iMaster NetEco 6000 V600R021C00

Product Description

Issue	**Draft A**
Date	**2020-06-30**

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1 Product Positioning and Features

1.1 Product Positioning

This document is applicable to iManager NetEco 6000 V600R009C00.

iManager NetEco 6000 (NetEco for short) is a data center infrastructure management system. It can manage the following devices and subsystems in the FusionModule500, FusionModule800, FusionModule1000A, FusionModule1000B, FusionModule2000, and FusionModule5000 solutions:

- Devices: air conditioner, UPS, power distribution cabinet, environmental device, video device, and access control device.
- Subsystems: power transformation and distribution, chiller group control, building automation, and security subsystems.

The NetEco provides basic and various optional network management functions, including configuration management, alarm management, asset life cycle management, capacity management, energy efficiency management, tenant management, video management, access control management, intelligent O&M, security management, log management, and system management.

The NetEco is the centralized operation and maintenance part of the Huawei data center infrastructure management solution. The system uses an open architecture and connects to various types of devices using device access packages.

The NetEco provides open interfaces for third-party products or vendors and can interconnect with devices from multiple mainstream vendors.

1.2 Product Features

Efficient Infrastructure Management

The NetEco manages infrastructures in different types of data centers equipment rooms in a centralized manner.

- Monitors all devices in real time to ensure their reliability and high usage efficiency.
- Monitors the environment in real time to ensure that the data center environment meets the design standards and reliability requirements, such as GB50174-2008 and TIA942.

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- Manages access control and videos to ensure the physical safety of devices and environment.
- Electronic inspection can be implemented on the infrastructure by using the mobile app, which can improve O&M efficiency.
- Capable of managing massive data.

Efficient Operation and Management

The NetEco functions as an operation platform and production center for medium and large data centers to achieve efficient data center operation.

- Full-power link energy efficiency management: Provides customized statistics and analysis methods for power consumption. Locates energy efficiency points to be improved by comparing PUE, energy efficiency distribution graph, and power consumption heat map, providing basis for decision making about improving energy efficiency.
- Life cycle asset management: Provides a unified data center asset management platform for customers, asset account and reports, and automatic data center asset stocktaking based on mobile app and asset label. Analyzes the maintenance and utilization of assets in light of relevant asset attributes, providing decision making for asset operation.
- Builds SPCN models based on all levels of the data center to implement the refined management over the capacity of data centers. The operation management provides basic data for the data center capacity planning and cabinet/U space occupation, and collects statistics about and analyze the utilization rate of related resources in consideration of U space, power supply, cooling, load bearing, network, and other factors, providing online data support for capacity usage and planning to maximize the utilization rate of resources.
- In co-location scenarios, the NetEco allocates cabinet, U space resources or area leasing to specific tenants. Allocated resources can no longer be allocated to other tenants. In this way, cabinet or U space preoccupation and occupation at pre-sales and after-sales stages are supported.
- Different types of data can be displayed in dashboards and management capacity on a large screen is supported. This feature allows you to master overall resource information.

Deployment of Software and Hardware by Layer and Function

The NetEco consists of management software and monitoring hardware.

- The monitoring hardware (collector) collects and processes equipment data and transmits data and alarms to the software in real time.
- The management software has two layers: data collection layer and management and operation service layer. The NetEco server software consists of the main version software, PowerEcho software, and device access package software. The main version software implements system functions. The PowerEcho software provides the routine maintenance functions of the system. The device access package software adapts the interfaces of different devices. You only need to add the corresponding device access package software to manage a new device.

Modular Design and On-Demand Provisioning

The management software, based on the basic platform development service and application service, uses the modular design and supports on-demand deployment.

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- As the foundation for running application services, the basic platform is mandatory.
- Application service modules, including energy efficiency management, capacity management, asset management, intelligent O&M, and battery management modules, can be deployed entirely or selectively based on requirements.

Northbound Integration Supported

The NetEco can be integrated. It can be integrated into the NMS or central control system over an SNMP(Simple Network Management Protocol, Performance and alarm information can be reported over an SNMP port.) or WebService port, and integrated into the ITSM system over a WebService port. Performance, alarm, configuration, and resource information can be reported over a WebService port. The implementation framework of WebService is RESTful.

