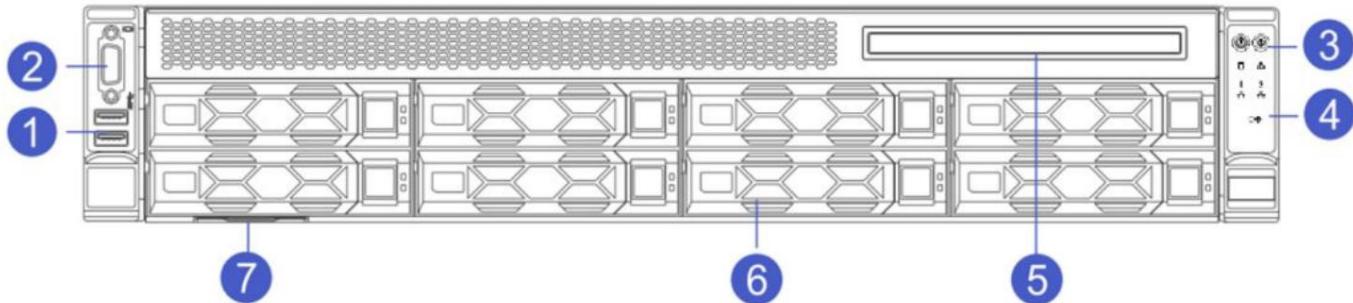
ÿ

Number	Module Name	Number	Module Name
	1. Front USB 3.0 port		2. Front VGA interface
3	UID		4. Reset button
	5. Fake optical drive control panel	6	3.5-inch hard drive bay
	7. Asset Tags		

ÿ 2U12 bay 3.5-inch drive model
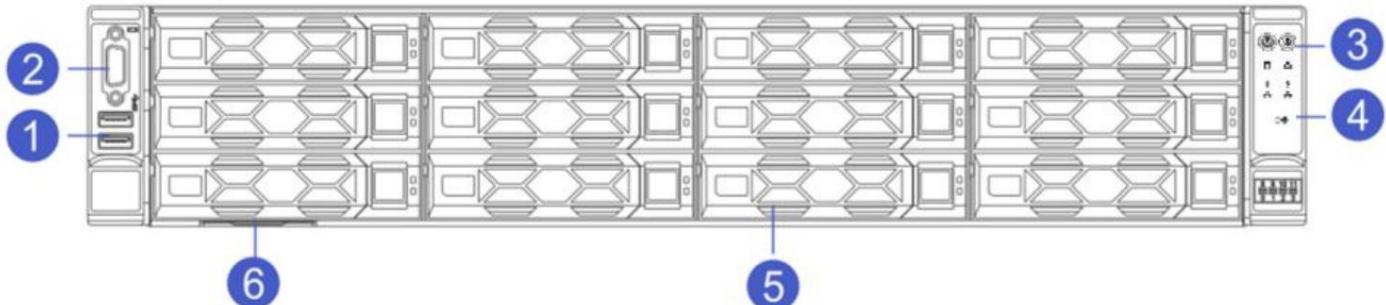
Number	Module Name	Number	Module Name
	1. Front USB 3.0 port		2. Front VGA interface
3	UID		4. Reset button
5	3.5-inch hard drive bay		6. Asset Tags

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The 3.5-inch hard drive bay can accommodate 3.5-inch and 2.5-inch hard drives.

Front Panel Interface Description

name	type	illustrate
VGA interface DB15		Used to connect to a monitor.
USB interface	USB 3.0	It provides a USB interface through which USB devices can be connected.

Notice

When using an external USB device, please ensure that the USB device is in good working order; otherwise, it may cause the server to malfunction.

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ÿ Front panel indicator lights and button descriptions
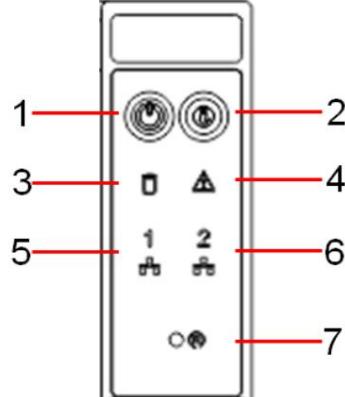
Number	Module Name	Number	Module Name
1. Power switch button/indicator light		2	UID button/indicator light
3	HDD indicator light	4. System fault indicator lights	
5. Network port connection status indicator light		6. Network port connection status indicator lights	
7. Reset button			

| Indicator lights/buttons	Status Description
Power switch button/indicator light	Power switch button/indicator light power button instructions: ÿ Press this button briefly while the device is powered on to shut down the OS normally. ÿ Press and hold this button for 6 seconds while the server is powered on to force it to shut down. ÿ Press this button briefly while the device is powered on to turn it on. Power indicator light description: ÿ Green (solid): Indicates that the device is powered on normally. ÿ Green off: Indicates that the device is not powered on.
UID Button/Indicator Light	UID Button/Indicator Light UID Button Description: ÿ A short press of the UID button can turn the location light on/off. ÿ Press and hold the UID button for 6 seconds to reset the server BMC management system. UID indicator light description: ÿ Blue (solid/blinking): Indicates that the server has been located. ÿ Off: Indicates that the server has not been located.
System fault indicator	ÿ Off: Indicates that the equipment is operating normally. ÿ Solid yellow/flashing: System power, fan, high temperature, memory errors, overvoltage warning If a warning is logged in the BMC (Browser Control Center) incorrectly, the yellow LED should be constantly lit or flashing.
Hard drive activity indicator light	ÿ Off: No read/write activity on the hard drive. ÿ Green flashing: The hard drive is currently performing read/write operations.
Network port connection status indicator light	ÿ Corresponding onboard Ethernet port indicator light. ÿ Green (solid): Indicates that the network port connection is normal. ÿ Green (flashing): Data interaction. ÿ Off: Indicates that the network port is not in use or is malfunctioning.
System reset button	ÿ Can be used to reset the system. ÿ Short press: Reset system.

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The UID button/indicator is used to easily locate the server to be operated. This can be done by manually pressing the UID button or...

BMC commands can be used to remotely control the lights to turn them off or on.

3.2 Rear Panel Components
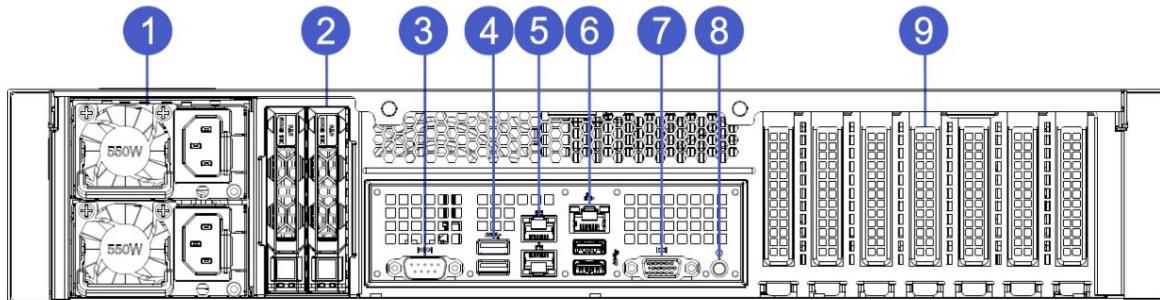
Number Module Name		Number Module Name	
1	PSU	2	2.5-inch HDD (optional)
3	COM interface	4	2 USB 3.0 ports
5	2 Gigabit Ethernet ports	6	IPMI management network port + 2 USB 3.0 interfaces
7	VGA interface	8	UID buttons and indicator lights
9	PCIe Expansion Slots	10	

ÿ Rear Panel Interface Description:

Name type		Quantity Description	
VGA interface DB15		1	Used to connect to display terminals, such as monitors or KVMs.
Management port GE BASE-T		1	Provides a 1000 Mbit/s Ethernet port for external connections. This interface allows for... The server is managed.
USB 3.0 interface		4	It provides an external USB port, through which USB devices can be connected.
Power module AC interface	CRPS	1 or 2	You can choose the number of power supplies according to your actual needs, but please make sure the power supply is sufficient. The rated power of the source is greater than the maximum power of the whole machine.

ÿ Rear panel indicator lights and button descriptions:
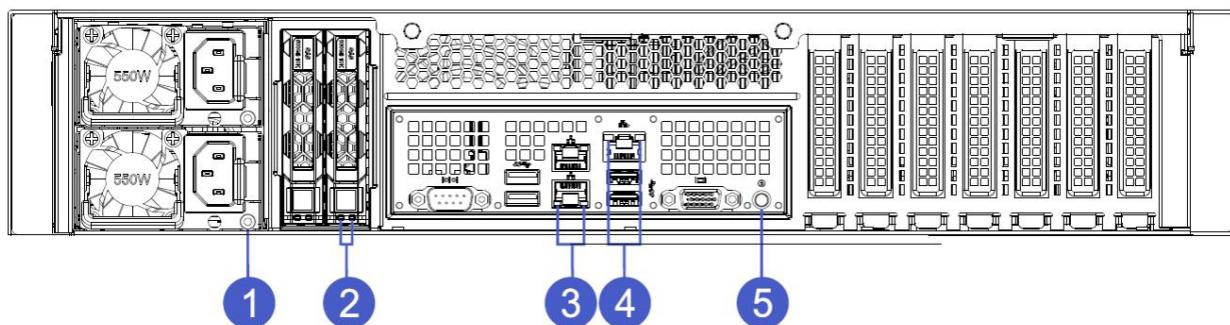
Number Module Name		Number Module Name	
1. Power module indicator light		2	2.5-inch hard drive status indicator light
3 Gigabit Ethernet Port Indicator Lights		4	IPMI Management Port Indicator Lights
5	UID button and indicator light		

| Indicator light/button status description	

Power module indicator light	Take Great Wall Power Supply as an example.
	
	ÿ Green (solid): Indicates that input and output are normal.
	
	ÿ Off: Indicates no AC power input.
	
	ÿ Green (1Hz/flashing): Indicates that the power module is in standby mode.
	
	ÿ Red (always on):
	
	    ÿ indicates that the power supply has no output. Possible causes include power supply over-temperature protection, power supply output overcurrent/short circuit, etc.
	
	    Output overvoltage, device failure (excluding all device failures), etc.
	
	    ÿ indicates that the power cord is not connected or has come loose.
	
	ÿ Red (flashing): Indicates a power alarm signal; the power module may be experiencing high temperature or high humidity.
	
	    Abnormalities include excessive load, high current, or low fan speed.

UID indicator light	ÿ The UID indicator light is used to easily locate the server to be operated. It can be accessed by manually pressing the UID button. Alternatively, you can use BMC commands to remotely control the lights to turn them off or on. ÿ Blue (solid/blinking): Indicates that the server has been located. ÿ Off: Indicates that the server has not been located.
Connection status indicator light	ÿ Solid green: Indicates Gigabit Link. ÿ Solid orange light: Indicates 100Mbps Link. ÿ Extinguish: 10 Trillion Link.
Data transmission status indicator	ÿ Yellow (flashing): Indicates that data is being transmitted. ÿ Off: Indicates no data transmission.

3.3 Motherboard Components

The interface specifications for the TU528V3 motherboard are as follows:
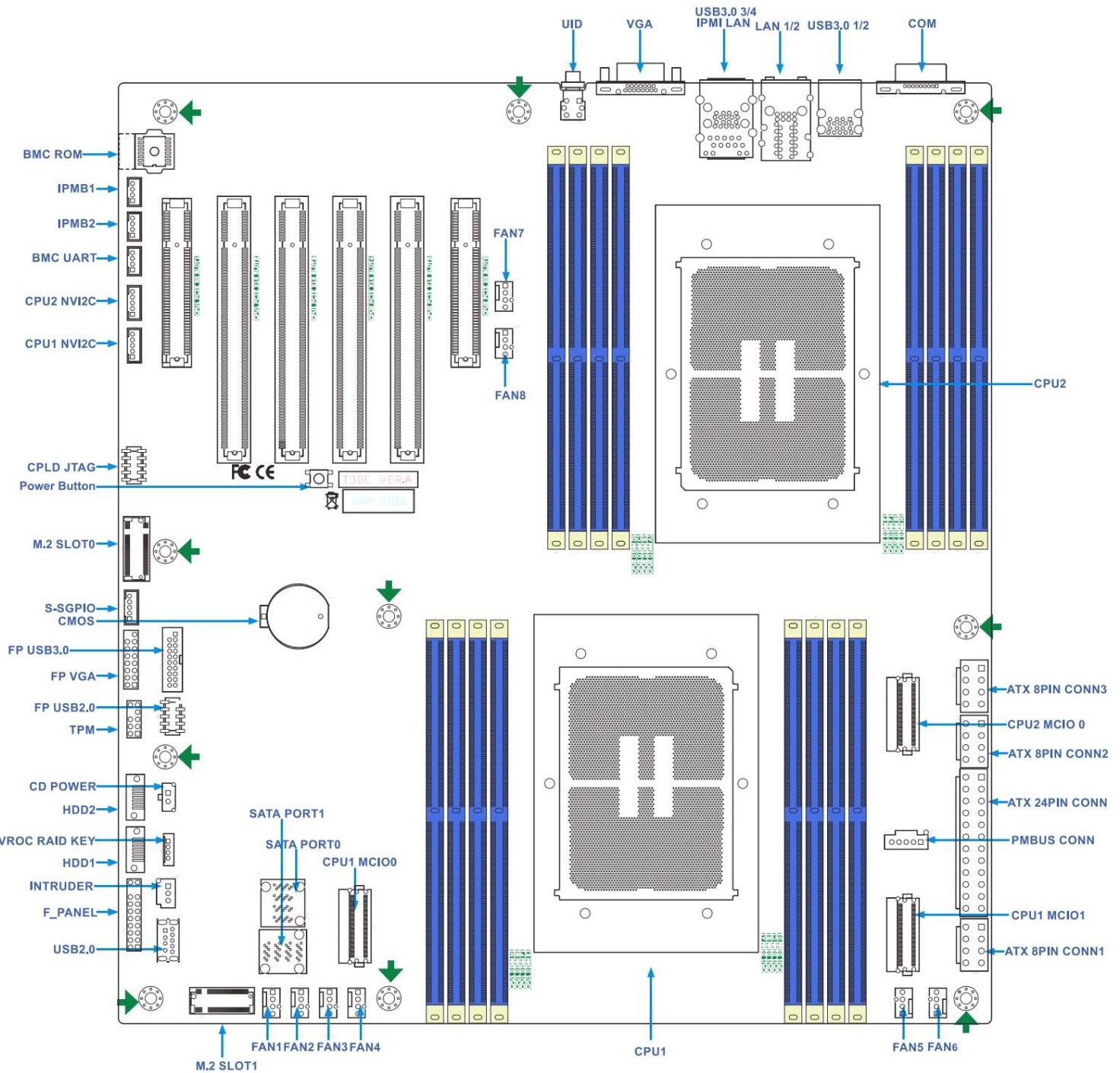
3.4 Memory DIMM Slots

The server provides 16 DIMM slots, and the corresponding slot order is shown in the following figure:
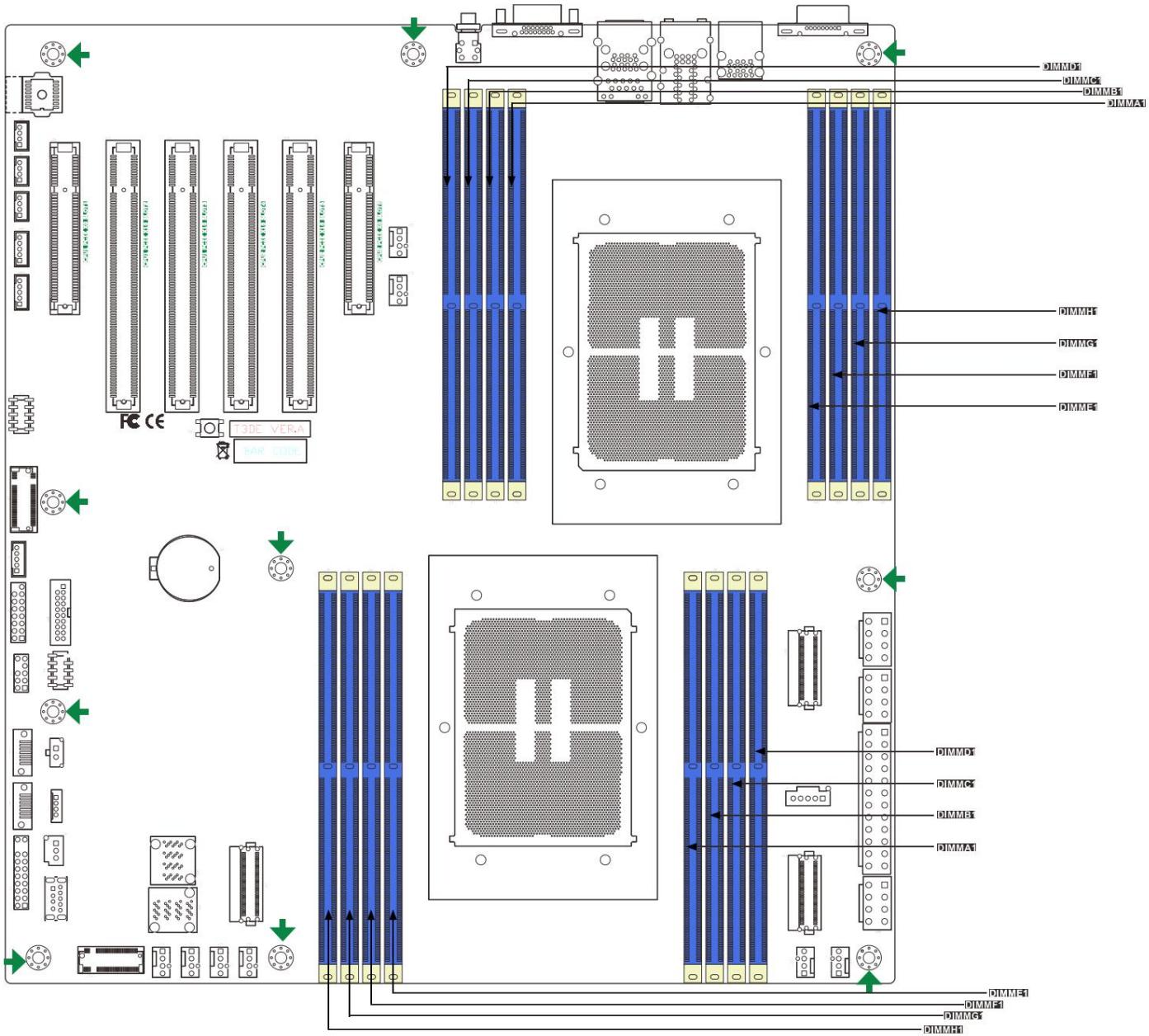
hint

ÿ When installing memory, you need to install the memory for each main memory channel first, and then install the system.

DIMMs are evenly distributed across each CPU based on the number of CPUs.

ÿ Different types (RDIMM, 3DS RDIMM) and [other types] are not allowed to be mixed on the same server.

Memory of different specifications (capacity, bit width, Rank, etc.).

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The DDR5 memory type supported by the server is CPU-dependent.

ÿ When using Intel 4th Generation Xeon Scalable processors (codename: Sapphire Rapids), the supported DDR5 memory is as follows:

Type	Ranks Per DIMM and Data Width	DIMM Capacity (GB)		Speed (MT/s); Voltage (V); DIMM Per Channel (DPC)	
				1DPC	2DPC
		16 GB	24 Gb	1.1V	
RDIMM	SRx8 (RC D)	16 GB	NA	4800	4400
	SRx4 (RC C)	32 GB	NA		
	SRx4 (RC F) 9x4	32 GB	NA		
	DRx8 (RC E)	32 GB	NA		
	DRx4 (RC A)	64 GB	96GB		
	DRx4(RC B) 9x4	64 GB	NA		
RDIMM-3DS	(4R/8R) x4 (RC A)	2H- 128 GB 4H- 256 GB	NA		

3.4.1 Memory installation requirements

ÿ At least one DDR DIMM is required for each CPU;

ÿ When there is only one DIMM in the memory channel, it must be plugged into the blue slot;

ÿ During normal use, the loading of DIMM0 in the same channel will be greater than that of DIMM1; if DIMM0 is used in the application...

If a dualDIMM is specified, then a single Rank DIMM can be used on DIMM1;

Each channel is allowed a maximum of 8 logical ranks;

3.4.2 Memory installation principles

Please refer to the following installation principles

单CPU模式下DDR安装建议

DDR5	CPU&iMC3		CPU&iMC2		CPU&iMC0		CPU&iMC1	
	CHH	CHG	CHF	CHE	CHA	CHB	CHC	CHD
1				●				
			●					
					●			
						●		
2		●			●			
				●			●	
4		●		●	●		●	
6		●	●	●	●		●	●
	●	●		●	●	●	●	
	●		●	●		●	●	●
	●		●		●	●		●
8	●	●	●	●	●	●	●	●

双CPU模式下DDR安装建议

DDR5	CPU1&iMC3		CPU1&iMC2		CPU1&iMC0		CPU1&iMC1		CPU2&iMC3		CPU2&iMC2		CPU2&iMC0		CPU2&iMC1	
	CHH	CHG	CHF	CHE	CHA	CHB	CHC	CHD	CHH	CHG	CHF	CHE	CHA	CHB	CHC	CHD
2					●								●			
				●								●				
						●								●		
			●								●					
4		●			●					●			●			
				●			●					●			●	
8		●		●	●		●			●		●	●		●	
12		●	●	●	●		●	●		●	●	●	●		●	●
	●	●		●	●	●	●		●	●		●	●	●	●	
	●		●	●		●	●	●	●		●	●		●	●	●
	●		●		●	●		●	●		●		●	●		●
16	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

The Eagle Stream platform supports the following limitations regarding mixed memory configuration:

1. The memory modules on the same CPU channel must have the same Rank.

2. x8 and x4 DIMMs cannot be mixed and matched on the same CPU or the same channel.

3. Non-3DS and 3DS DIMMs cannot be used interchangeably.

4. 9x4 RDIMM cannot be used with other categories.

5. All DIMMs on the same CPU socket must have the same speed.

6. When all memory slots are filled on a single CPU, memory of different Rank categories are not allowed to be mixed except for the Rank 1 + Rank 2 combination.

7. RDIMMs support cross-insertion between different manufacturers, while 3DS-RDIMMs cannot be cross-inserted between different manufacturers.

3.4.3 DDR5 memory RAS features

The TU528V3 motherboard supports the following memory protection technologies for DDR5 memory:

ÿ ECC

ÿ Memory Mirroring

ÿ Memory Single Device Data Correction (SDDC, +1)

ÿ Failed DIMM Isolation

ÿ Memory Thermal Throttling

ÿ Command/Address Parity Check and Retry

ÿ Memory Demand/Patrol Scrubbing

ÿ Memory Data Scrambling

ÿ Memory Multi Rank Sparing

ÿ Post Package Repair (PPR)

Write Data CRC Protection

ÿ Adaptive Data Correction - Single Region (ADC-SR)

ÿ Adaptive Double Device Data Correction - Multiple Region(ADDDC-MR, +1)

3.5 Hard Drive Label

ÿ 2U 8-bay 3.5-inch drive unit
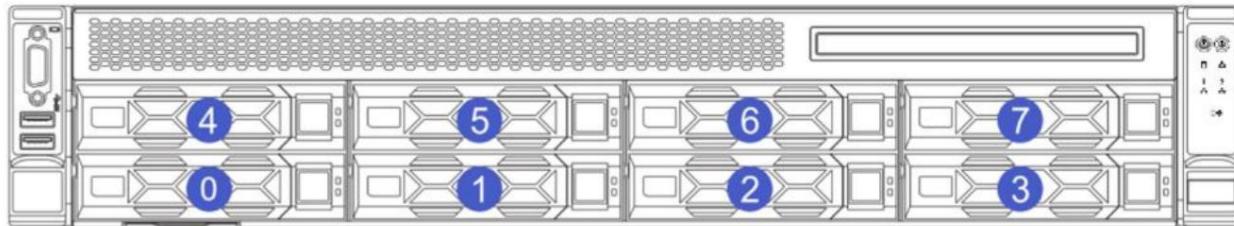
ÿ 2U12 bay 3.5-inch drive model
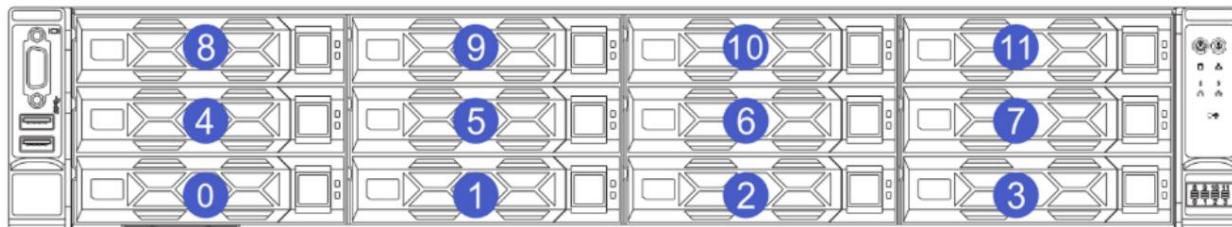
ÿ

3.6 Hard Drive Indicator Light

黄灯
绿灯

Hard drive status	Hard drive Active indicator light (green)	Hard drive Fault indicator light (yellow)
The hard drive is not in	Off,	Extinguish
place. The hard drive is in place, but there is no data. The	constantly	Extinguish
active hard drive is in place, but the active hard	lit, flashing	Extinguish
drive is faulty.	Chang Liang	Chang Liang

The hard drive	Always on	Flickering (4Hz)
has been located and is in Rebuild state.	Always on	Flickering (1Hz)

3.7 System Fan

The server supports variable fan speeds. Normally, the fans run at their lowest speed, but if the server temperature rises, the fans will increase their speed.

To cool down.
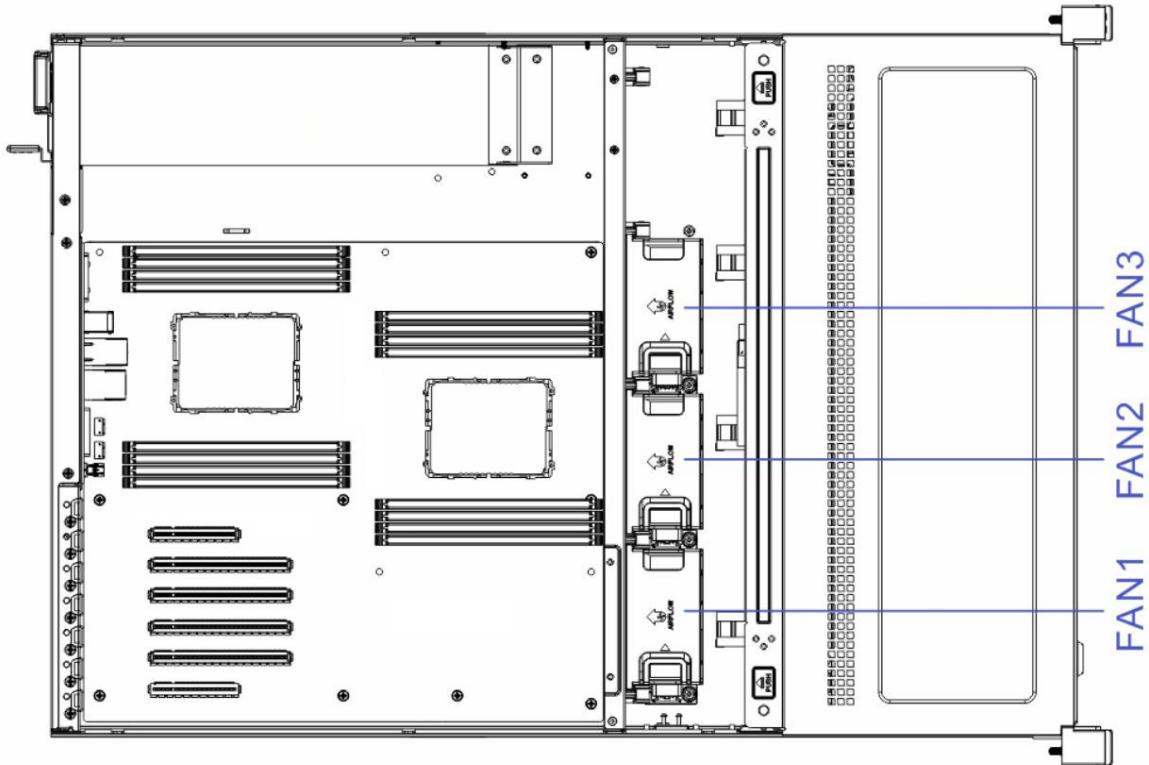
4. Install system components

4.1 Removal of the rear top cover

Disassembly steps:

1-1. Loosen the rear hand screw as shown in the diagram;

1-2. Slide the top cover backward in the direction of the arrow;

1-3. Following the direction of the arrow, remove the top cover by moving upwards.
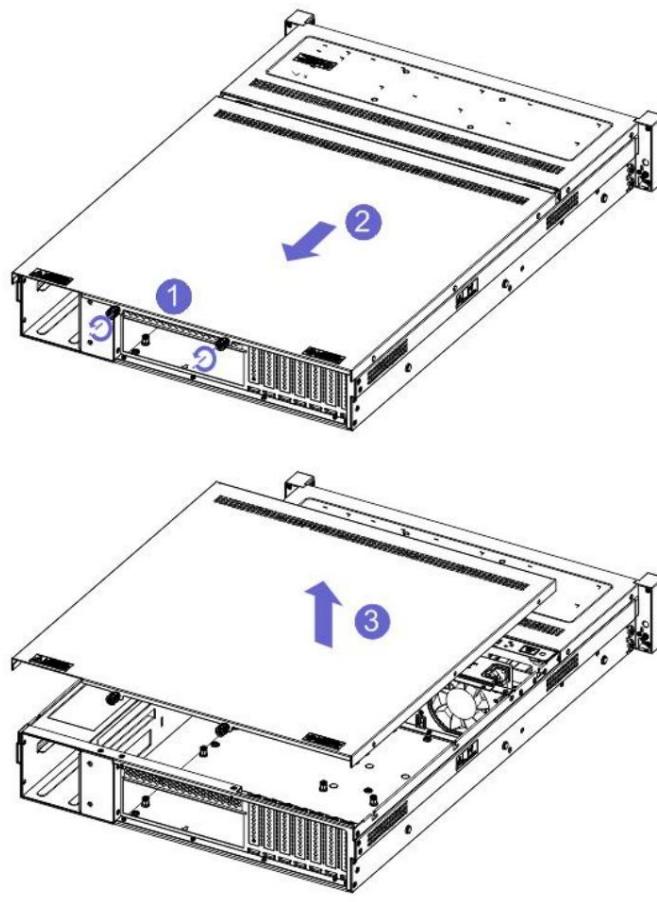
warn

To reduce the risk of personal injury from overheating of the server surface, please ensure proper ventilation of the drives and internal systems .

Touch the components only after they have cooled down.

4.2 CPU Installation

Install the processor:

Step 1: CPU Installation

1-1. Tilt the CPU at the angle shown in the diagram and secure it to one end of the clamping plate. The A1 angle of the CPU (triangle mark) should align with the triangle on the clamping plate.

Align one corner of the hole to ensure that the groove on the processor is aligned with the protrusion on the clip.

1-2. Bend the other end of the clamping plate in the direction of the arrow to fix the CPU to the clamping plate.

1-3. Loosen the clamping piece so that the other end of the clamping piece hooks into the CPU recess;

Step 2: Install the CPU onto the heatsink, ensuring that the CPU and heatsink surfaces are clean and free of oil and foreign matter.

2-1. Apply approximately 0.4ml of thermal paste to the CPU and smooth it out evenly.

2-2. Align corner A1 (triangle mark) and attach the CPU to the heatsink.

2-3. Carefully check the installation of the clamping plates and the heat sink to ensure that the clamping plates are fully clamped and flat.
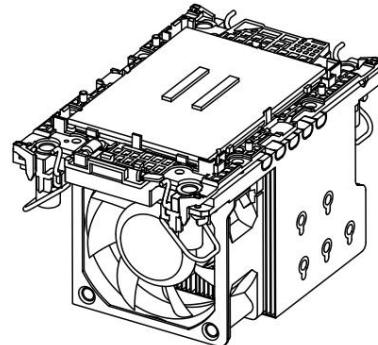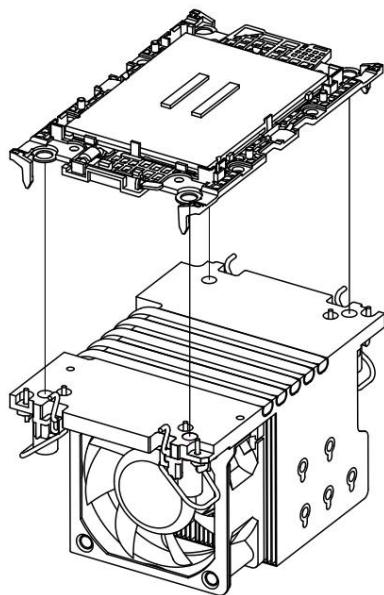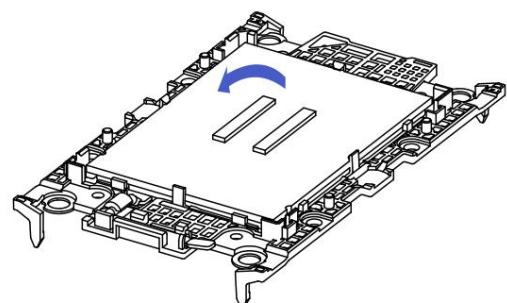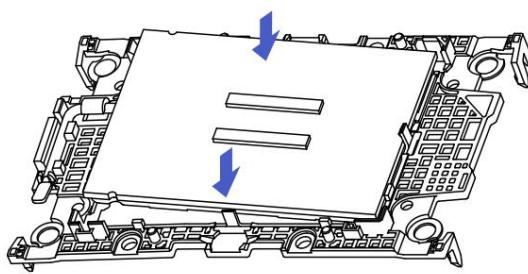
4.3 Radiator Installation

Steps: Install the radiator

1-1. Press the protective cover in the direction of the arrow and remove it upwards.

1-2. Move the locking clips on the heatsink in the direction of the arrow until they are in a vertical position, then attach the heatsink to the CPU socket.

Align the fixing studs and place them vertically downwards on the base.

1-3. Press the fastening latch on the heatsink in the direction of the arrow to lock it into the hook on the processor socket.

1-4. Use a T30 Torx screwdriver to tighten the screws securing the radiator.
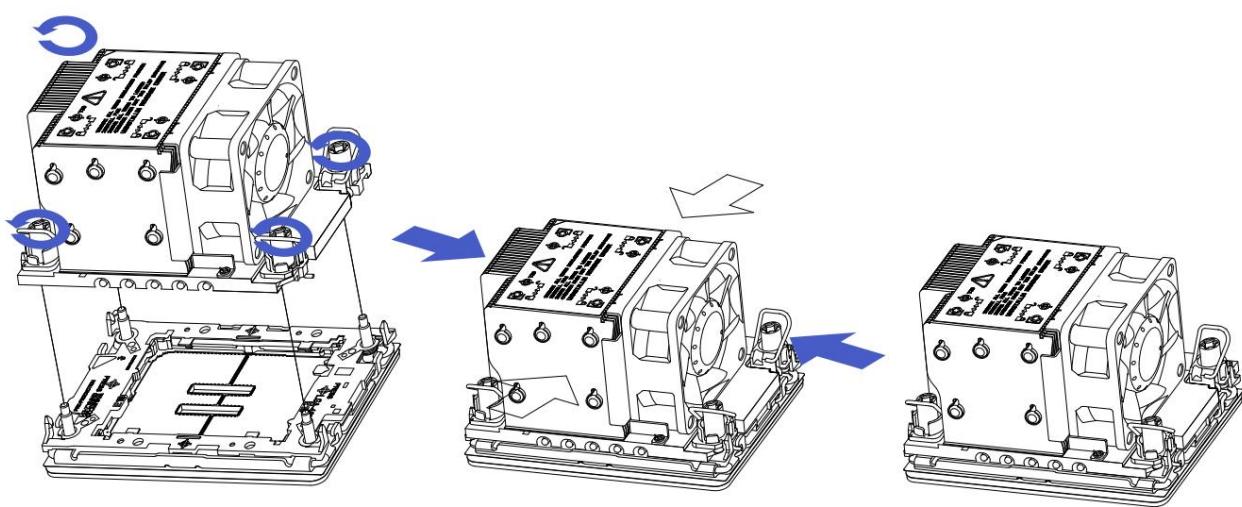
4.4 Memory Installation

Step 1. Open the levers on both sides of the memory slot, align the memory module with the memory slot, and make sure the notch on the memory module corresponds to the memory slot.

Step 2. Firmly insert the memory module vertically into the memory slot until you hear the click of the memory lever locking.
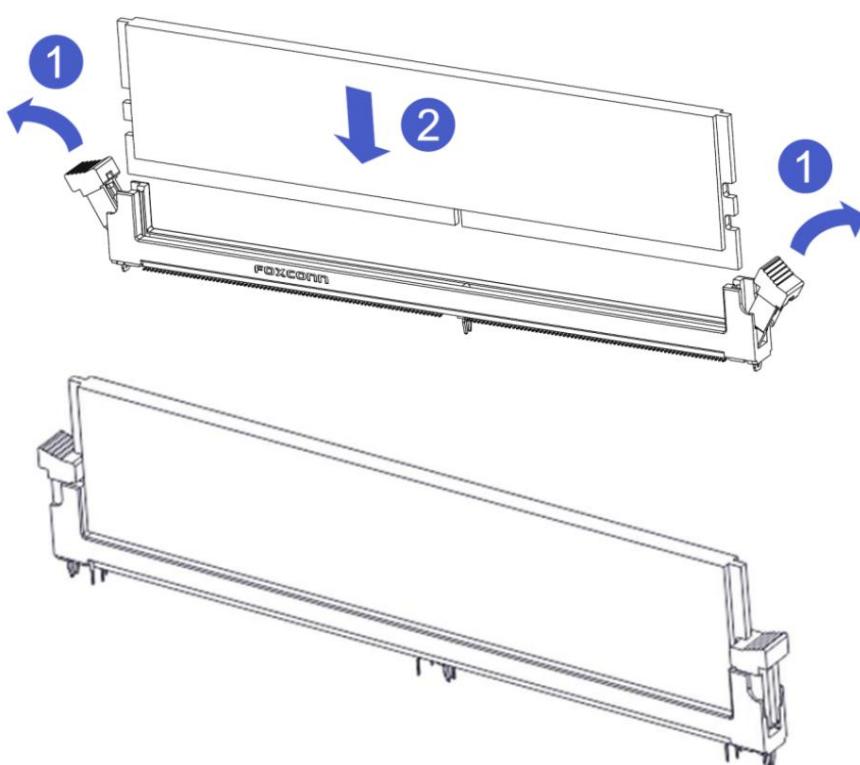
4.5 Power Supply Installation

Installation steps:

1-1. Place the power supply frame downwards;

1-2. After attaching it to the bottom of the chassis, push it towards the rear.

1-3. Secure the last 3 screws;

1-4. Tighten two screws from the bottom;
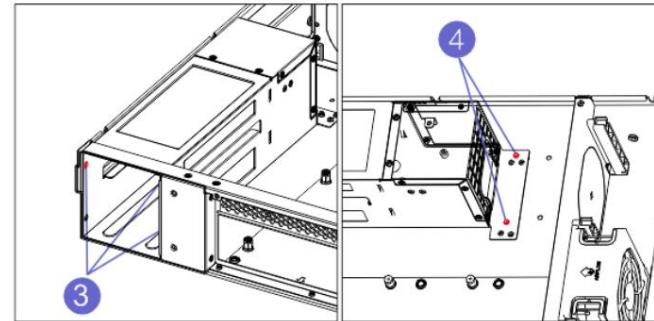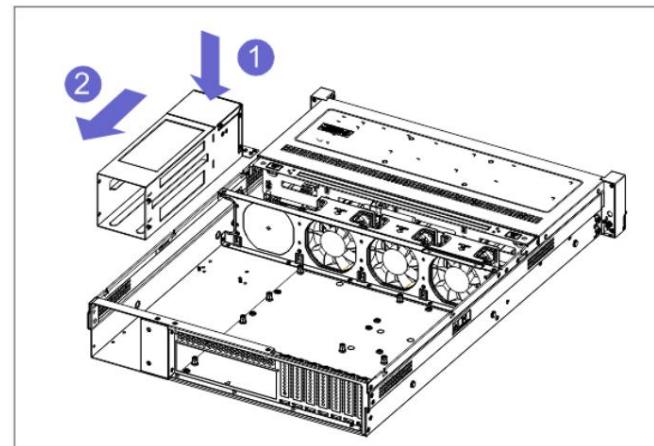
1-5. Insert power modules PSU1 and PSU2 into the power supply frame respectively;
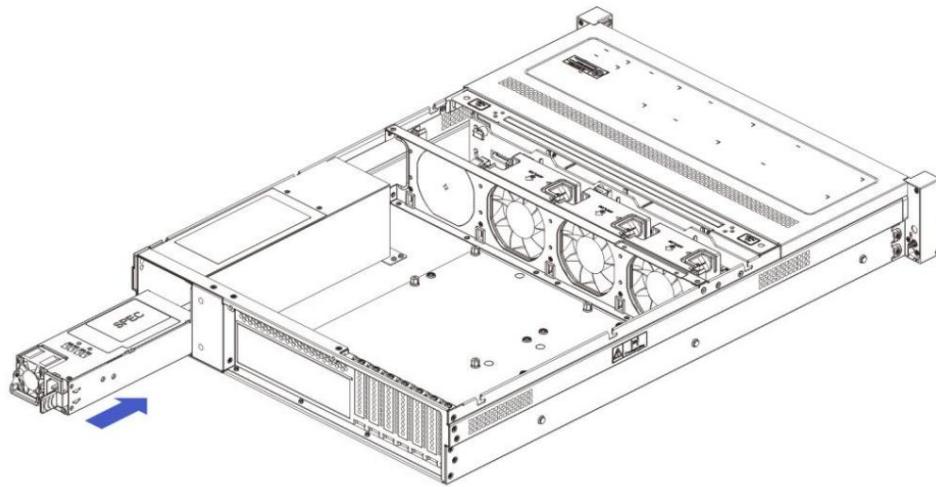
1-6. Images showing the effect after power supply installation.
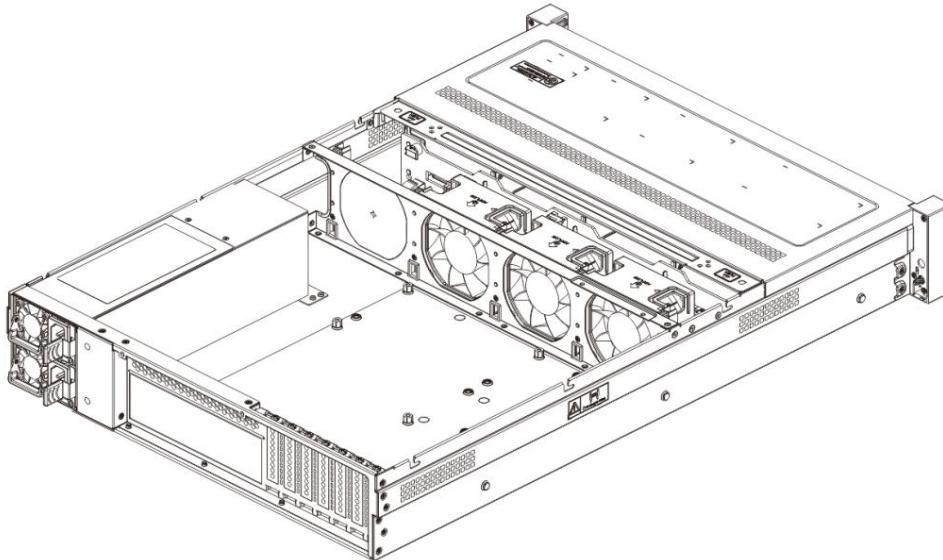
📄 **说明**

不同的电源框，锁螺丝位置及数量可能有微小差别。

4.6-inch and 3.5-inch front hard drive backplate installation

Before installing the front hard drive backplate, you need to remove its rear cover and front cover. The removal of the rear cover has already been described.