Device and Subsystem Access

The NetEco supports the access of smart devices and subsystems based on the SNMP, Modbus-RTU, and Telcom protocols, and supports the access of subsystems based on the C interface, SNMP, Modbus-TCP, WebService protocols.

The NetEco supports Huawei's site monitoring units that work over the BIN4.0 protocol and supports automatic discovery and configuration management of smart modules that work over the BIN4.0 protocol.

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2 Product Architecture

2.1 Hardware Components

The NetEco system consists of the NetEco server, NetEco clients, ECC, access actuator, temperature and humidity sensor, and some other networking devices.

For details about the specifications of power supply and distribution devices and cooling devices, see the product documentation of the devices.

Table 2-1 Power supply and distribution devices

Device Name	NetEco Monitored Object	Implementation
DG	• Operating status, operating parameters, alarms, and remote management. • Operating parameters that can be managed remotely over communications protocols.	Two network connection modes are available based on ports: • Connect Modbus RTU or Telcom devices to a serial port server or a collector that supports transparent transmission over RS485 ports and then to NetEco over an FE port. • Connect Modbus TCP or SNMP devices to NetEco over an FE port.
ATS and STS		
UPS		
Batteries and battery cabinet		
PDU		
PDB		
RPDU		

Table 2-2 Cooling devices

Device Name	NetEco Monitored Object	Implementation
Refrigerating unit	• Operating status, operating parameters, alarms, and remote management • Operating parameters	Two network connection modes are available based on ports: • Connect Modbus RTU or Telcom devices to a serial port server or a collector that
Precision air conditioner		
Cooling meter		

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Device Name	NetEco Monitored Object	Implementation
Humidifier	that can be managed remotely over communications protocols	supports transparent transmission over RS485 ports and then to NetEco over an FE port. • Connect Modbus TCP or SNMP devices to NetEco over an FE port.

2.1.1 Server

- TaiShan 200 Server

  The TaiShan 200 server is a new-generation data center server developed by Huawei. Based on Huawei Kunpeng processor, the TaiShan 200 server is a high-performance computing, secure, reliable, and open ecosystem. It is the monitoring host of the NetEco management system and is responsible for data processing and analysis.

  Figure 2-1 TaiShan 200 server (Model 2180) interface diagram

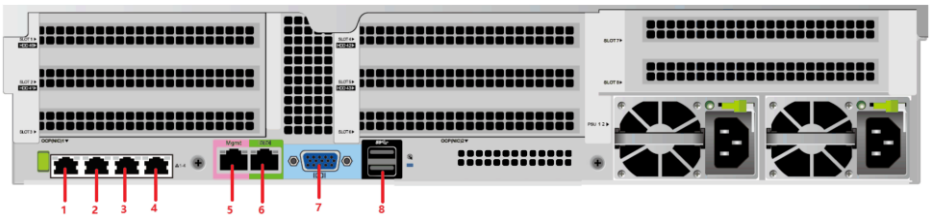

Table 2-3 TaiShan 200 server (Model 2180) interface description

No.	Interface Type	Function
1	**eth0** GE interface	Used for connecting to the LAN switch. • If southbound and northbound network isolation is not adopted, the connects to eth0 and eth1 and is configured as bond0 by default to provide southbound and northbound services. • If southbound and northbound network isolation is adopted, the port is connected to eth0 and eth1. By default, the port is configured as bond0 to provide northbound services. Connects to eth2 and eth3. By default, bond1 is used to provide southbound services.
2	**eth1** GE interface	
3	**eth2** GE interface	
4	**eth3** GE interface	
5	iBMC remote managemen t interface	Used for connecting to the PC computer to manage the TaiShan 200 server (Model 2180).
6	Server serial	Used for Connecting to the alarm SMS modem.

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No.	Interface Type	Function
	interface	
7	VGA interface	Used for connecting to the monitor.
8	USB interface	Used for connecting to the mobile storage device.