1. The process of removing the front top cover is as follows:

1-1 Press the latch to unlock;

1-2 Pull the front cover back;

1-3 Pull the top cover all the way down and then lift it up to remove the front cover.
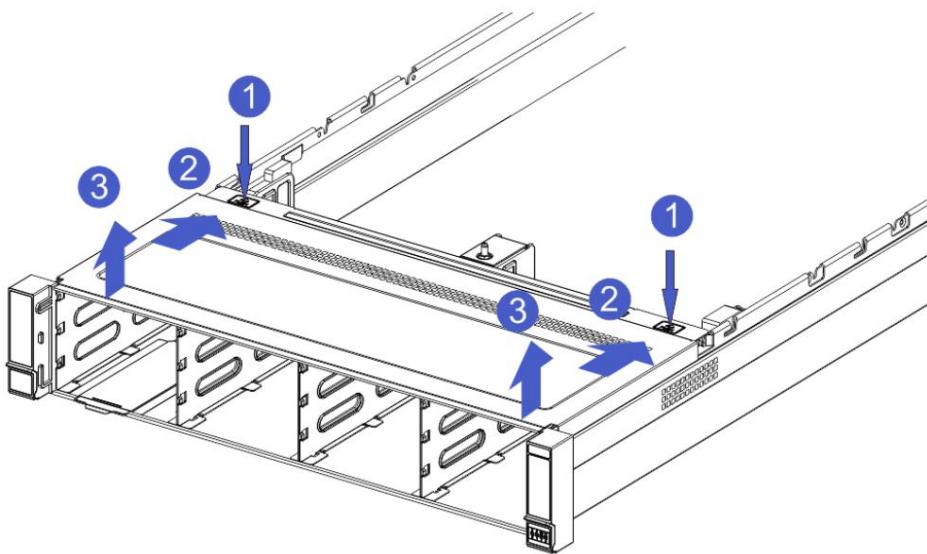
The installation steps for the 2.3.5-inch front hard drive backplate are as follows:

2-1. Align the gourd holes and mounting holes on the left and right sides of the hard drive backplate with the mounting pins of the hard drive frame, and push them in the direction of the arrow;

2-2. After the hard drive backplate is pushed all the way in, press down on the backplate until all the hooks and mounting holes on both sides are in place;

2-3. Flip the fasteners on the left and right sides of the hard drive back panel and lay them flat.
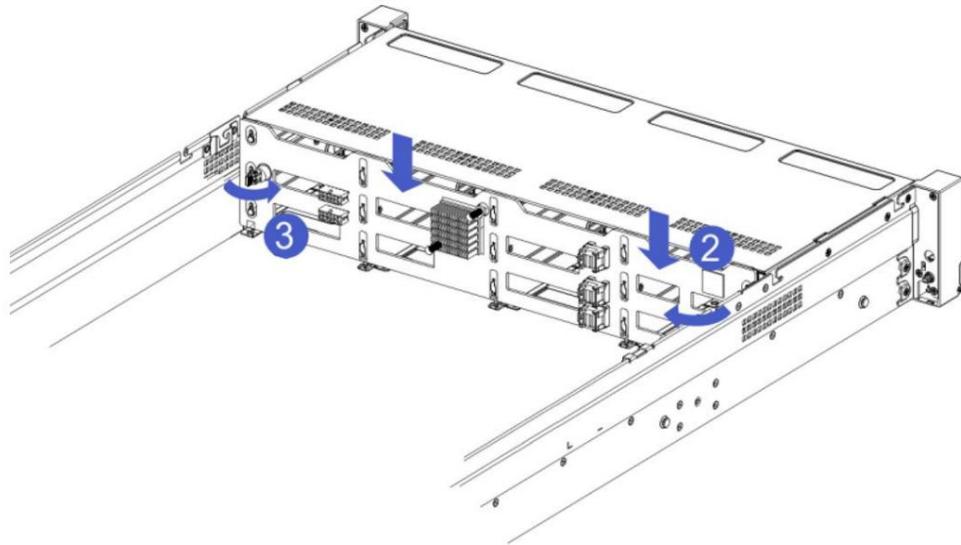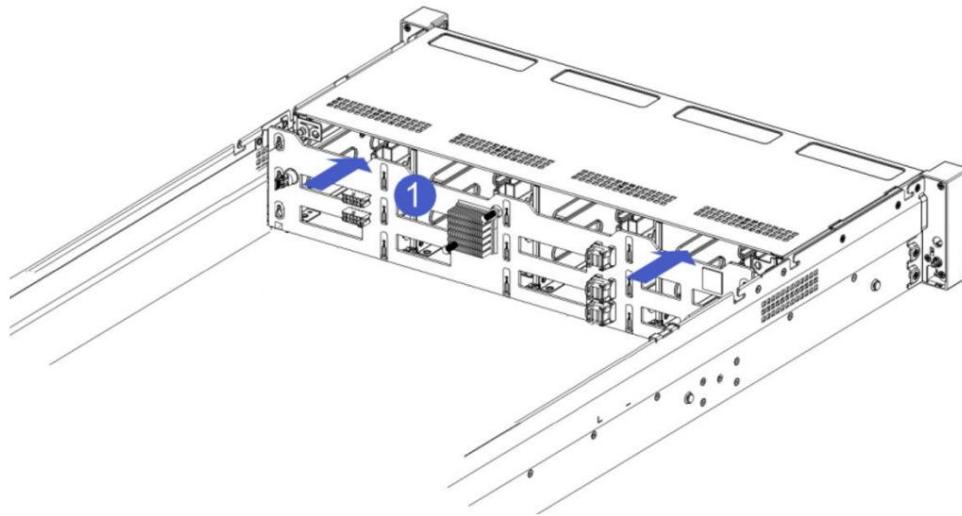
4.7 Installation of the front hard drive

Install a 3.5-inch hard drive

1-1. Place the hard drive in the tray;

1-2. Secure the hard drive with four countersunk screws on both sides (the screw heads must not protrude from the surface of the slide rails on both sides of the tray).
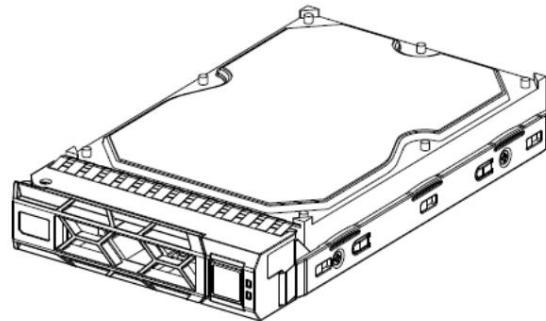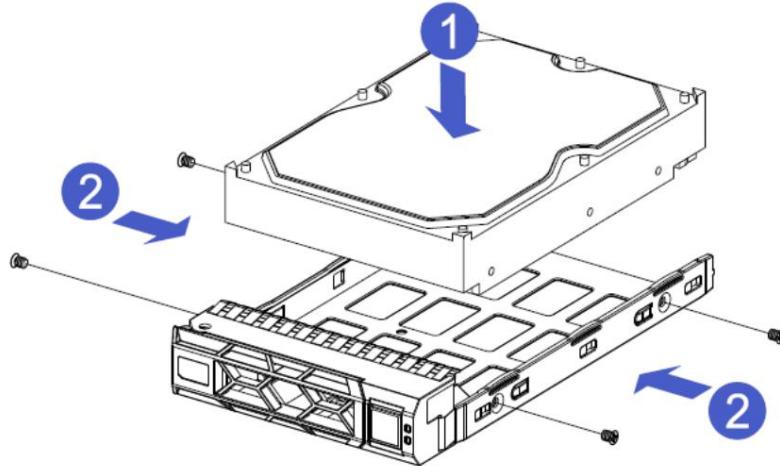
Hard drive tray assembly installed in the chassis

1-1. With the hard drive lever open, push it into the computer case;

1-2.3.5 inch hard drive installation method: When the hard drive gold fingers touch the back panel components, turn the wrench in the direction of the arrow;

1-3. Diagram showing hard drive installation:
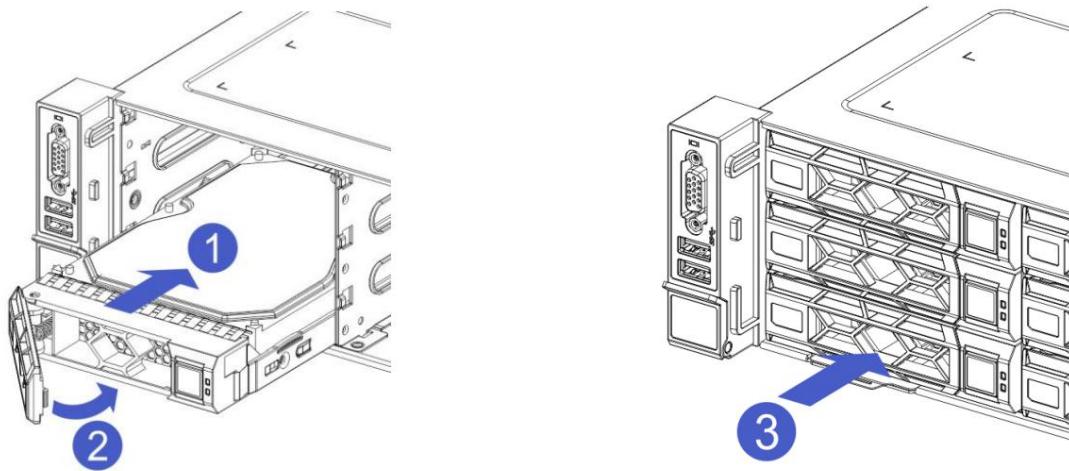
4.8 Installation of the rear hard drive

1-1. Install the rear-mounted 2.5" HDD assembly from the back inwards, aligning the screw holes on the left, right, and top.
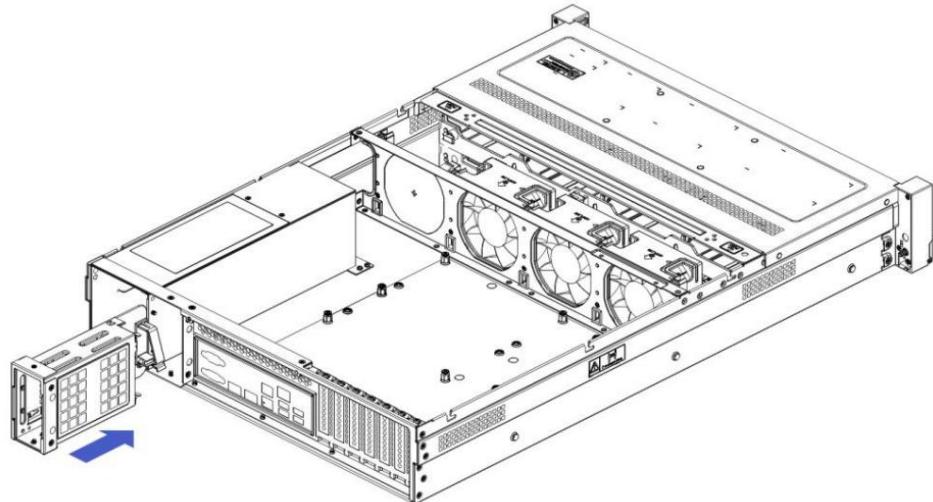
1-2. After installing the built-in 2.5" HDD module, tighten the screws in the five screw holes on the left, right, and top sides. This is mainly to secure the built-in 2.5" HDD module to the...

The rear window and power supply components are fixed together;
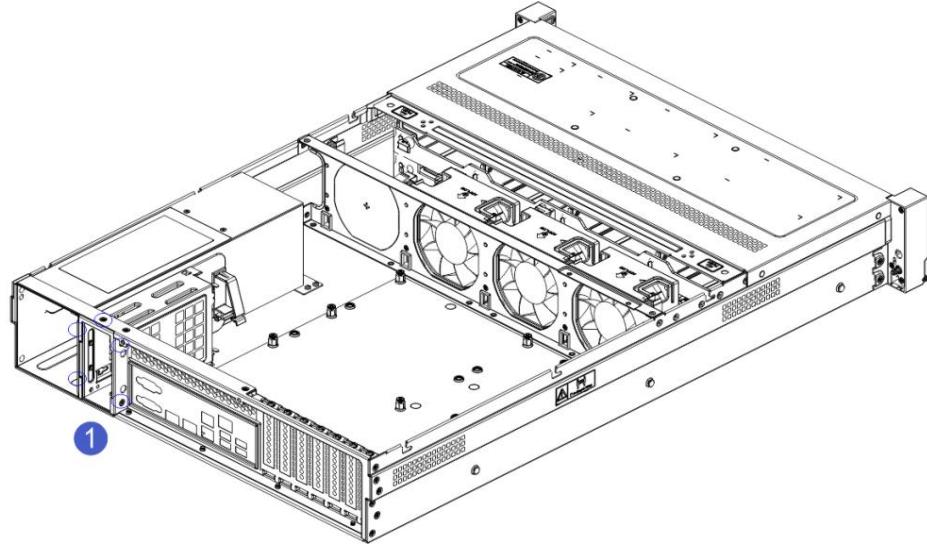
1-3. Installation steps for component 2.5 HDD module;
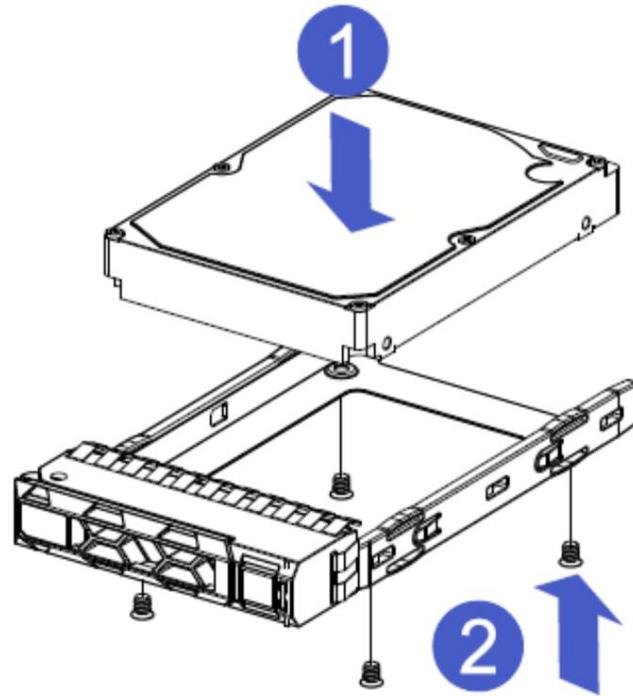
1-4. Insert the 2.5" HDD module into the built-in 2.5" HDD assembly until it is inserted into the built-in 2.5" HDD backplane connector, and then insert the 2.5" HDD module.

Just snap the button on and you're good to go;
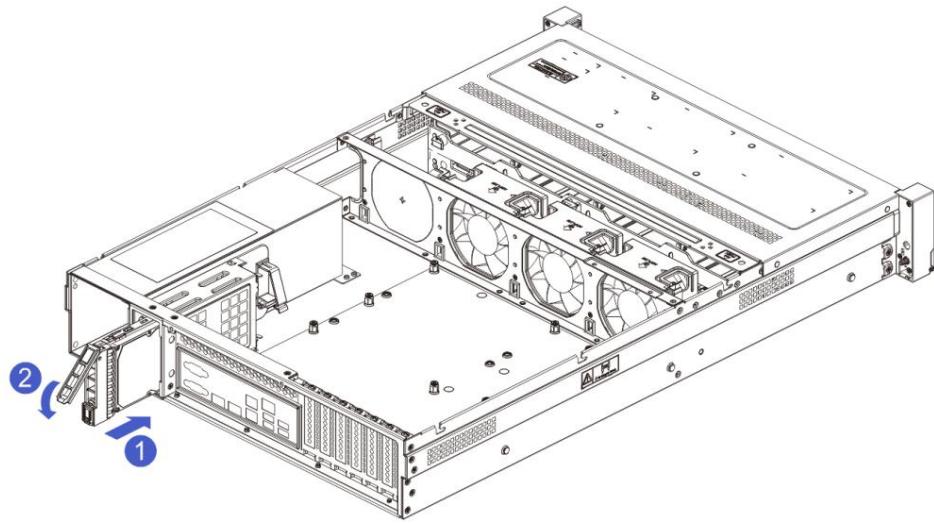
1-5. Installation of the PCIe Expansion Card: A screenshot showing the effect of the installed rear 2.5" HDD module.
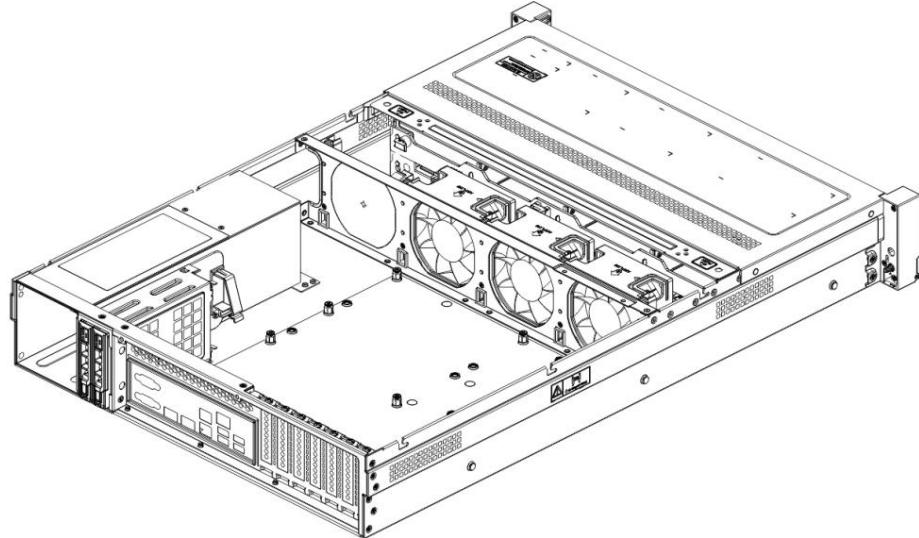
4.9 Fan Module Maintenance

1-1. Press your thumb inward on the left side of the fan's retaining ring, and pinch the other side with your index finger. This will disengage the hook on the fan from the fan's slide rail.

1-2. Lift up to raise the fan.
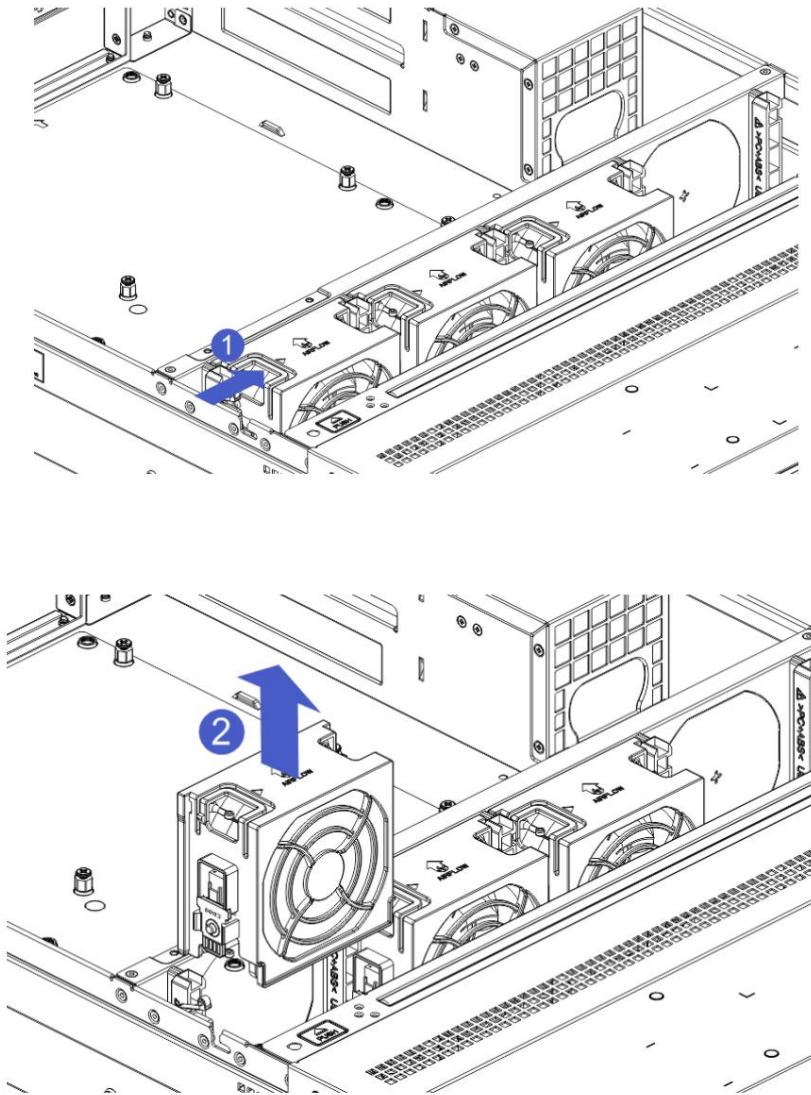
1-3. Support for a fourth fan: This case supports three fans by default. To install a fourth fan, you will need to repeatedly select the fourth fan slot.

A sheet metal baffle is installed; only after this baffle is removed can the fan adapter plate and fan module be installed.
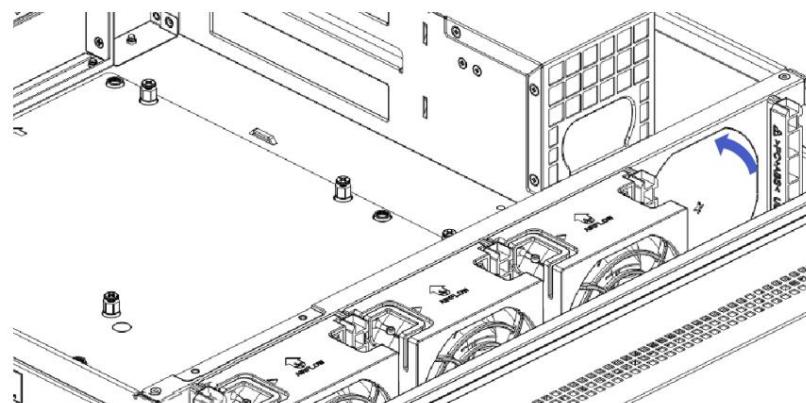
4.10 Rail assembly installation

Step 1. After removing the inner rail from the guide rail, push the middle rail into the guide rail.

1-1. Pull the inner rail outward from the guide rail until you hear a click and it stops.