Figure 2-2 TaiShan 200 server (Model 2280) interface diagram

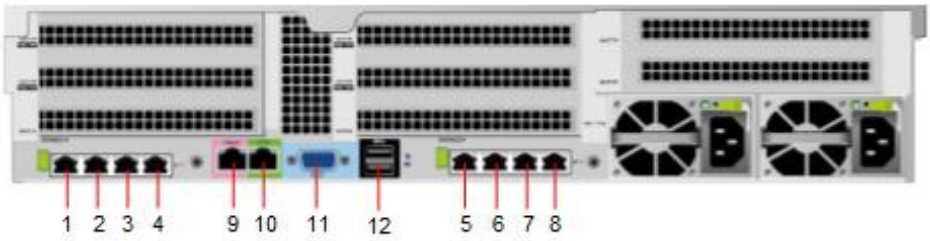


Table 2-4 TaiShan 200 server (Model 2280) interface description

No.	Interface Type	Function
1	**eth0** GE interface	Used for connecting to the LAN switch. • If southbound and northbound network isolation is not adopted, the connects to eth0 and eth1 and is configured as bond0 by default to provide southbound and northbound services, the connects to eth2 and eth3 and is configured as bond1 by default to provide southbound2 services. • If southbound and northbound network isolation is adopted, the port is connected to eth0 and eth1. By default, the port is configured as bond0 to provide northbound services. Connects to eth2 and eth3. By default, bond1 is used to provide southbound services. Connects to eth4 and eth5. By default, bond2 is used to provide southbound2 services.
2	**eth1** GE interface	
3	**eth2** GE interface	
4	**eth3** GE interface	
5	**eth4** GE interface	
6	**eth5** GE interface	
7	**eth6** GE interface	Reserved.
8	**eth7** GE interface	
9	iBMC remote managemen	Used for connecting to the PC computer to manage the TaiShan 200 server (Model 2280).

No.	Interface Type	Function
	t interface	
10	Server serial interface	Used for Connecting to the alarm SMS modem.
11	VGA interface	Used for connecting to the monitor.
12	USB interface	Used for connecting to the mobile storage device.

- 2288X V5 Server

  The 2288X V5 server is a new-generation Huawei data center server that integrates patented technologies such as Dynamic Energy Management Technology (DEMT) and fault diagnosis & management (FDM). It features efficient computing, high security and reliability, and an open ecosystem. Suitable for efficient acceleration of applications such as big data, distributed storage, native applications, high-performance computing, and databases, the server aims to meet the requirements of diversified computing and green computing in data centers.

  Figure 2-3 2288X V5 server interface diagram

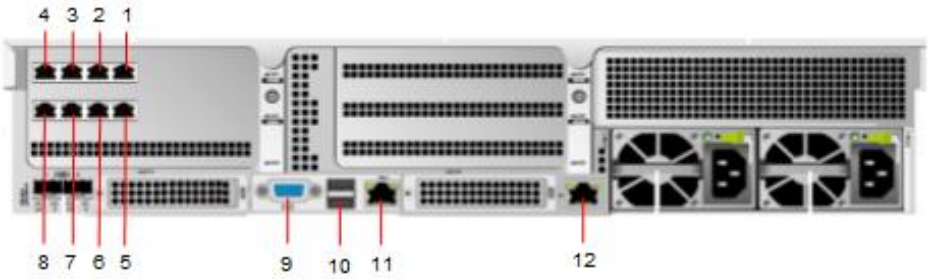


Table 2-5 2288X V5 server interface description

No.	Interface Type	Function
1	**eth0** GE interface	Used for connecting to the LAN switch. • If southbound and northbound network isolation is not adopted, the connects to eth0 and eth1 and is configured as bond0 by default to provide southbound and northbound services, the connects to eth2 and eth3 and is configured as bond1 by default to provide southbound2 services. • If southbound and northbound network isolation is adopted, the port is connected to eth0 and eth1. By default, the port is configured as bond0 to provide northbound services. Connects to eth2 and eth3. By default, bond1 is used to provide southbound services. Connects to eth4 and eth5. By default, bond2 is used to
2	**eth1** GE interface	
3	**eth2** GE interface	
4	**eth3** GE interface	
5	**eth4** GE	

No.	Interface Type	Function
	interface	provide southbound2 services.
6	**eth5** GE interface	
7	**eth6** GE interface	Reserved.
8	**eth7** GE interface	
9	VGA interface	Used for connecting to the monitor.
10	USB interface	Used for connecting to the mobile storage device.
11	iBMC remote managemen t interface	Used for connecting to the PC computer to manage the 2288X V5 server.
12	Server serial interface	Used for Connecting to the alarm SMS modem.