1-2. Push the white button in the direction of the arrow while simultaneously pulling the inner rail outwards completely;

1-3. Complete the removal of the inner rail;
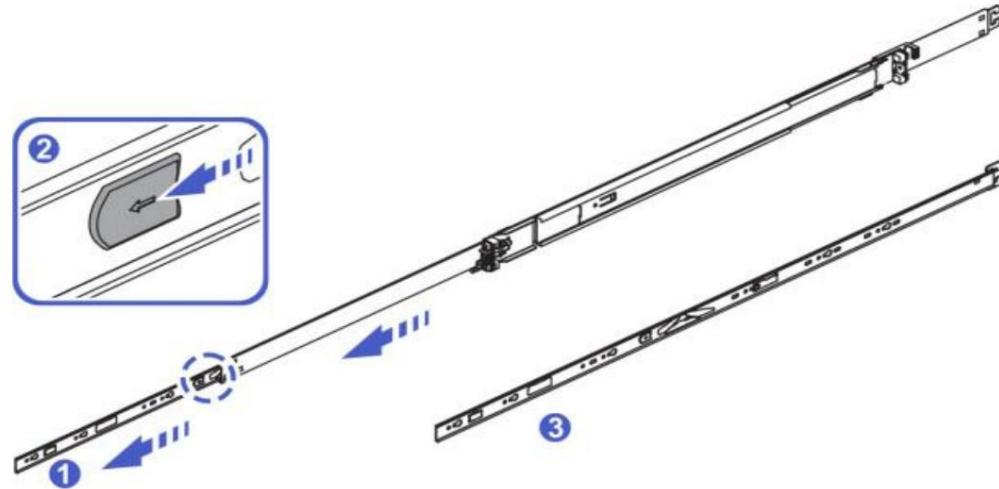
1-4. Push the latch a in the guide rail in the direction of the arrow;

1-5. Simultaneously push the middle rail into the slide rail;

1-6. Complete step 1.
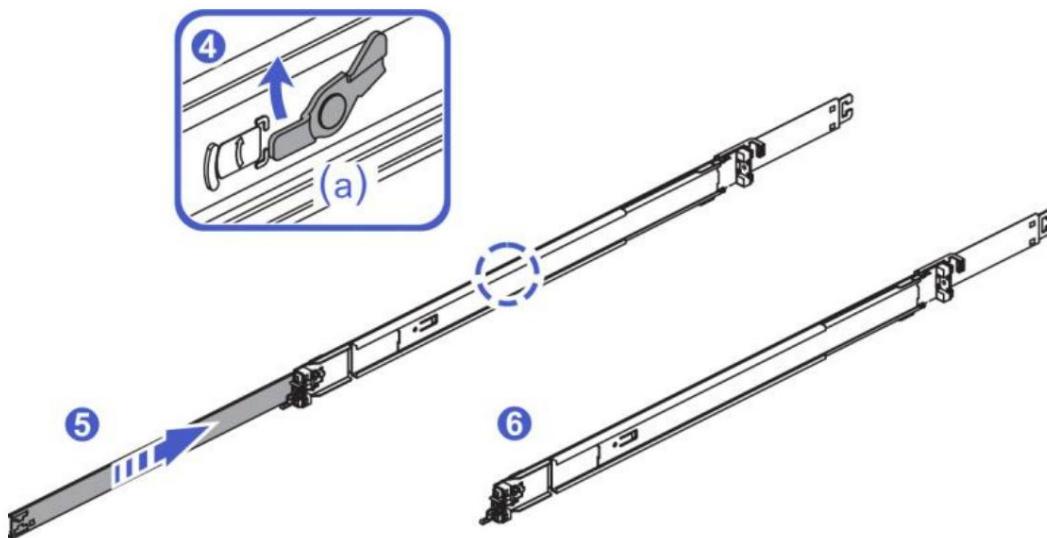
Step 2. Install the inner rails onto the chassis (the installation method for the left and right inner rails is the same).

2-1. Align the positioning holes of the inner rail with the four mounting pins on one side of the chassis, and install the inner rail onto the chassis as shown in the diagram. Once installed, you should be able to hear...

Upon hearing a click, ensure the installation is complete.

2-2. At point a on the chassis, tighten the M4x4 screws from the accessories into point a on the chassis. This completes step 2.
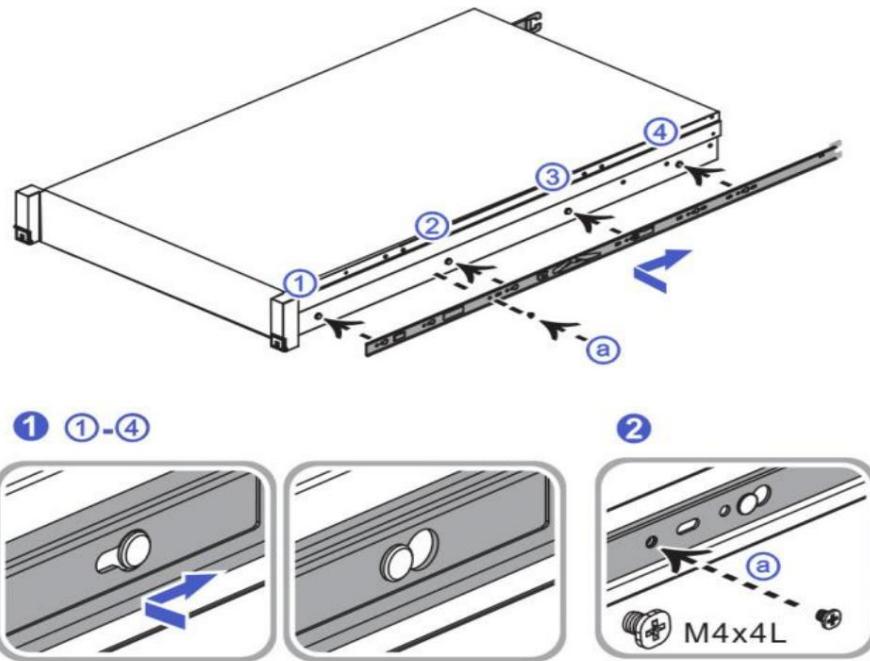
When removing the inner rail from the chassis, you need to unlock the clips in the inner rail as shown in the picture:
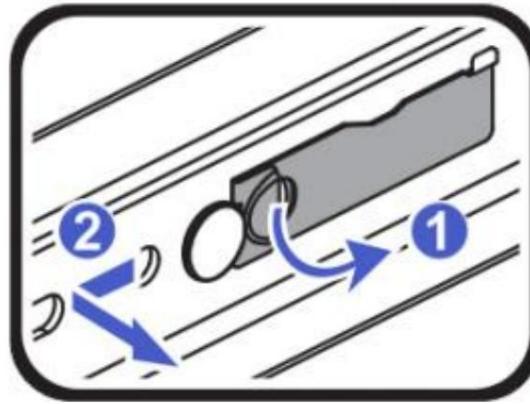
Step 3. Install the guide rails into the frame (the left and right guide rails are symmetrical, please repeat the installation).

3-1. Push the rear latch of the guide rail according to the arrow indication, align it with the frame hole, and install the guide rail into the frame;

3-2. Install the guide rail into the rear end of the frame. Once you hear a click, the rear end installation of the guide rail is complete.

3-3. Push the front hook of the guide rail according to the arrow indication, align it with the frame hole, and install the guide rail into the frame;

3-4. After you hear a click when you install the guide rail into the front of the frame, step 3 is complete.
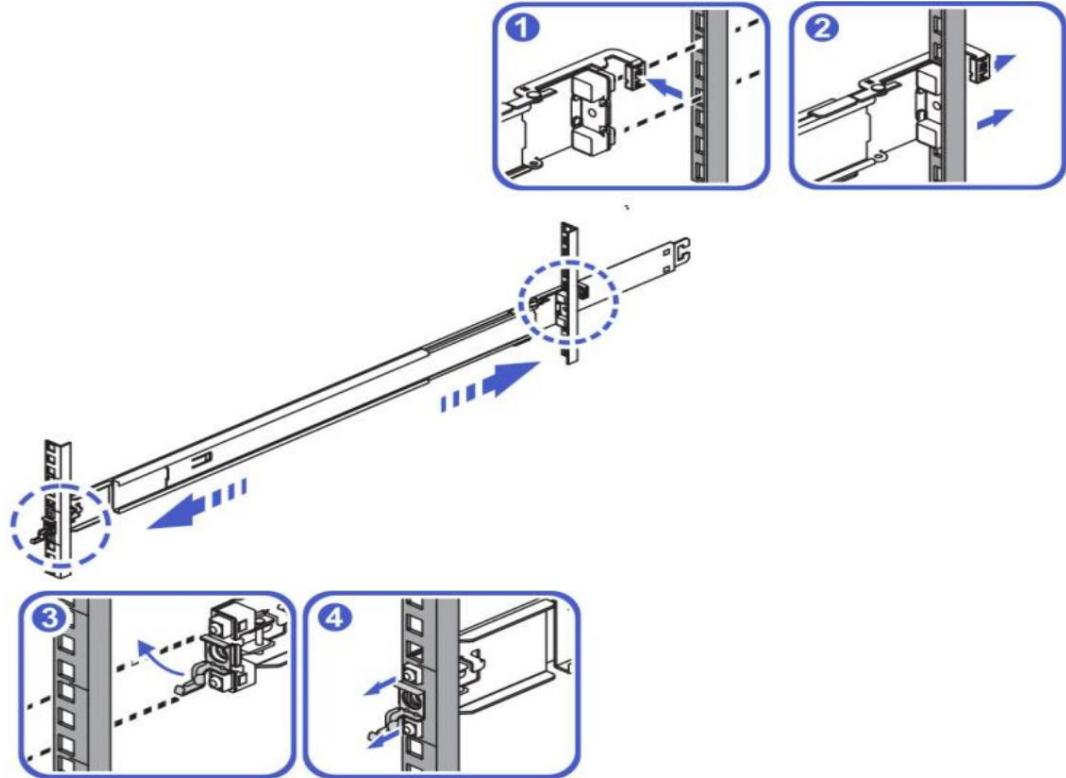
When removing the guide rail from the rack, the clips in the guide rail need to be unlocked as shown in the figure:
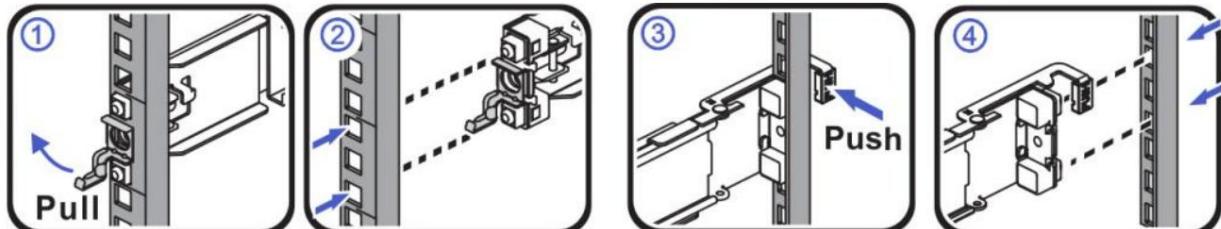

Step 4. Install the server into the rack.

4-1. Pull out the two side rails installed in the frame. You will hear a click when they stop.

4-2. Lift the server and align the inner rail with the middle rail. Push the server into the rack in the direction of the arrow, ensuring that the inner rail is smoothly inserted into the middle rail.

4-3. After pushing the server into the middle track, you should hear a click and then it should stop.

4-4. Move the blue button in the direction of the arrow, and push the server into the rack while holding down the button;

4-5. Pry open the front mounting ears on both sides and tighten the screws with a screwdriver to complete step 4.
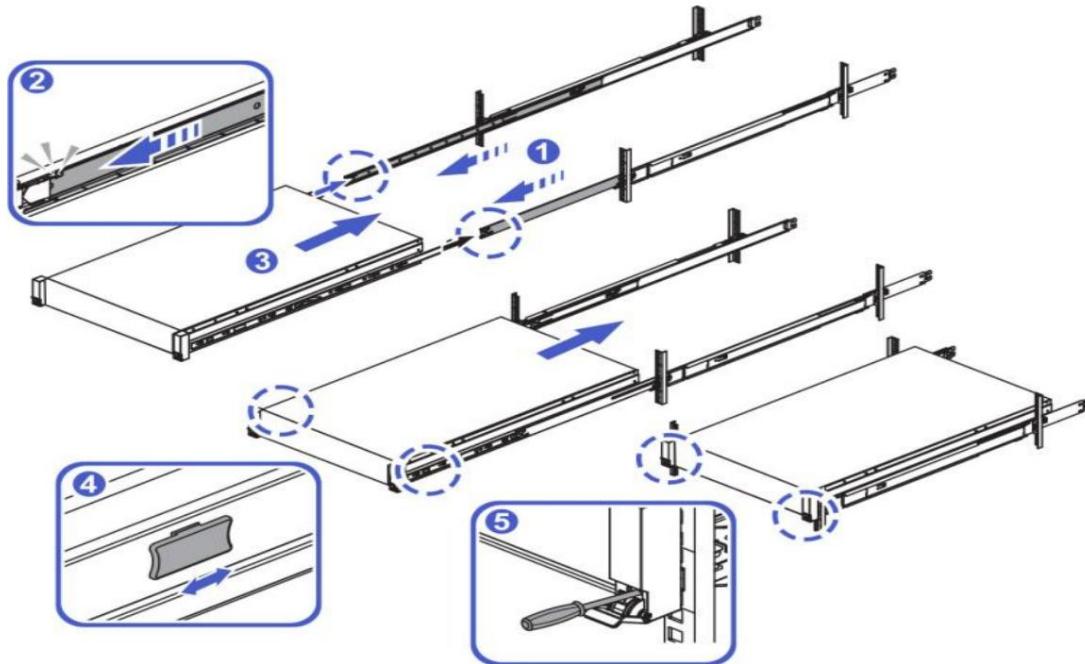
To remove the server from the rack, you need to unlock the screws on both sides and the white button, as shown in the picture:
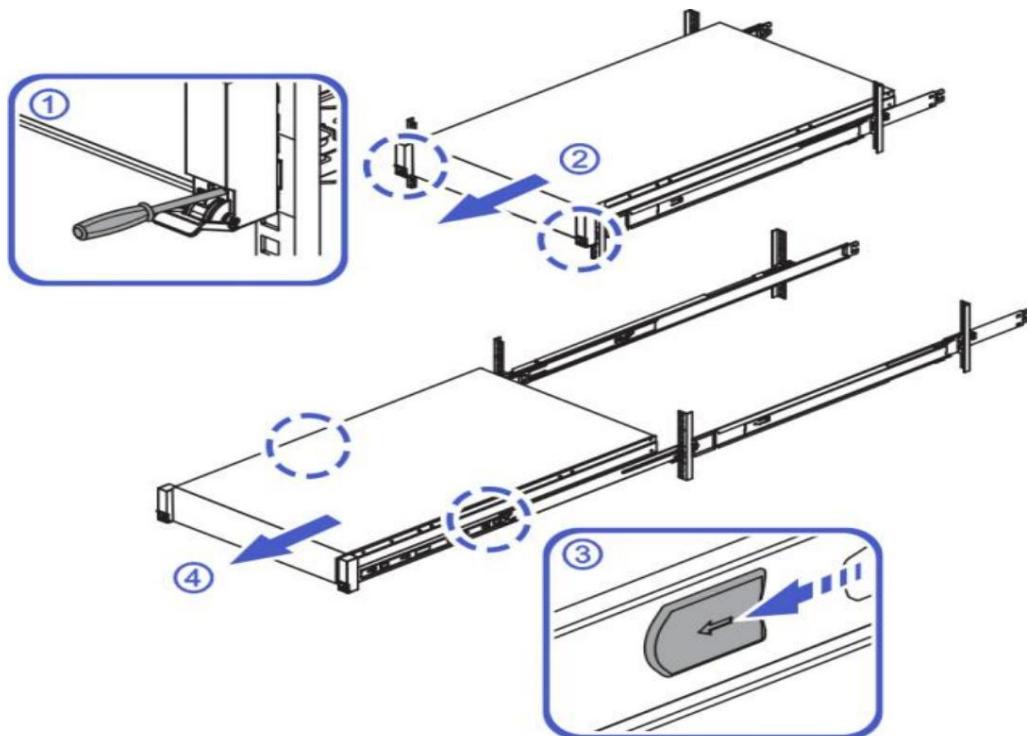
5. Operating Precautions and Troubleshooting

5.1 Operating Precautions

The duty cycle and speed of the system fans are controlled and adjusted uniformly; when the CPU fan and system fan are set to manual speed adjustment, they need to be controlled separately.

ÿ In the BMC WEB page, you can manually adjust the duty cycle by dragging the slider.

ÿ Memory must be installed according to POR rules, with the memory connection method that provides optimal performance;

The LSI 9560 RAID card does not support Legacy mode management of RAID cards;

ÿ PCH SATA does not support RAID creation in Legacy mode;

ÿ To enable MDNS for a specific network interface, the "Register BMC" function must be enabled for the corresponding network interface.

It will only take effect after that;

ÿ Configuring DNS information for BMC may cause network reconnection. Please wait for a certain period of time (1 to 2 minutes is recommended) before proceeding with the next operation.

The BMC WEB NTP function requires the dedicated network port to be in DHCP mode to function properly.

After configuring NTP-related settings on BMC WEB, the corresponding services will restart. Please wait for a certain period of time (1 minute is recommended) before proceeding to the next step.

This operation must be performed twice; otherwise, an error may occur.

To grant SNMP privileges to the admin user, you need to change their password first, as SNMP passwords require a minimum length of 8 characters, and the admin user...

The user's default password length is incorrect;

ÿ Although the SSL certificate uploaded on the SSL page and the SSL file on the LDAP settings page are both in PEM format, they cannot be used interchangeably;

ÿ Avoid installing multiple operating systems on one machine. If you must install multiple operating systems, ensure that each system has a separate boot partition and data partition.

The partitions belong to the same hard drive;

ÿ When writing to FRU for the first time using the IPMI tool, a "bad header CHECKSUM" message will appear; subsequent updates will not show this message.

The Red Hat 9.0 system displays a "PCI BAR failed" message. This message is unrelated and can be ignored.

ÿ Red Hat 9.0 system logs contain some failed messages, such as systemd errors, which can be ignored;

ÿ The BMC WEB interface will no longer log out when updating the BIOS and CPLD;

The BMC NCSI function only supports one network port: LAN1 (downstream port) supports NCSI, while LAN2 (upstream port) does not.

The T3DE motherboard uses an I210 network port and does not support legacy PXE.

ÿ After disconnecting AC power for DDR5 memory, it is recommended to wait 20 seconds before removing or reinserting the memory. [DDR5 DIMMs are powered by 12V; after powering off, the 12V power supply will be interrupted.]

[It won't be over so quickly]

When you press F3 to restore default settings in BIOS, the TPM option will be reset to its default value.

The BIOS supports English only; Chinese is not supported.

In the BIOS setup interface, under Boot Override, the two I210 network cards have identical names, both displaying UEFI: 00 PXE.

This is because there are two independent network cards with different bus numbers but the same fun number;

When using a 4090 graphics card for display, KVM will not display anything; KVM only maps the motherboard's VGA image signal.

interest;

ÿ The BIOS Post list does not display PCIe device information;

ÿ For memory performance testing, such as the stream test, it is recommended to use 2Rx8 memory for testing, as 1R memory has lower performance;

ÿ When connecting an LSI 9560 RAID card, the disk order in the system may differ from that in the RAID card, but this will not affect functionality;

ÿ Because the latest Broadcom RAID driver does not yet support Red Hat 9.2, LSI 9560 will be used on Red Hat 9.2 systems.

There is a chance that the card status will be "Failure" when using a RADI card.

ÿ When powering on immediately, the BMC IP address may not be displayed in the BIOS setup hotkey interface.

ÿ Installing Windows 2019 on a disk connected to an LSI 9560/9500 card in RAID1 or JBOD mode requires driver installation;

ÿ Using LSI 9560/9500 to install EulerOS V2.0SP5 fails due to missing drivers, the disk cannot be recognized and installation is impossible;

ÿ When installing Windows 2019, the image requires the latest version of the OS image;

Installing Ubuntu 21.10 requires disconnecting from the network; (if the network is not disconnected, the installation will fail; this OS is a non-TLS version).

ÿ When installing in Legacy mode using an LSI 9560 card in JBOD mode, it is recommended to connect only one disk for installation. If multiple disks are available,

Please ensure that the system is installed on the first drive. If the system is not installed on the first drive, the system will not function correctly after installation and restart.

Access the system desktop;

ÿ When installing Windows, it is recommended to use only one boot disk. If multiple disks are available, install it on the first boot disk.

There may be other hidden partitions on other drives; removing them will cause the system to fail to boot.

ÿ When installing the system, it is recommended to format the disk first before installation;

Due to Mellanox network card limitations, MAC addresses are not displayed in the BMC web interface in Legacy mode.

The T3DE motherboard uses a single BMC flash and does not support SD cards.

The right-mounted hard drive indicator light is only used to indicate the onboard hard drive and does not indicate the M.2 slot.

The BMC webpage's Post Code function will display 4-byte postcode information for the entire startup process, making it convenient to troubleshoot.

exclude;

ÿ In the BIOS, the Configuration Address source, whether DHCP or Static, displays "Unspecified".

ÿ After setting the BMC static IP in the BIOS to take effect, clearing the CMOS will not reset it to a DHCP IP;

ÿ When using a direct-connect backplane to connect a hard drive, a MiniSAS cable must be connected;

When replacing components such as the CPU or memory, the system will still display the information of the previous components before booting on the first power-on. You will need to wait until the system boots up.

The display will be updated later;

The BMC web login page cannot be refreshed using the F5 key;

It is normal for the temperature displayed on the BMC WEB to differ from the GPU temperature displayed in the system when the GPU card is connected.

The temperature read by nvidia-smi is the chip temperature;

After installing the GPU card driver on a Linux system, the GPU card will enter power-saving mode when the GPU load is low.

In this mode, the GPU card's Link speed under the OS will drop to 2.5GT/s; after the GPU card is under load, the Link speed will...

The rate will reach 16GT/s [driving behavior];

There may be some discrepancy between the power consumption displayed on the BMC WEB page and the power consumption read by the actual power meter.

ÿ The first boot after upgrading the BIOS takes a relatively long time (nearly 3 minutes);

ÿ BMC WEB Video Recording: Only the latest two video log entries will be retained. Previously retained video events will be lost after AC (Accepted).

ÿ Video log generation takes approximately 20 seconds. Clicking on the video before generation will display an error message.

The BMC SOL function needs to be implemented using the ipmitool tool;

When using a USB flash drive to update the BIOS under UEFI Shell, please note that the USB flash drive must be formatted as FAT32.

ÿ When flashing the BIOS under UEFI Shell, ensure that the file path does not contain Chinese characters;

ÿ BIOS setup help information is out of range. Press M to scroll down and K to scroll up.

ÿ Loading the default BIOS will not clear the password or the UEFI Drive BBS Priorities boot order;

ÿ When the above 4G Decoding option is turned off, it will not only affect the graphics card, but also prevent the computer from booting if there are too many PCIe devices;

ÿ BIOS clear log settings: After the BIOS has accumulated 3639 log entries, a Powercycle operation is required for the changes to delete all entries.

    log;

ÿ When updating the firmware version using out-of-band tools, the device must not be rebooted or disconnected from the network. Please keep the device powered on or off.

After updating the BMC version, you need to restart your machine so that information such as PCIe devices can be displayed correctly in the BMC WEB.

ÿ During the BMC WEB BIOS update process, if the server loses power when the update progress exceeds approximately 80%, the BIOS will most likely get stuck at the POST stage.

    The interface requires a BIOS update.

ÿ Due to adjustments to the Security Flash policy to support the AMI changelogopro tool, versions from previous versions (0101 and later) are no longer supported.

    (Earlier) Updating to the newest version using AFU requires flashing or refreshing the BMC page;

Due to adjustments in the Security Flash policy, UEFI BIOS updates are no longer restricted by version number.

ÿ After setting a password in the BIOS, entering the wrong password three times will result in a black screen and require a restart;

ÿ After simply changing the Boot option filter to [Legacy only] and restarting to the post list, both the KVM and local monitors will show a black screen.

    show;

ÿ In the BIOS, setting "State After G3" to "Last State" will allow the server to automatically power on after an abnormal shutdown and AC power-on.

    If the device is turned off, it will remain off even after AC power is applied.

5.2 Heat Dissipation Limitations

	Front hard drive configuration	Maximum operating temperature 30ÿ	Maximum operating temperature 35ÿ	Remarks
Tongtai Yi chassis	12 x 3.5-inch hard drives	Supports CPUs up to 330W and up to 300W.		2U Active Cooler
	8 x 3.5-inch hard drives	Supports CPUs up to 350W and up to 330W.		

5.3 Troubleshooting

5.3.1 Common hardware failures

ÿ Server rear VGA cannot display

Fault description: After the server is powered on, the status indicator lights show normal operation, but there is no display output from the rear VGA.

Cause of the fault: When both the front VGA and rear VGA are connected at the same time, only one output can be generated from the two VGAs, and the front VGA takes priority.

Solution: Disconnect the front VGA port; the rear VGA port will then display normally.

The operating system cannot start.

Fault description: After configuring RAID on the RAID card and installing the operating system, the operating system fails to boot.

Cause of the problem: The RAID card is not configured with the installation drive as the preferred boot drive;

Solution: Access the LSI RAID card management interface and set the RAID disk where the system is installed as the preferred boot drive. This will allow you to boot normally into the system.

system;

Unable to log in to BMC Web

Fault description: Unable to log in to BMC WEB;

Possible causes: There are two possible reasons;

ÿ Incorrect username and password;

ÿ BMC IP DHCP has been changed;

Solution: First, confirm that the BMC username and password are correct. After the system boots up and displays the information, check the server POST interface or BIOS settings.

In Setup, check BMC's current IP address and log in to BMC WEB again using this IP address.

GPU card PCIe speed reduction

Fault description: The GPU or graphics card is displayed as Gen2 in the OS;

Cause of the problem: The system may activate the power-saving mode of the GPU or graphics card. After the GPU or graphics card is overloaded, it will automatically upgrade to Spec.

rate;

Solution: This is normal and requires no intervention.

ÿ Server ear-mount indicator light is red

Fault description: The status indicator light on the right mounting bracket of the server is red;

Possible causes of the malfunction: There are four possible causes.

ÿ Fan malfunction alarm

ÿ PSU abnormal alarm

ÿ Memory error alarm

ÿ Chassis opening error alarm

Solution: Follow these troubleshooting steps to diagnose the problem.

ÿ If both the memory status LED and the system status LED on the earpiece are flashing, then the memory fault handling process needs to be initiated.

ÿ If the system status light is constantly red, you need to confirm whether the PSU is in place and whether there is any abnormal chassis intrusion.

ÿ If the system status light flashes red, you need to check if the PSU power cord connection is abnormal.

ÿ After manually offlineing the hard drive via the RAID card, the hard drive warning light does not illuminate.

Fault Description: The server uses a direct-attached hard drive backplane configuration, connected with an LSI 9560 RAID card. The issue was detected during the RAID card setup in the BIOS.

After moving the offline hard drive, the hard drive warning light does not illuminate;

Cause of failure: This is due to the design of the LSI 9560 RAID card;

Solution: Due to inherent limitations of RAID, this issue cannot be resolved.

ÿ After the hard drive positioning light is turned on, the other status lights on the hard drive will be replaced.

Fault description: After the Locate indicator light on the hard drive is turned on, other status lights such as rebuild and failure lights on the hard drive will be replaced.

Cause of the failure: The server is designed with a high-priority mechanism for the hard drive location indicator light. When the hard drive location indicator light is on, other status indicators are ignored.

The status indicator light will be replaced to help users locate abnormal hard drives.

Solution: This is normal and requires no intervention.

5.3.2 Common software failures

ÿ BMC log time is inconsistent with actual time

Fault Description: The BMC log generation time is abnormal and inconsistent with the current Beijing time;

Cause of failure: Time configuration not synchronized;

Solutions: There are two solutions.

ÿ Configure the OS time to Beijing time and enable NTP synchronization;

ÿ In the Linux operating system, execute the command `timedatectl set-local-rtc 1` to perform time synchronization;

6 OS Installation

6.1 Microsoft Windows Server Installation Steps

6.1.1 Pre-installation preparation

Install equipment:

The following installation methods are supported:

      A. DVD drive

      B. USB devices

      C. PXE Network Boot

   D. BMC Remote Mount

Software environment configuration:

Power on the server and press the "DEL" key when the following hotkey prompt appears to enter the BIOS setup;

```
BMC D/S IP: 172.17.0.161/172.17.0.172
Press <DEL> or <ESC> to enter setup, <F7> to enter Boot Menu, <F12> to boot PXE.
Entering Setup...
                                                                            92
```

Go to the "Advanced" > "CSM Configuration" tab and confirm that the boot method is as required. In this case, "UEFI" will be used as an example.

```
                              Aptio Setup - AMI
        Advanced

 Compatibility Support Module Configuration              Enable/Disable CSM Support.

 CSM Support                      [Enabled]

 CSM16 Module Version             07.84

 Boot option filter              [UEFI only]

 Option ROM execution

 Option ROM Policy               [UEFI]
 Network                         [UEFI]
 Storage                         [UEFI]
 Video                           [UEFI]
 Other PCI devices               [UEFI]
                                                        ++: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/-: Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F3: Optimized Defaults
                                                        F4: Save & Reset
                                                        ESC: Exit



                       Version 2.22.1287 Copyright (C) 2023 AMI
```

Note: To enable Legacy mode, please change both "Boot option filter" and "Option ROM Policy" to Legacy.

6.1.2 Installation process

Power on the server. When the following prompt appears, press "F7" to select the boot device.

```
BMC D/S IP: 172.17.0.118/172.17.0.117
Press <DEL> or <ESC> to enter setup, <F7> to enter Boot Menu, <F12> to boot PXE.
Entering Boot Menu...
```

Select the boot device (taking USB flash drive as an example);

Select "zh-cn_windows_server_2022_updated_april_2023_x64_dvd_644d5669.iso" and press Enter to confirm;

On the installation screen, select the installation language, time, and keyboard, then click "Next" to proceed to the next step.
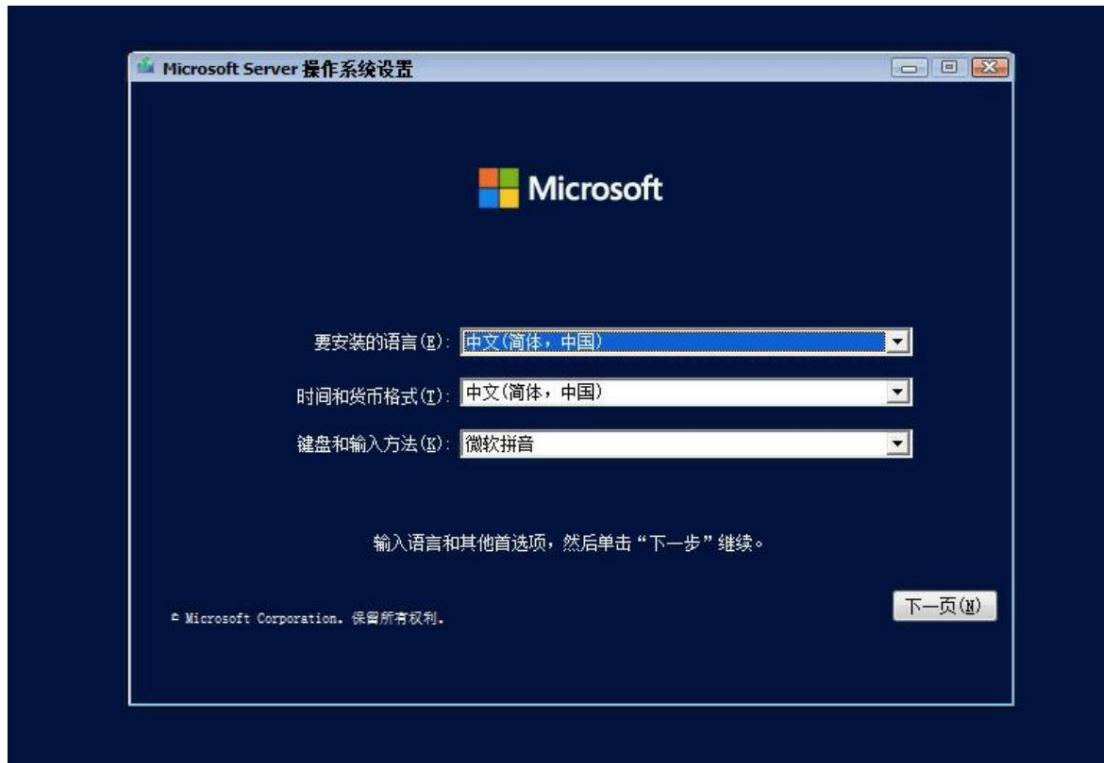
Press "Continue Installation Now";

Select "I do not have a product key (I)"
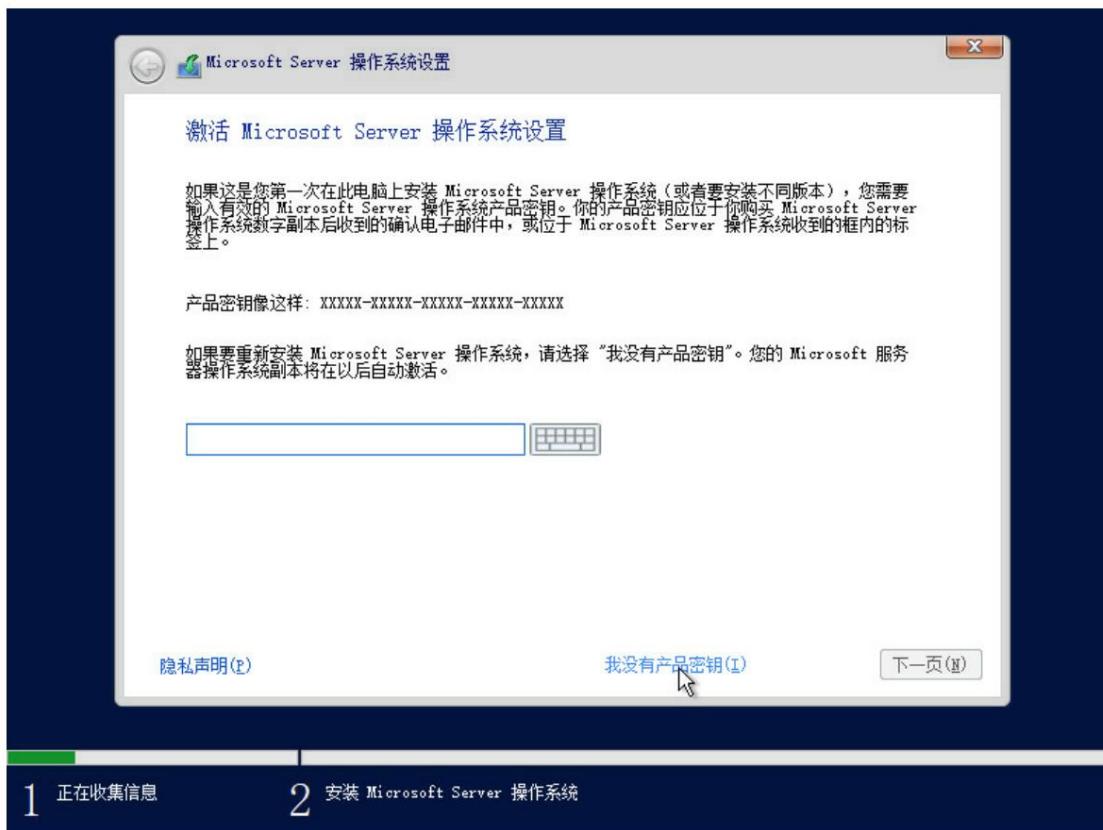
Select the operating system you want to install, and then press "Next Page";

Check the box next to "I accept..." and then click "Next Page";
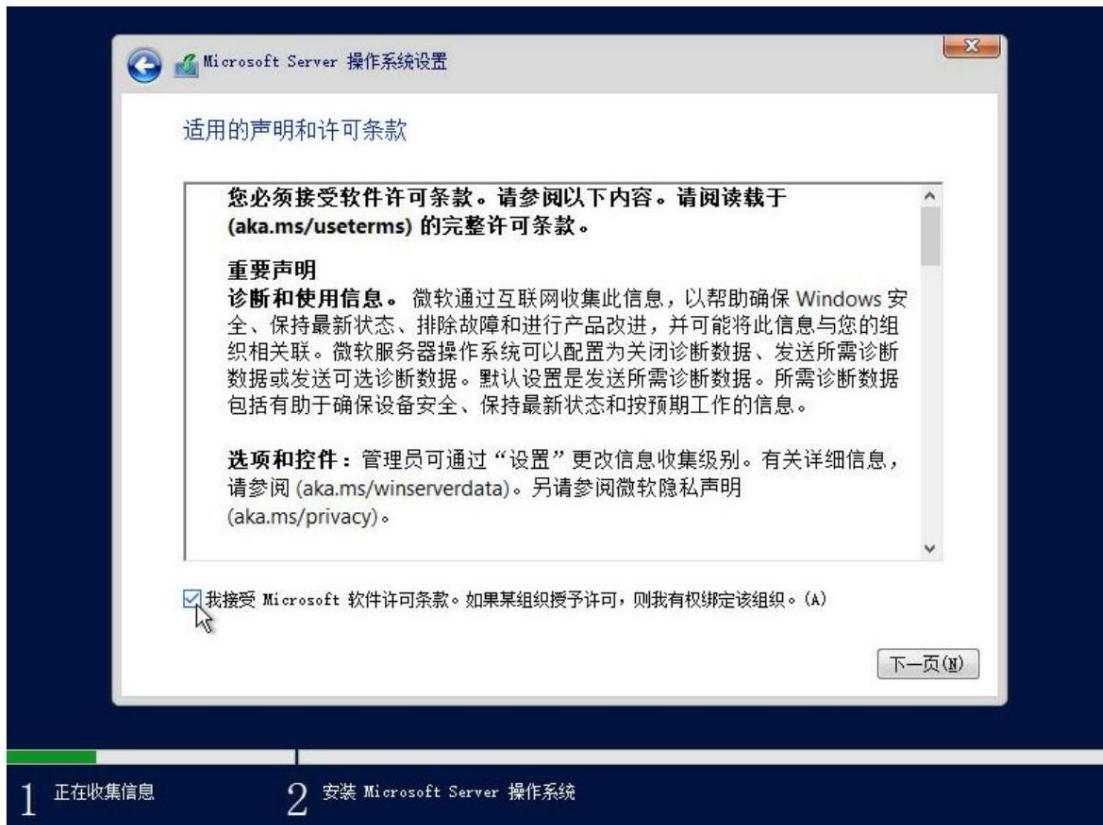
Click "Custom: Install only Microsoft Server operating system (advanced(C))";