2.1.2 LAN Switch

2.1.2.1 S5331-H24P4XC LAN Switch

Appearance and Structure

Figure 2-4 S5731-H24T4XC appearance

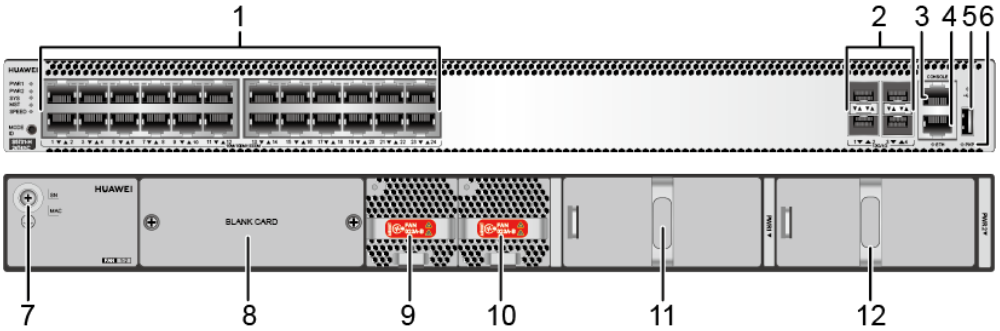
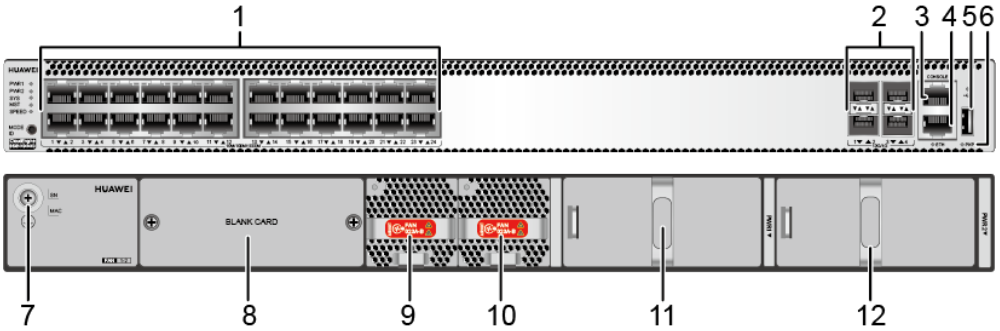


Figure 2-5 S5331-H24T4XC appearance



1	Twenty-four 10/100/1000BASE-T ports	2	Four 10GE SFP+ ports Applicable modules and cables: • GE optical module • GE-CWDM optical module • GE-DWDM optical module • GE copper module (100M/1000M auto-sensing) • 10GE SFP+ optical module (OSXD22N00 not supported) • 10GE-CWDM optical module • 10GE-DWDM optical module • 1 m, 3 m, 5 m, and 10 m SFP+ high-speed copper cables • 3 m and 10 m SFP+ AOC cables • 0.5 m and 1.5 m SFP+ dedicated stack copper cables (used for zero-configuration stacking)
3	One console port	4	One ETH management port
5	One USB port	6	One PNP button **NOTICE** To restore the factory settings and reset the switch, hold down the button for at least 6 seconds. To reset the switch, press the button. Resetting the switch will cause service interruption. Exercise caution when you press the PNP button.
7	Ground screw	8	Rear card slot
9	Fan module slot 1	10	Fan module slot 2
11	Power module slot 1	12	Power module slot 2

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Technical Specifications

Table 2-6 lists technical specifications of the S5331-H24T4XC.