Select the disk to install on, New -> Apply -> Format, Next;
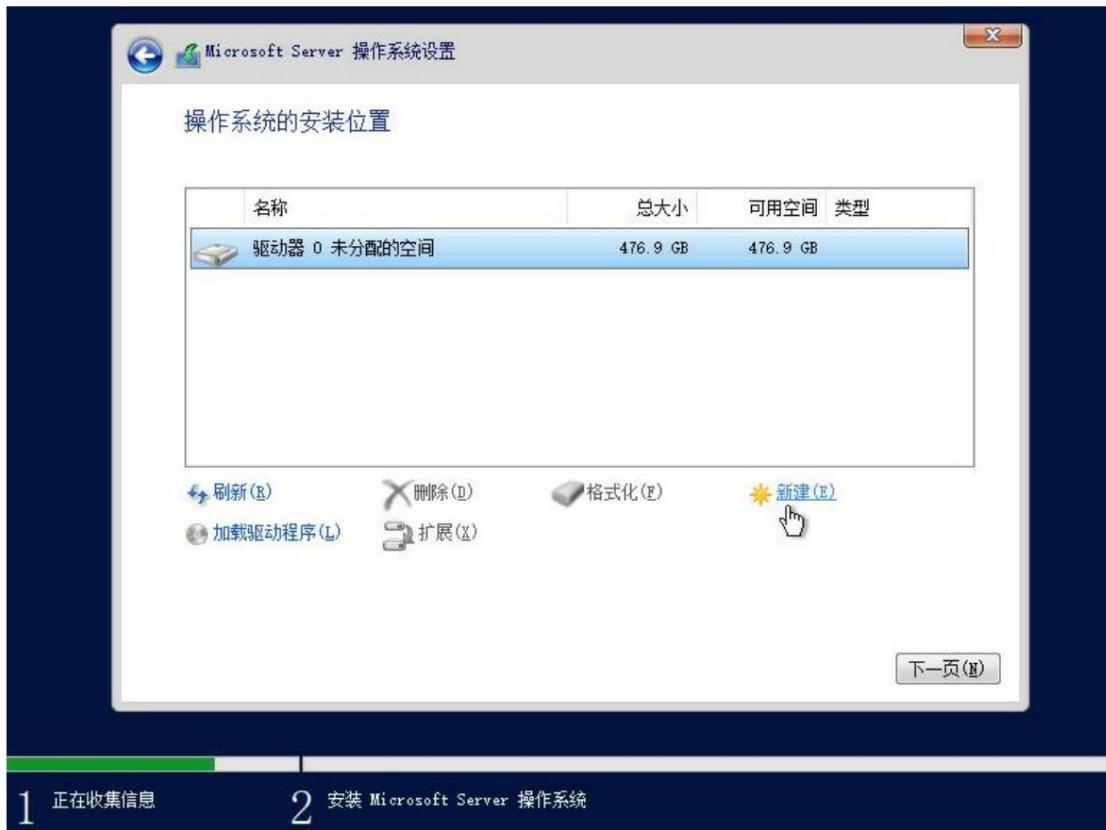
Start installation
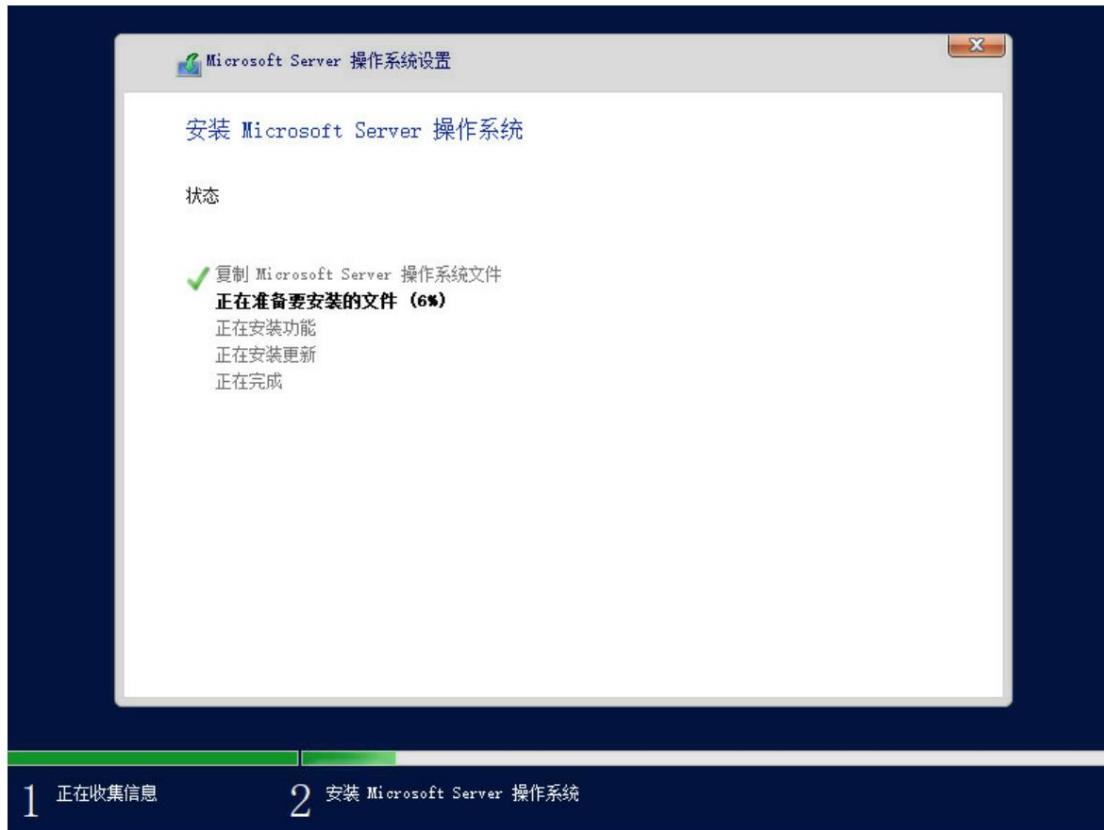
The server will automatically restart after installation. After restarting, you will enter the system. The first time you enter the system, you will need to set a password. Click "Finish".
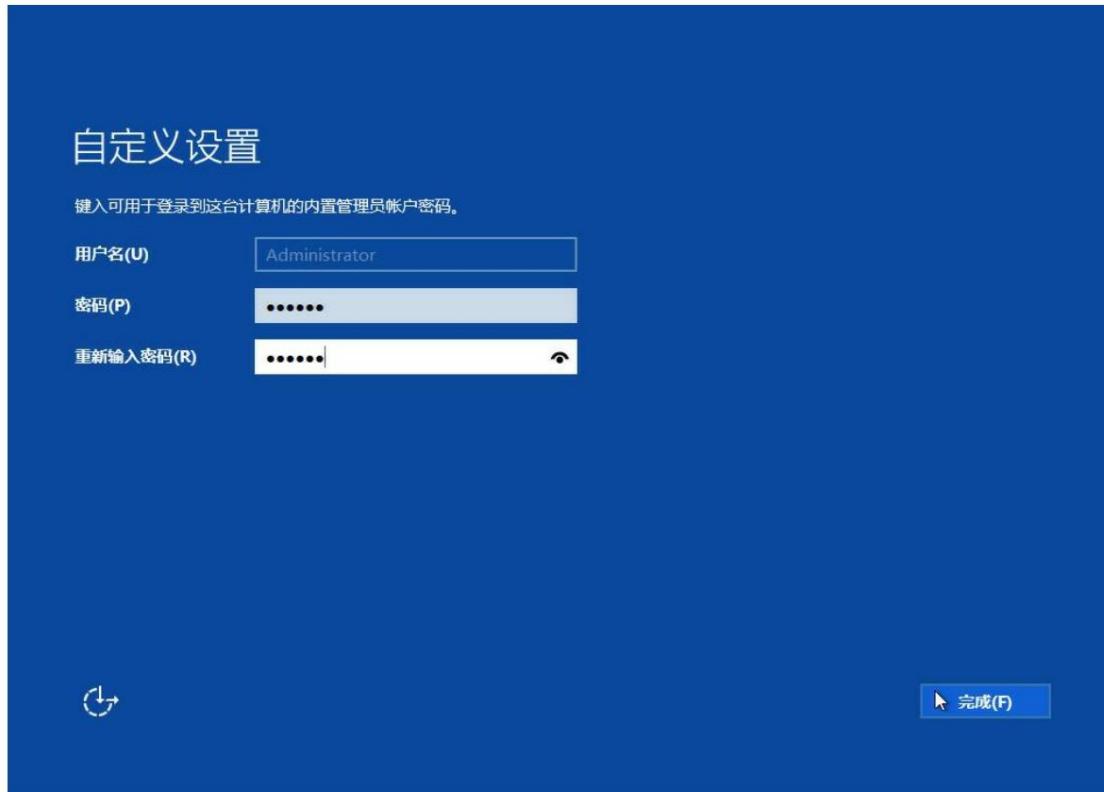
On the lock screen, press "Ctrl" + "Alt" + "Delete" simultaneously, enter your password, and then you will be taken to the desktop.
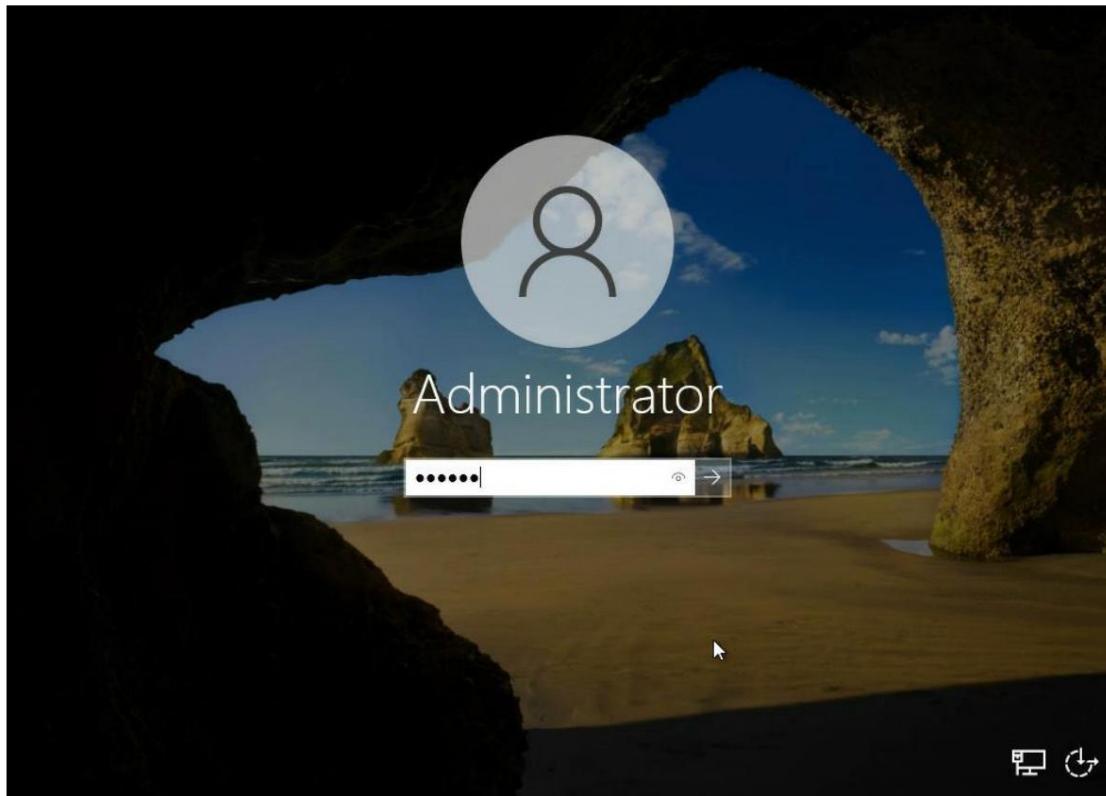
The installation of the Windows Server 2022 desktop is now complete.
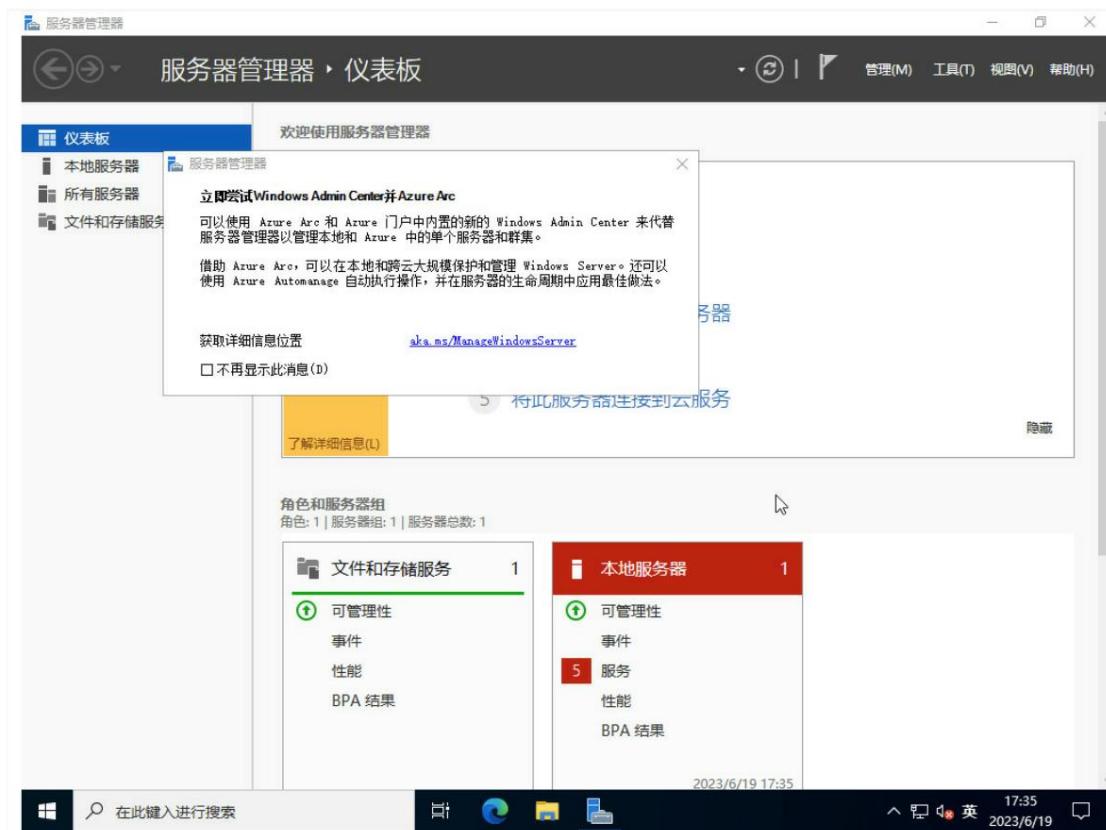
Note: If the disks on the RAID array formed by the 9560 RAID card or VROC Key are not recognized, you need to load their drivers before installation;

6.2 Red Hat 9.0 Installation Steps

6.2.1 Pre-installation preparation

Install equipment:

The following installation methods are supported:

E. DVD drive

F. USB devices

G. PXE Network Boot

H. BMC Remote Mount

Software environment configuration:

Power on the server and press the "DEL" key when the following hotkey prompt appears to enter the BIOS setup;

```
BMC D/S IP: 172.17.0.161/172.17.0.172
Press <DEL> or <ESC> to enter setup, <F7> to enter Boot Menu, <F12> to boot PXE.
Entering Setup...
                                                                          92
```

Go to "Advanced" - "CSM Configuration" and confirm that the boot method is as required. Here, we will take "UEFI" as an example.

Change the BIOS settings within the red box to "UEFI Only" and "UEFI".
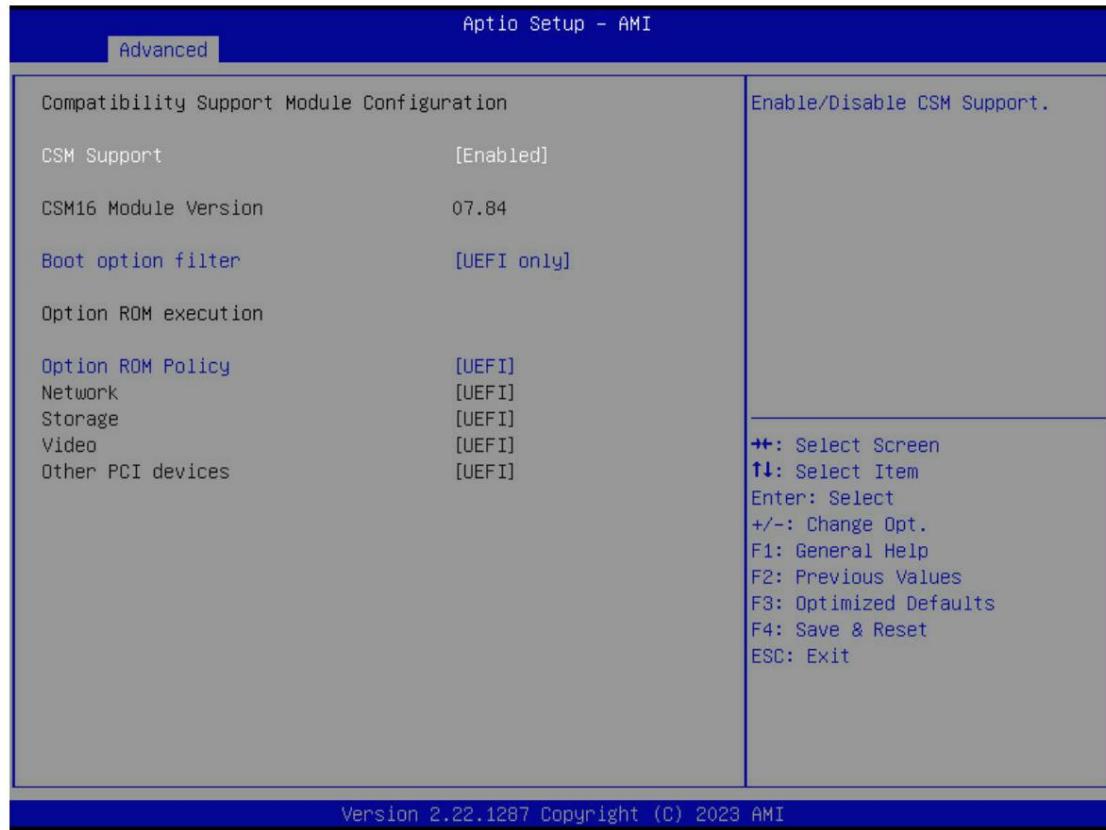
Note: To enable Legacy mode, please change both "Boot option filter" and "Option ROM Policy" to Legacy.

6.2.2 Installation process

Power on the server. When the following prompt appears, press "F7" to select the boot device.