Table 2-6 Technical specifications

Item	Description
Memory (RAM)	4 GB
Flash	1 GB in total. To view the available flash memory size, run the **display version** command.
Mean time between failures (MTBF)	57.21 years
Mean time to repair (MTTR)	2 hours
Availability	> 0.99999
Service port surge protection	Common mode: ±6 kV
Power supply surge protection	• Using AC power modules: ±6 kV in differential mode, ±6 kV in common mode • Using DC power modules: ±2 kV in differential mode, ±4 kV in common mode
Dimensions (H x W x D)	• Basic dimensions (excluding the parts protruding from the body): 43.6 mm x 442.0 mm x 420.0 mm (1.72 in. x 17.4 in. x 16.5 in.) • Maximum dimensions (the depth is the distance from ports on the front panel to the handle on the rear panel): 43.6 mm x 442.0 mm x 448.0 mm (1.72 in. x 17.4 in. x 17.7 in.)
Weight (with packaging)	8.4 kg (18.52 lb)
Stack ports	10GE SFP+ ports on the front panel, or ports on the rear card
RTC	Supported
RPS	Not supported
PoE	Not supported
Rated voltage range	• AC input: 100 V AC to 240 V AC, 50/60 Hz • High-Voltage DC input: 240 V DC • DC input: -48 V DC to -60 V DC
Maximum voltage range	• AC input: 90 V AC to 290 V AC, 45 Hz to 65 Hz • High-Voltage DC input: 190 V DC to 290 V DC • DC input: -38.4 V DC to -72 V DC
Maximum power consumption (100% throughput,	114 W (without card)

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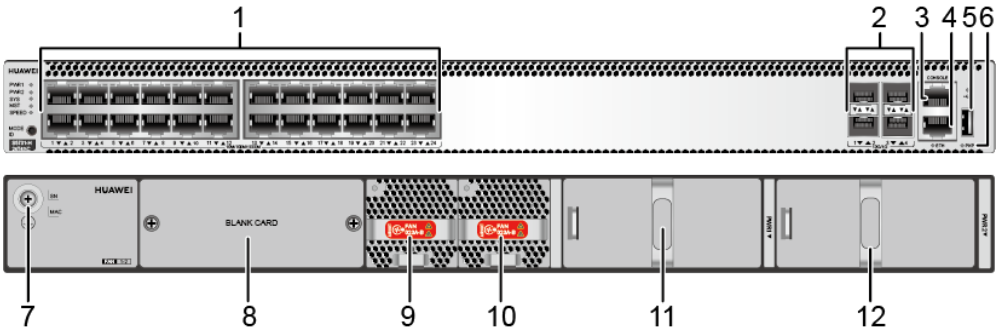
Item	Description
full speed of fans)	
Typical power consumption (30% of traffic load, tested according to ATIS standard)	88 W (without card)
Operating temperature	-5°C to +45°C (23°F to 113°F) at an altitude of 0-1800 m (0-5906 ft.) **NOTE** When the altitude is 1800-5000 m (5906-16404 ft.), the highest operating temperature reduces by 1°C (1.8°F) every time the altitude increases by 220 m (722 ft.). The switch cannot be started when the ambient temperature is lower than 0°C (32°F).
Storage temperature	-40°C to +70°C (-40°F to +158°F)
Noise under normal temperature (27°C, sound power)	< 57.5 dB(A)
Relative humidity	5% to 95%, noncondensing
Operating altitude	0-5000 m (0-16404 ft.)
Certification	• EMC certification • Safety certification • Manufacturing certification

2.1.2.2 S5731-H24P4XC LAN Switch

Appearance and Structure

Figure 2-6 S5731-H24T4XC appearance



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11	Power module slot 1	12	Power module slot 2

Technical Specifications

Table 2-7 lists technical specifications of the S5731-H24T4XC.