Select the boot device (taking USB flash drive as an example);
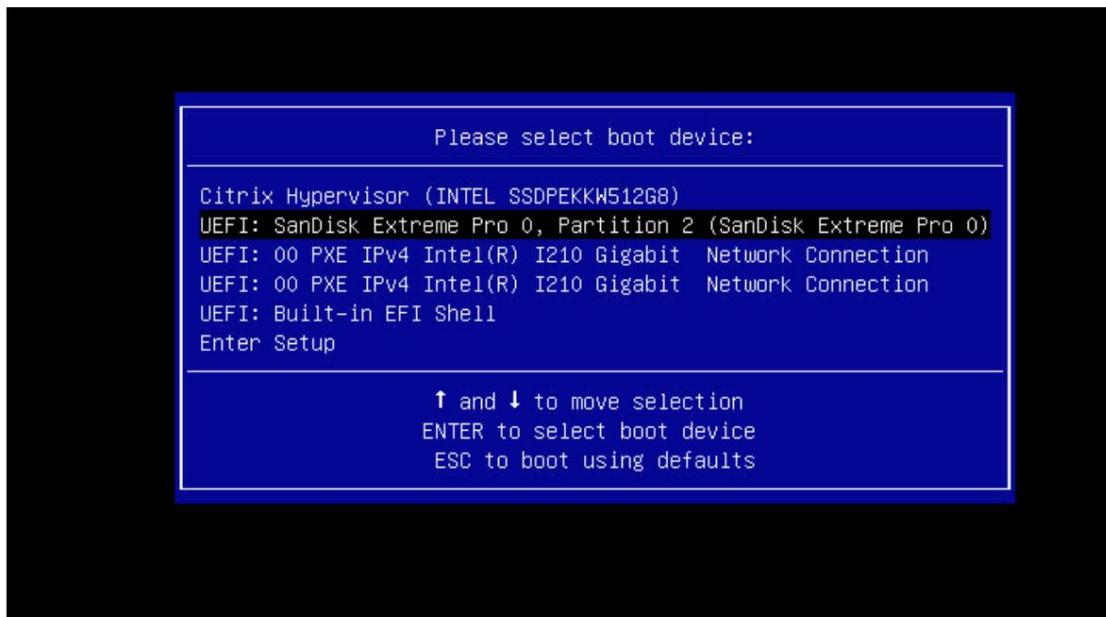
Select "rhel-baseos-9.0-x86_64-dvd.iso" and press Enter to confirm;
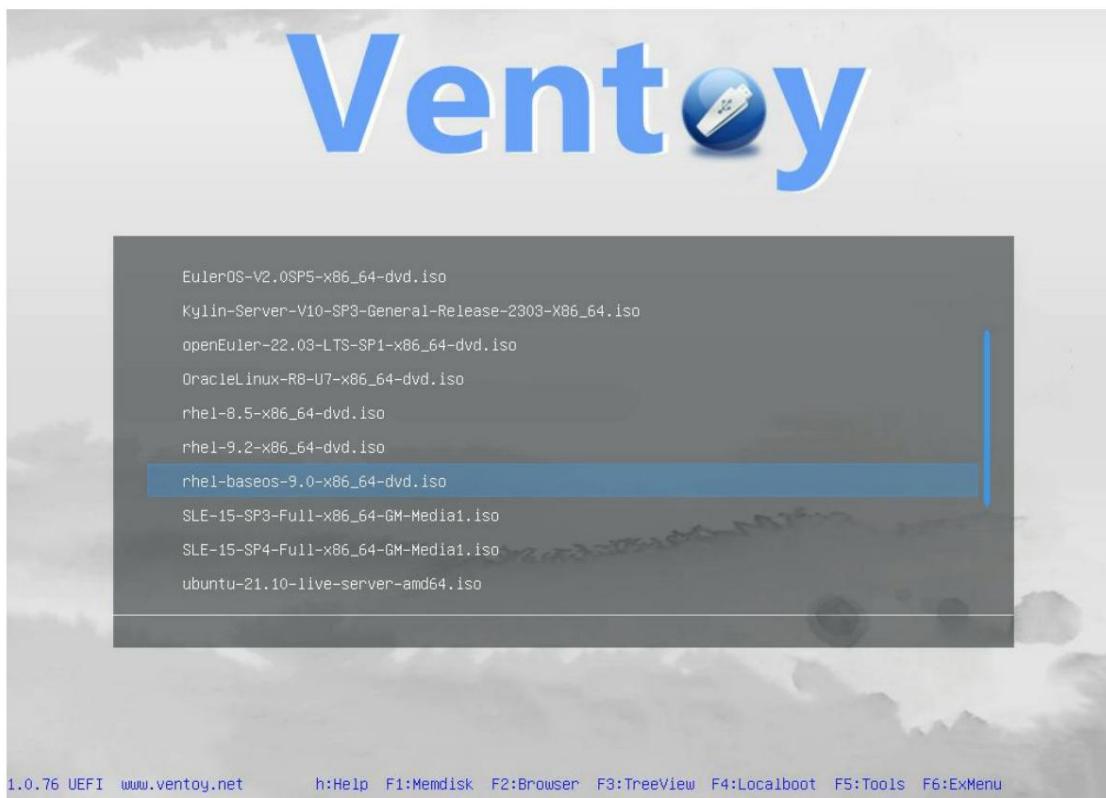
In the installation interface, select "Install Red Hat Enterprise Linux 9.0" and press Enter.
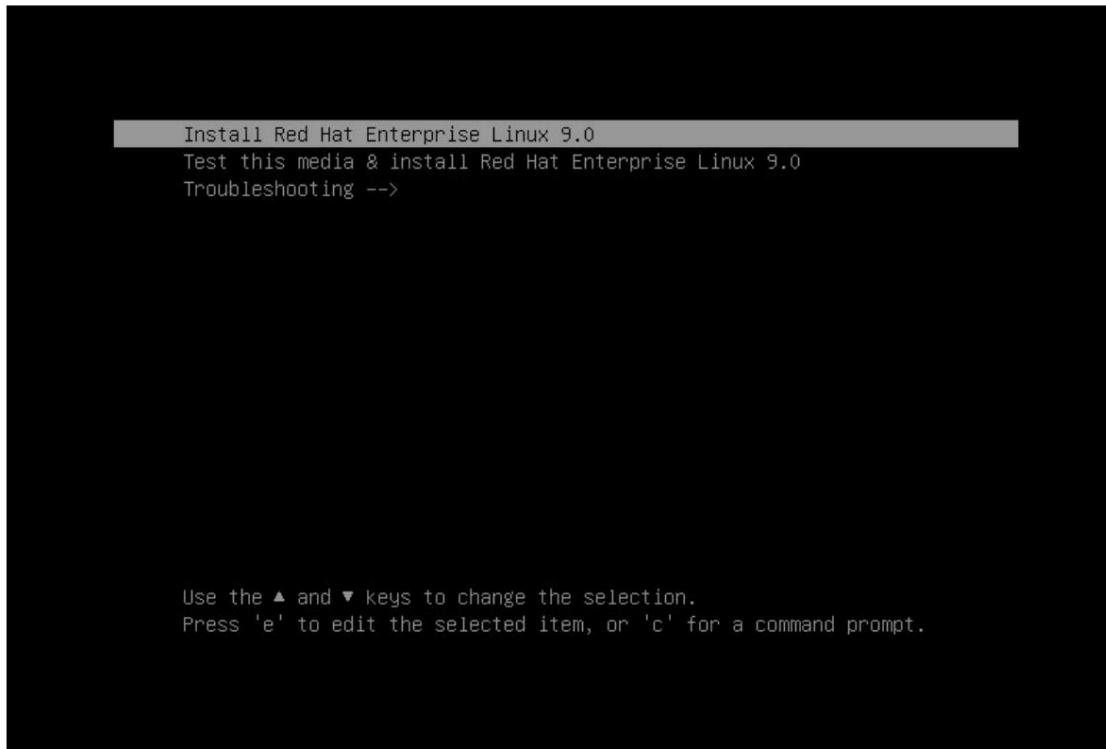
On the language selection screen, select "English", then "English (United States)" and press "Continue".
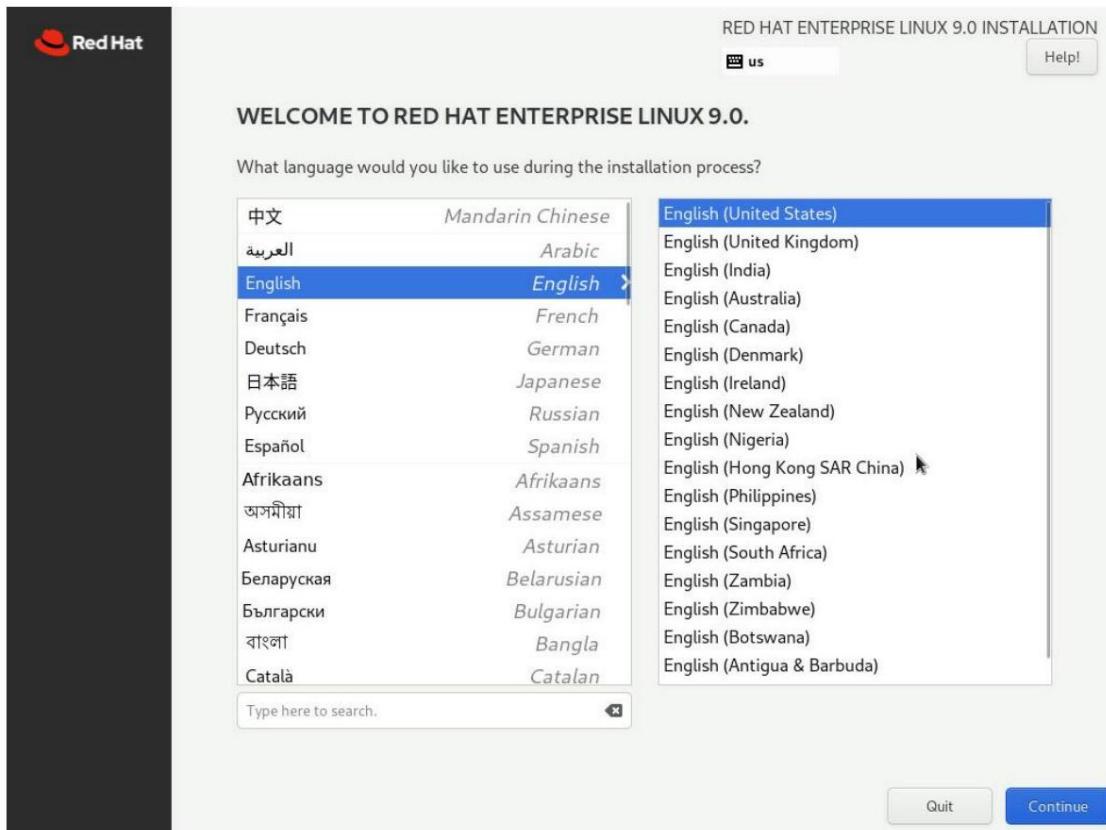
Select "Integration Destination";
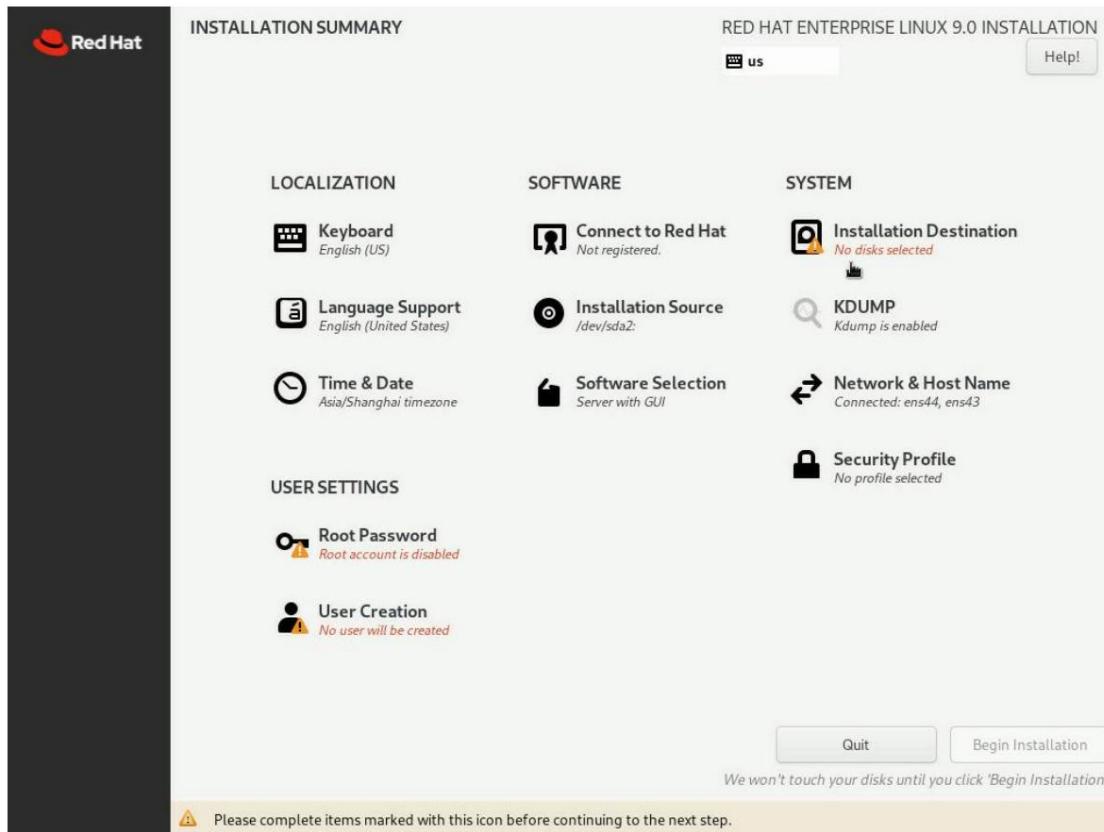
Select the drive letter to install to, and click Done.
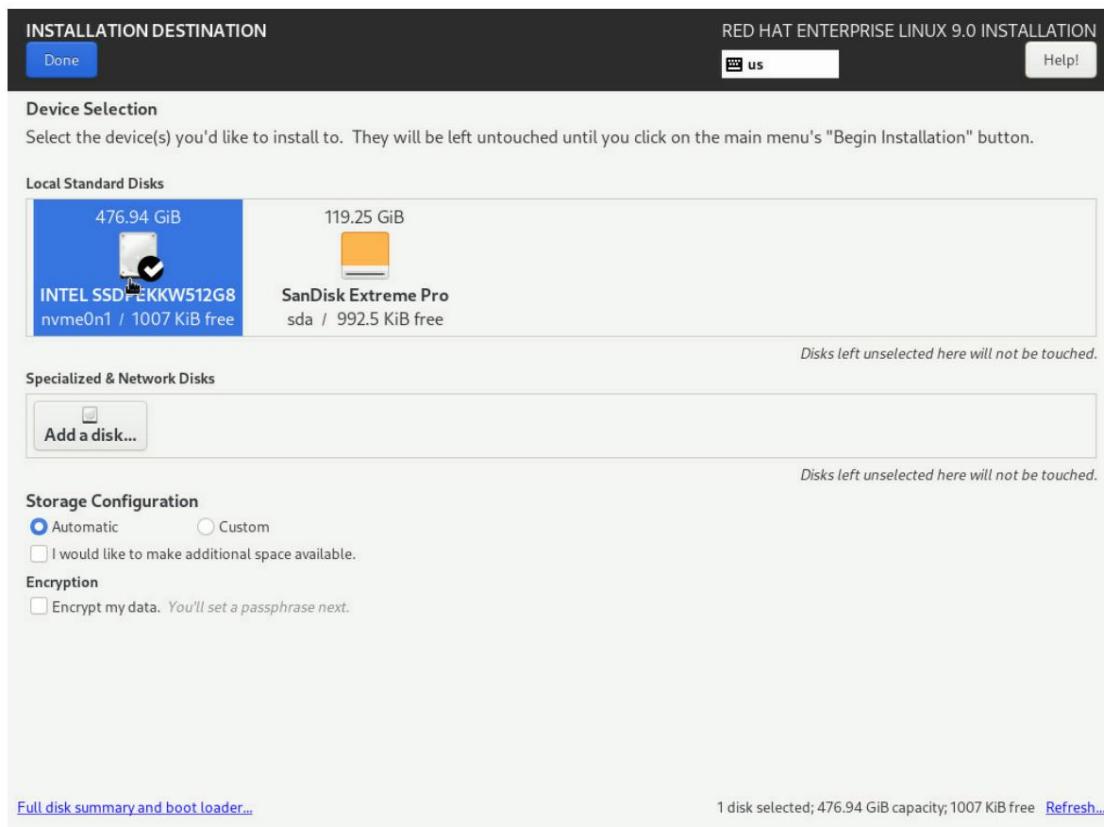
Click "Reclaim space" to reclaim hard drive space;
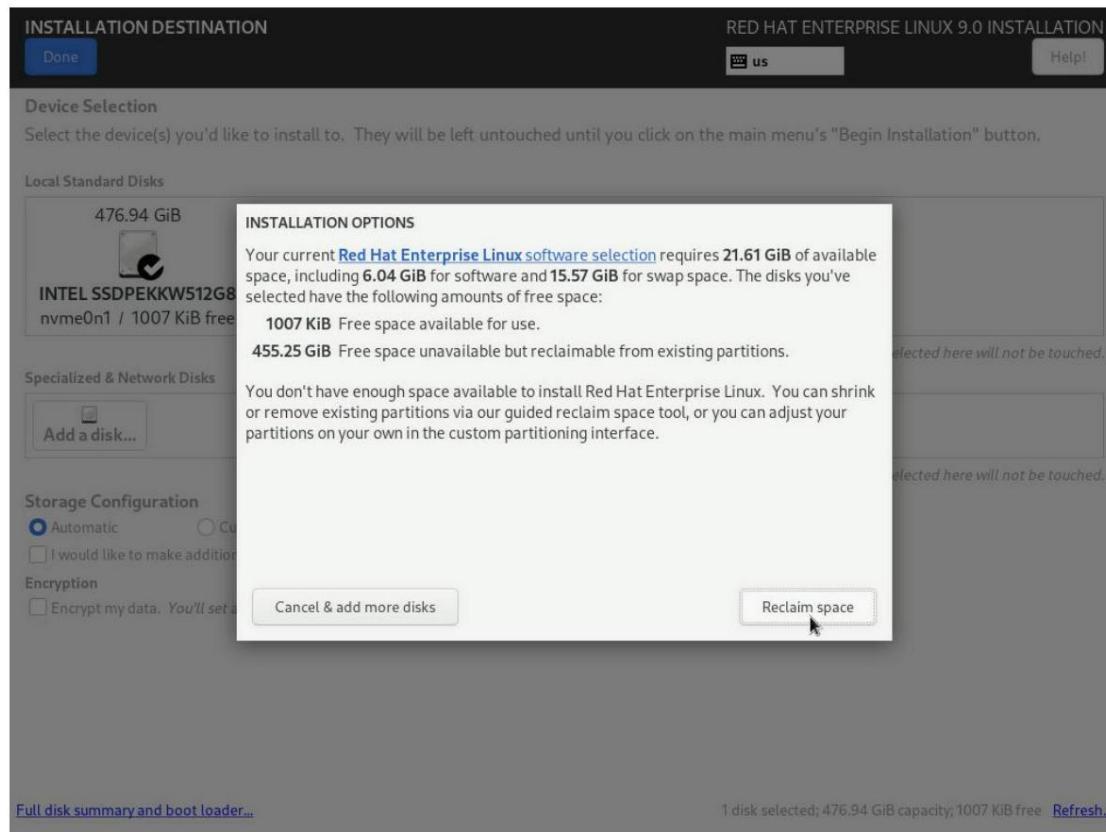
Click "Delete all" to remove the existing system.
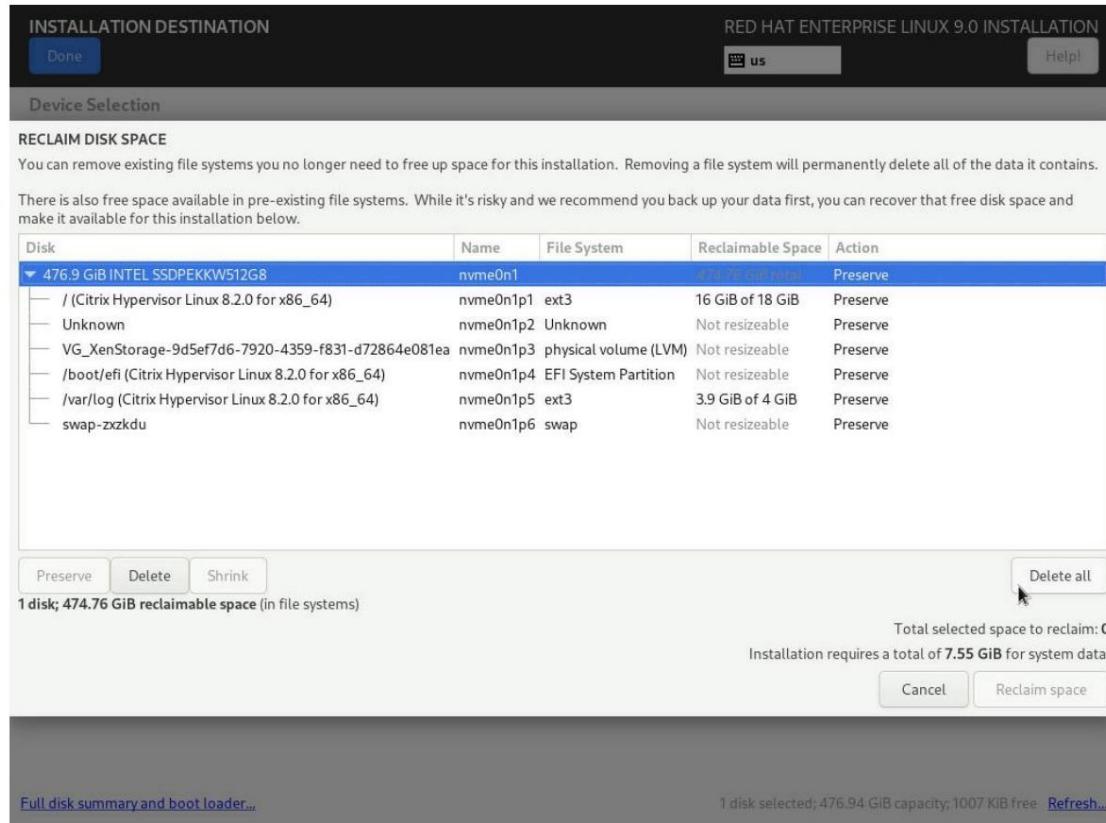
Click "Reclaim space" again to reclaim hard drive space;
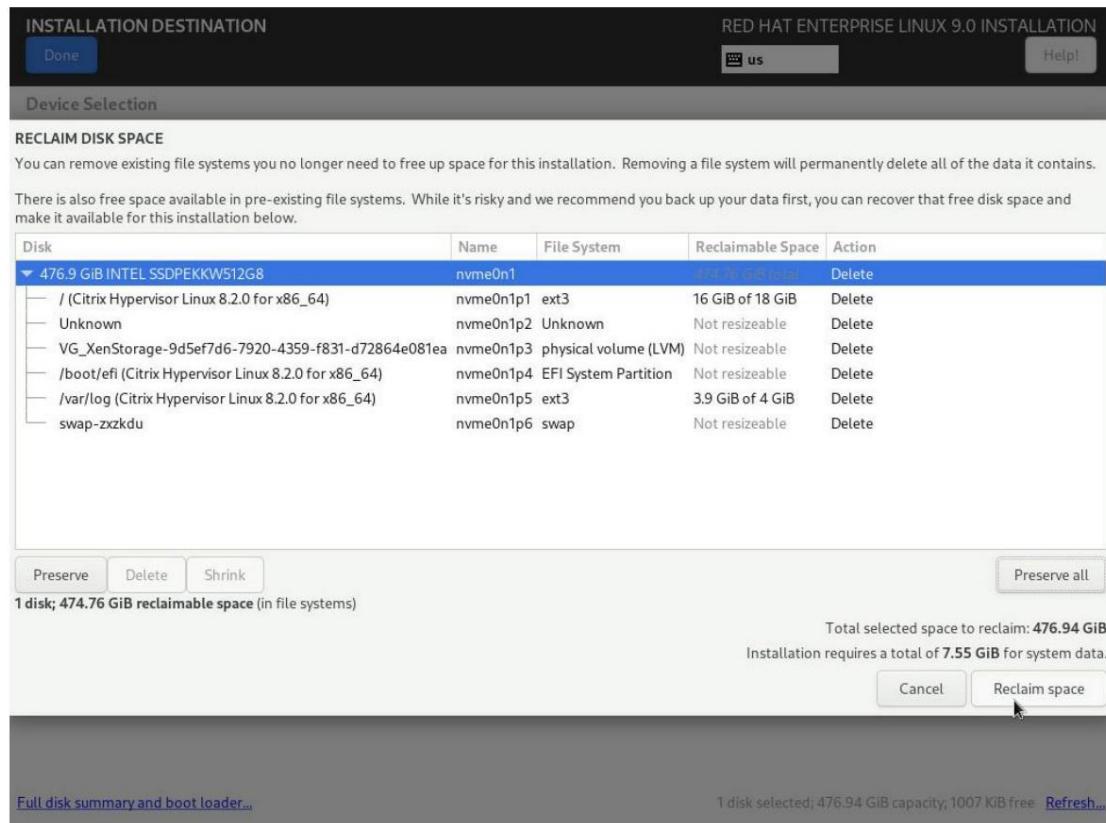
Click "NETWORK & HOST NAME", set all connected network ports to "ON", and click "Done";
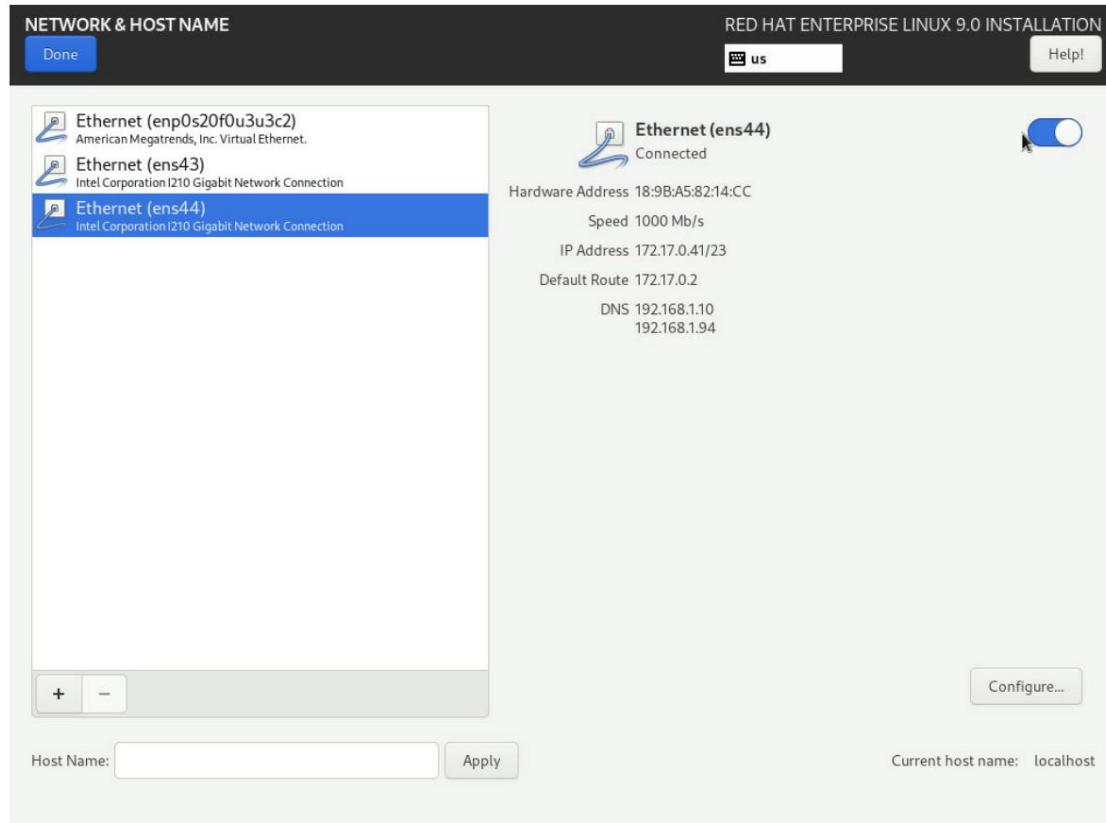
Click "Software Selection" to enter the custom software installation;

After selecting "Server with GUI", check all the boxes on the right and click "Done".
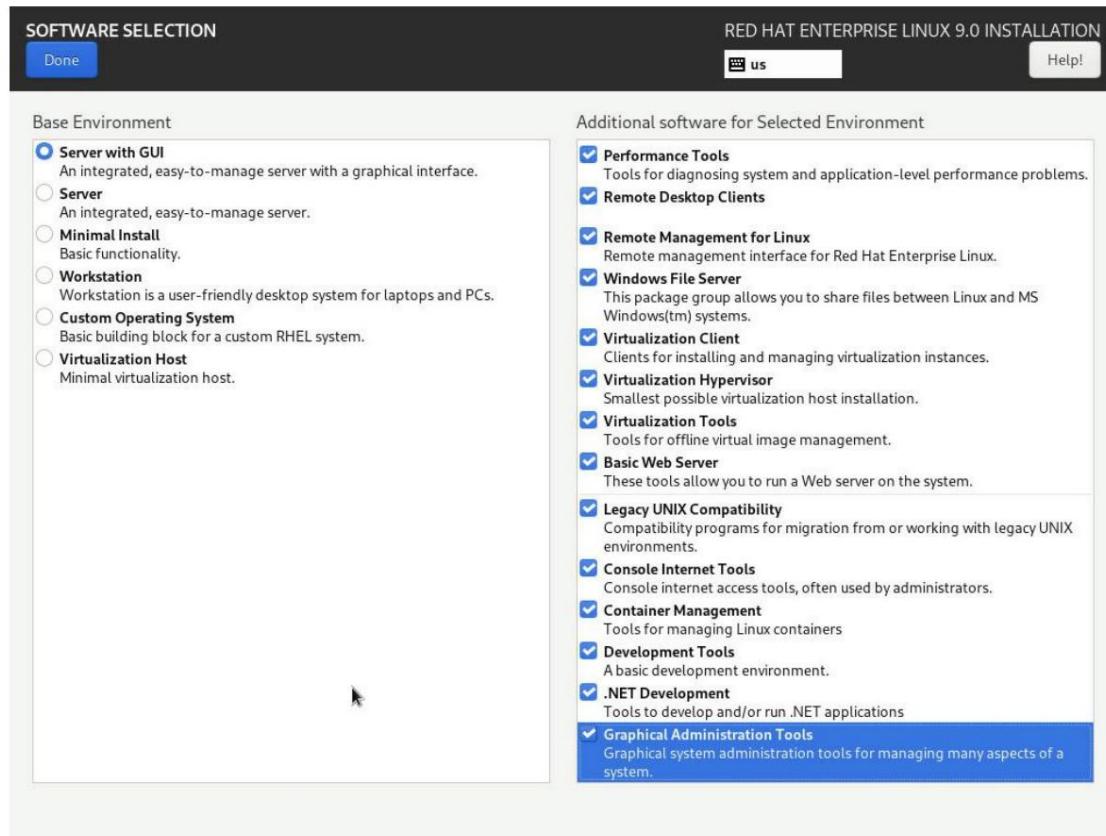
Click the "DATE & TIME" settings item to set the time, then click "Done".

Click on the "Root Password" setting under "USER SETTINGS" to set the root user password;

Enter the root user password, check "Allow root SSH login with password", and click the "Done" button to continue;

Click "USER CREATION" to set your user information, then click "Done".

To begin installation, click "Begin Installation".
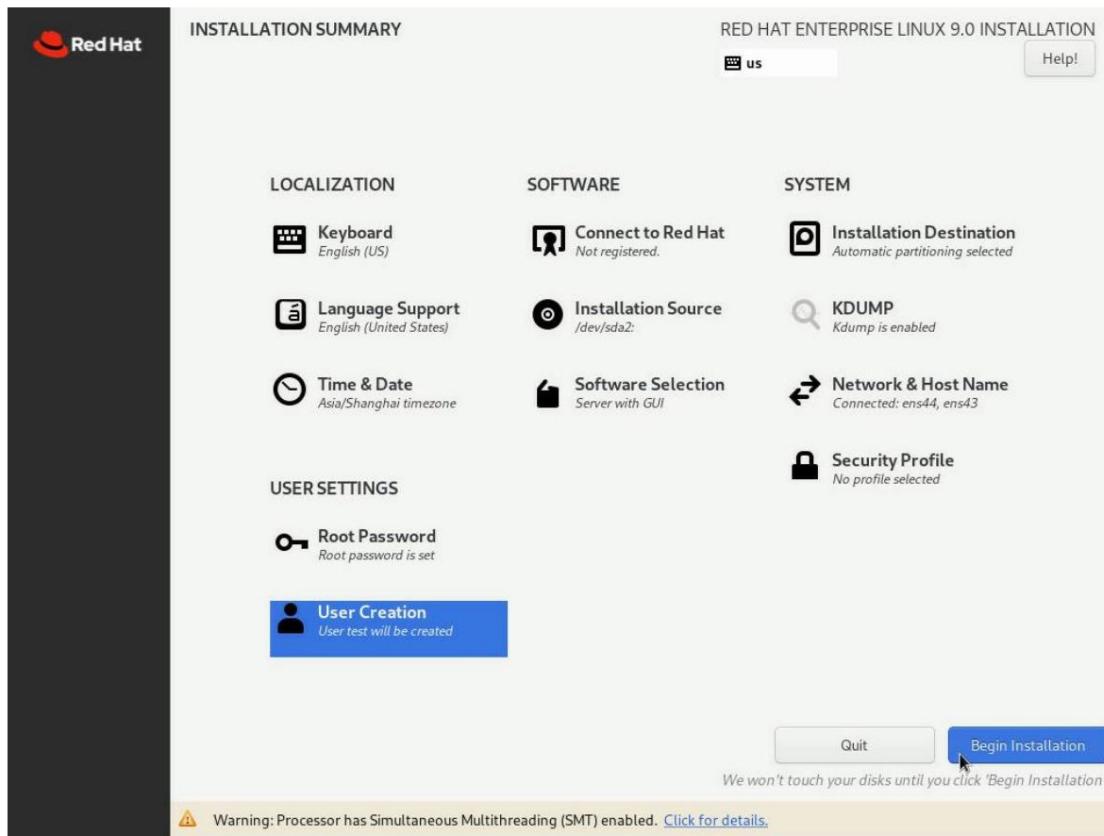
The system installation has begun;
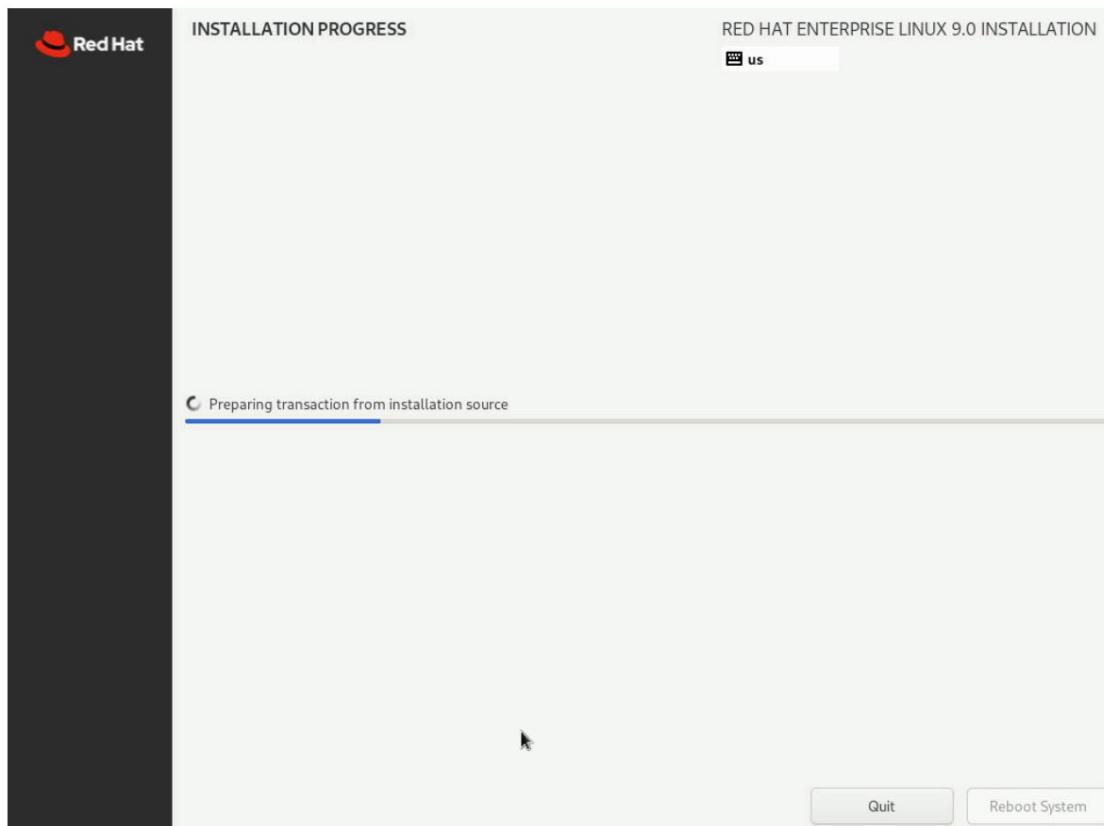
The system installation is complete. Click "Reboot".
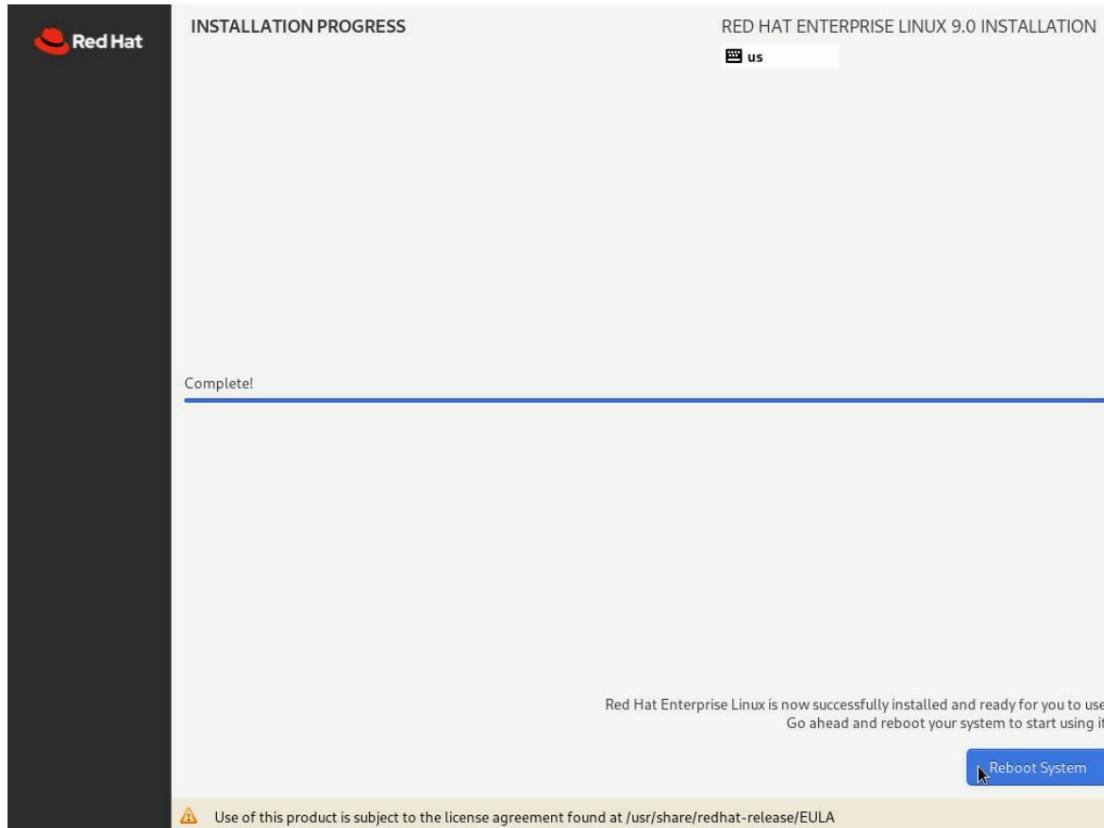
After rebooting and entering the system, select your username and enter your password to log in.
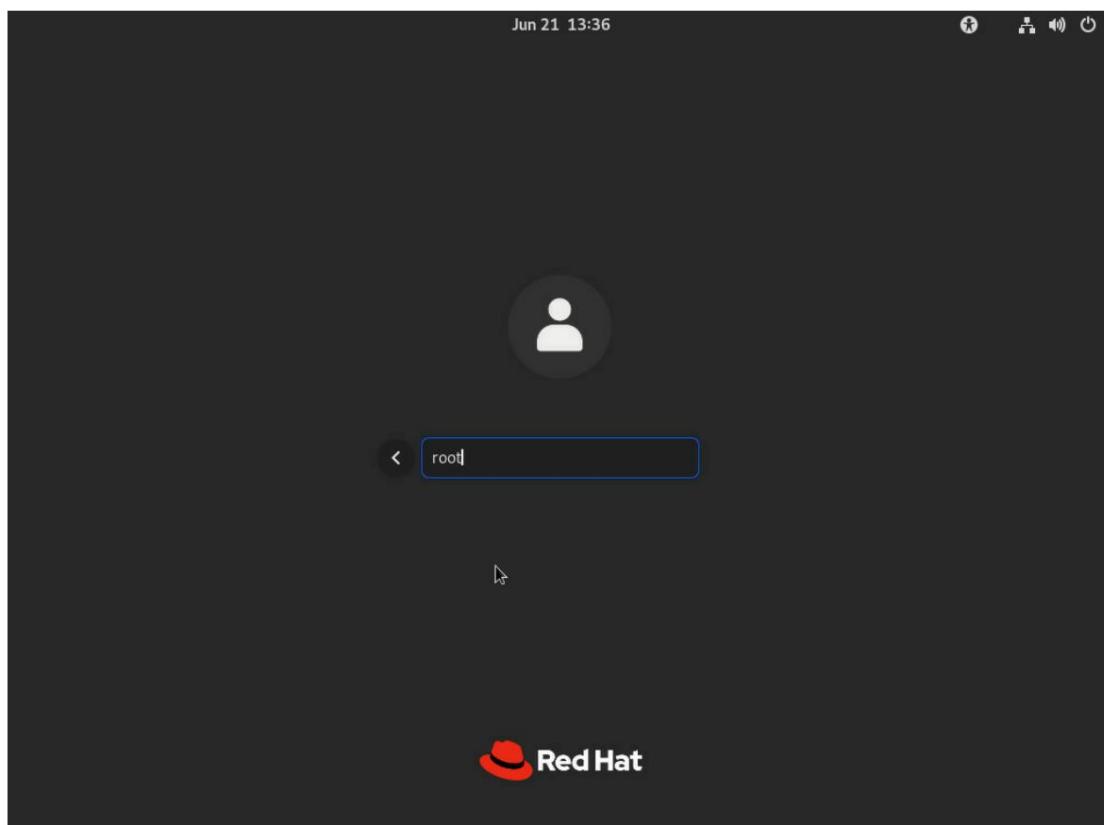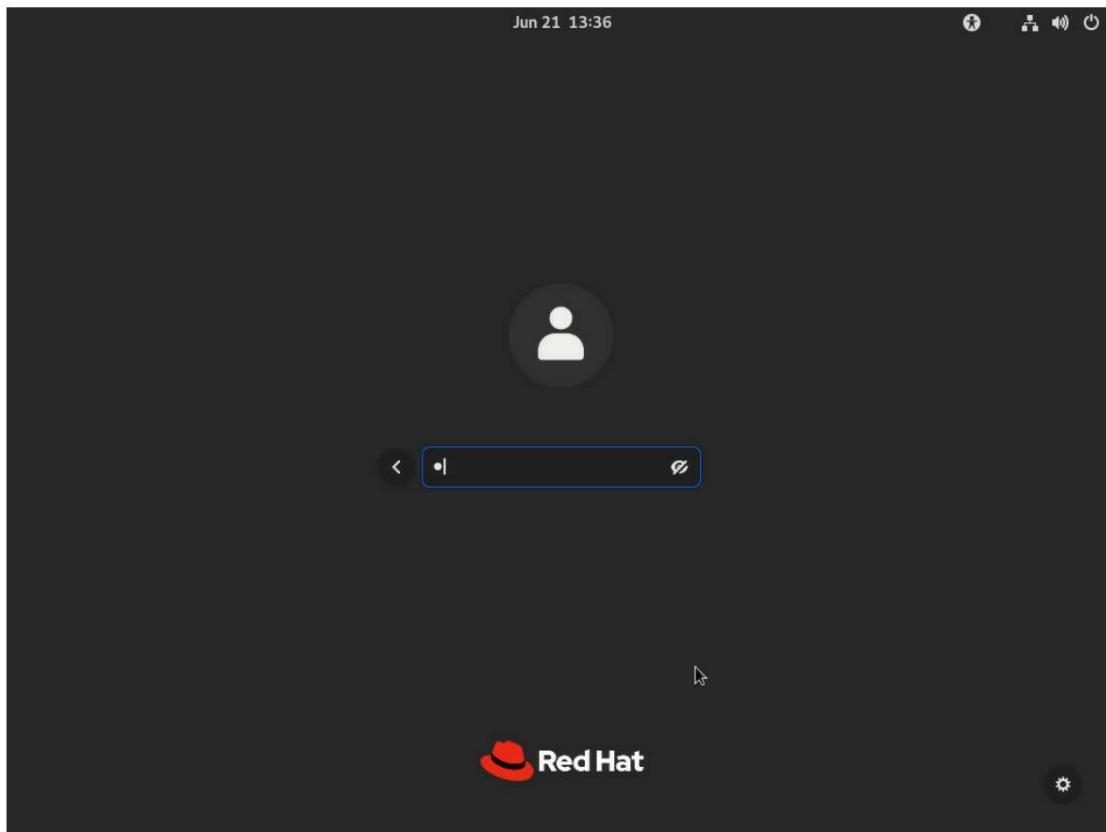
Once you access the desktop, you can begin using Red Hat 9.0;
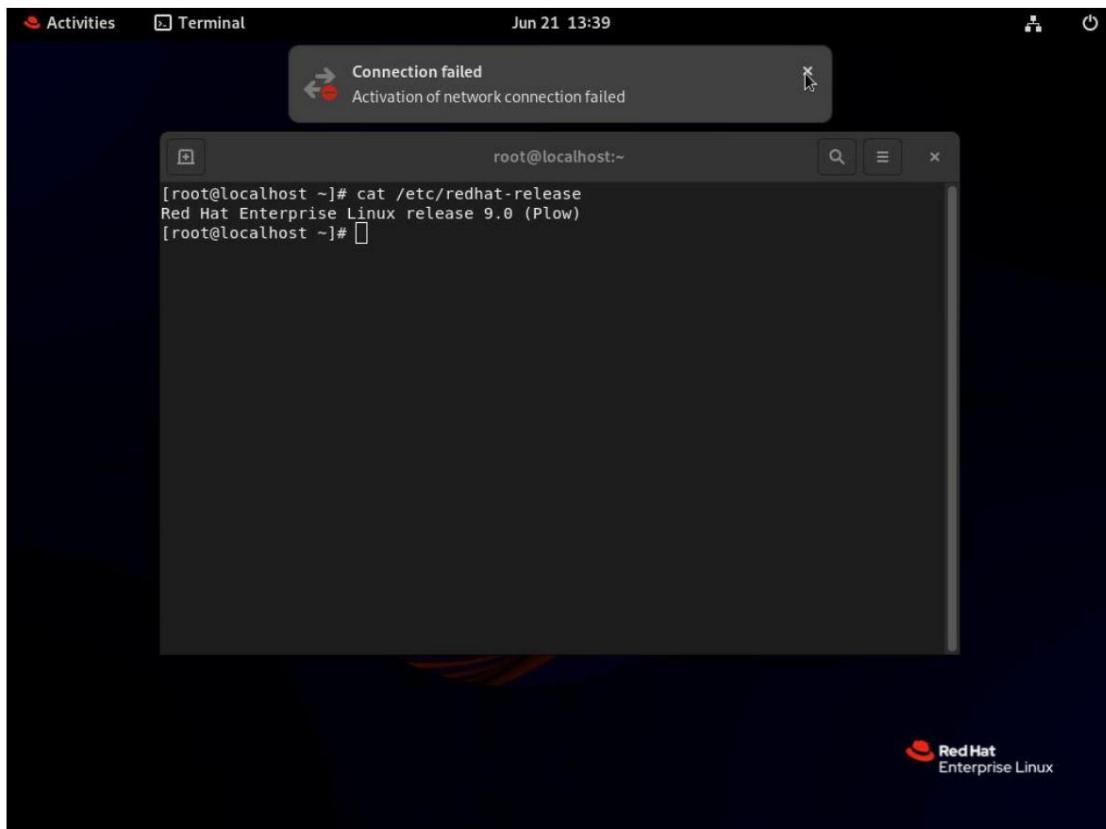
7 Appendix

7.1 Terminology & Abbreviations

Serial Number	English Abbreviation	Full English Name	Chinese explanation
A	AC	Alternating Current	Alternating current
	ACPI	Advanced Configuration and Power Management Interface	
	AES	Advanced Encryption Standard New Instruction Set	New instruction set of Advanced Encryption Standard
	AVX	Advanced Vector Extensions	Advanced Vector Extension Instruction Set
	AOC	Active Optical Cables	Active optical cable
	API	Application Program Interface	Application Programming Interface
	ARP	Address Resolution Protocol	Address Resolution Protocol
B	BIOS	Basic Input Output System	Basic Input/Output System
	BMC	Baseboard Management Controller	Motherboard Management Control Unit
	BBU	Backup Battery Unit	Backup battery unit
C	CMOS	(Complementary Metal-Oxide-Semiconductor Transistor)	
	CPLD	Complex Programming Logic Device	Complex Programmable Logic Devices
	CPU	Central Processing Unit	CPU
	CRPS	Common Redundant Power Supplies	General redundant power supply
	CSM	Compatibility Support Module	Compatibility Support Module
D	DC	Direct Current	DC
	DHCP	Dynamic Host Configuration Protocol	Dynamic Host Configuration Protocol
	DEMT	Dynamic Energy Management Technology	Dynamic energy management technology
	DIMM	Dual-Inline-Memory-Modules	Dual in-line memory modules
	DDR4	Double Date Rate 4	Double data rate 4
	DRAM	Dynamic Random-Access Memory	Dynamic Random Access Memory (DRAM)
	DNS	Domain Name System	Domain Name Service System
E	ECC	Error Checking and Correcting	Memory error checking and correction
	EMC	ELECTRO MAGNETIC COMPATIBILITY	Electromagnetic compatibility
	EMI	ELECTRO MAGNETIC INTERFERENCE	Electromagnetic interference
	ESD	ELECTRO STATIC DISCHARGE	electrostatic discharge
F	FC	Fiber Channel	Fibre Channel
	FRU	Field-Replaceable Unit	On-site replaceable parts

	FTP	File Transfer Protocol	Text Transfer Protocol
	FCoE	Fibre Channel Over Ethernet	Ethernet Fibre Channel
	FW Firmware		firmware
G	GE	Gigabit Ethernet	Gigabit Ethernet
	GPIO	General Purpose Input/Output	General Purpose Input/Output
	GPU	Graphics Processing Unit	Graphics processing unit
	GUI	Graphical User Interface	Graphical User Interface
H	HBA Host Bus Adapter		Host bus adapter
	HCA Host Channel Adapter		Host Channel Adapter
	HDD Hard Disk Drive		Mechanical hard disk drive
	HPC	High Performance Computing	High-performance computing
	HTML Hyper Text Markup Language		Hypertext Markup Language
	HTTP	Hypertext Transfer Protocol	Hypertext Transfer Protocol
	HTTPS Hypertext Transfer Protocol Secure		Hypertext Transfer Security Protocol
I	I/O	Input/Output	Input/output unit
	IEC	International Electrotechnical Commission	International Electrotechnical Commission
	IOPS	Input/Output Operations Per Second	Number of read/write operations per second
	IP	Internet Protocol	Internet Protocol
	IPMB	Intelligent Platform Management Bus	Intelligent Platform Management Bus
	IPMI	Intelligent Platform Management Interface	Intelligent Platform Management Interface
	IRQ	INTERRUPT REQUEST	Interruption Request
K	KVM Keyboard Video Mouse		Keyboard, monitor, and mouse all in one
L	LAN	Local Area Network	local area network
	LRDIMM Load Reduced Dual In-Lane Memory Module		Low-load dual in-line memory modules
	LOM LAN On Motherboard		Onboard network card
M	MAC Media Access Control		Media access control
	MBR MASTER BOOT RECORD		Master Boot Record
N	NCSI	National Communication System Instructions	National Communications System Guidelines
	NIC	Network Interface Controller	Network Interface Controller
	NTP	Network Time Protocol	Network Time Protocol
	NVDIMM Non-Volatile Dual In-Line Memory Module		Non-volatile dual in-line memory modules
	NVMe Non-Volatile Memory Express		Non-volatile memory standard
O	OCP	Open Compute Project	Open Computing Project
	OS	Operating System	operating system

P	PCH	Platform Controller Hub		Platform Path Controller
	PCIe	Peripheral Component Interconnect express		Quick Peripheral Component Interconnect Standard
	PDU	Power Distribution Unit		power distribution unit
	PHY	Physical		Port physical layer
	POST Power On Self Test			Power-on self-test
	PSU	Power Supply Unit		Power supply equipment
	PMBUS Power Management Bus			Power Management Bus
	PXE	Pre-boot Execution Environment		Pre-boot runtime environment
	PWM Pulse-width Modulation			Pulse Width Modulation
R	RAS	Reliability, Availability and Serviceability		Reliability, availability, serviceability
	RAM Random-Access Memory			Random access memory
	RAID	Redundant Arrays of Independent Drives		Independent disk redundant array
	RDIMM Registered Dual In-line Memory Module			Temporary storage type dual in-line memory module
	ROM Read-Only Memory			Read-only memory
	RTC	Real Time Clock		Real-time clock
S	SAS	Serial Attached Small Computer System Interface		Serial connection small computer system interface
	SATA Serial Advanced Technology Attachment			Serial Advanced Technology Annex
	SFP	Small Form-factor Pluggable		Small pluggable light and shadow module
	SMTP Simple Mail Transfer Protocol			Simple Mail Transfer Protocol
	SNMP Simple Network Management Protocol			Simple Network Management Protocol
	SSD	Solid State Disk		Solid State Drive
	SSH	Secure Shell		Enclosure Protocol
	SERDES Serializer/Deserializer			Serializer/Deserializer
	SEL	System Event Log		System event log
	SOL	Serial Over LAN		Serial port redirection
T	TCG	Trusted Computing Group		Trusted Computing Organization
	TCM Trusted Cryptography Module			Trusted cryptographic module
	Total Cost of Ownership			Total Cost of Ownership
	TDP	Thermal Design Power		Thermal Design Power
	TPCM Trusted Platform Control Module			Trusted Platform Control Module
	TPM Trusted Platform Module			Trusted Platform Module
U	UEFI	Unified Extensible Firmware Interface		Unified Scalable Firmware Interface
	UID	User Identification		Positioning indicator light
	UPI	Ultra Path Interconnect		Superchannel Interconnection

	ups	Uninterrupted Power Supply	Uninterruptible power supply
V		VGA Video Graphics Array	Video graphics array
		VLAN Virtual Local Area Network	Virtual LAN
X	XDP	eXtend Debug Port	XDP Extended Debug Interface