Table 2-7 Technical specifications

Item	Description
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Flash	1 GB in total. To view the available flash memory size, run the **display version** command.
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Item	Description
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Availability	> 0.99999
Service port surge protection	Common mode: ±6 kV
Power supply surge protection	• Using AC power modules: ±6 kV in differential mode, ±6 kV in common mode • Using DC power modules: ±2 kV in differential mode, ±4 kV in common mode
Dimensions (H x W x D)	• Basic dimensions (excluding the parts protruding from the body): 43.6 mm x 442.0 mm x 420.0 mm (1.72 in. x 17.4 in. x 16.5 in.) • Maximum dimensions (the depth is the distance from ports on the front panel to the handle on the rear panel): 43.6 mm x 442.0 mm x 448.0 mm (1.72 in. x 17.4 in. x 17.7 in.)
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Stack ports	10GE SFP+ ports on the front panel, or ports on the rear card
RTC	Supported
RPS	Not supported
PoE	Not supported
Rated voltage range	• AC input: 100 V AC to 240 V AC, 50/60 Hz • High-Voltage DC input: 240 V DC • DC input: -48 V DC to -60 V DC
Maximum voltage range	• AC input: 90 V AC to 290 V AC, 45 Hz to 65 Hz • High-Voltage DC input: 190 V DC to 290 V DC • DC input: -38.4 V DC to -72 V DC
Maximum power consumption (100% throughput, full speed of fans)	114 W (without card)
Typical power consumption (30% of traffic load, tested according to ATIS standard)	88 W (without card)
Operating temperature	-5°C to +45°C (23°F to 113°F) at an altitude of 0-1800 m (0-5906 ft.) **NOTE** When the altitude is 1800-5000 m (5906-16404 ft.), the highest operating temperature reduces by 1°C (1.8°F) every time the altitude increases by 220

Item	Description
	m (722 ft.). The switch cannot be started when the ambient temperature is lower than 0°C (32°F).
Storage temperature	-40°C to +70°C (-40°F to +158°F)
Noise under normal temperature (27°C, sound power)	< 57.5 dB(A)
Relative humidity	5% to 95%, noncondensing
Operating altitude	0-5000 m (0-16404 ft.)
Certification	• EMC certification • Safety certification • Manufacturing certification

2.1.3 SMS Modem

The SMS modem is an industrial-grade modem based on the wireless GSM technology. It is an embedded GSM wireless communication module. After a mobile phone SIM card of a mobile operator is inserted into the SMS modem, the modem establishes a wireless connection with the short message center of the mobile operator. When the modem is connected to a PC, the computer control application system can achieve free short message sending and receiving.

- **Appearance**

Figure 2-7 SMS Modem Appearance

- **Technical Specifications**

Item		Specifications
Power		12V DC, 1A
Antenna	Frequency range	Dual band: GSM 900/DCS 1800 MHz

Item		Specifications
	Resistance	50 Ω
	Gain (antenna + cable)	0 dBi
	VSWR (antenna + cable)	-10 dB
Operating temperature		–20°C to +55°C

- **Indicators**

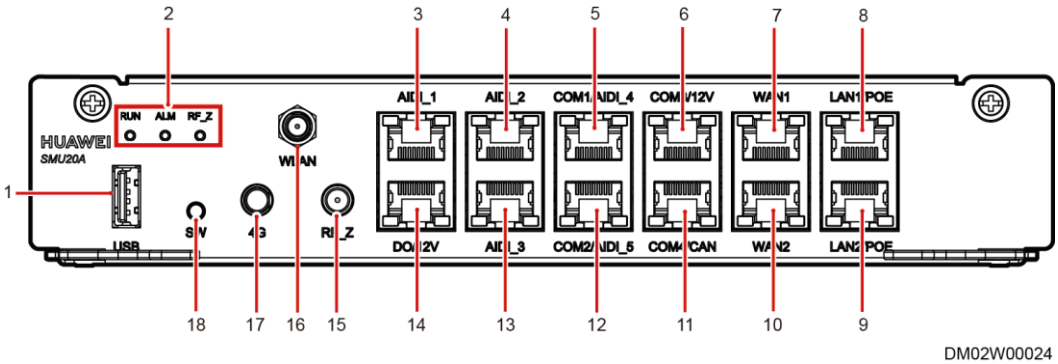
Table 2-8 SMS modem indicator description

Indicator	Modem
On	Activated. It is not registered with the network.
Blinks slowly	Idle mode. It is connected to the network.
Blinks quickly	Transmission mode.
Off	Deactivated.

2.1.4 Collector

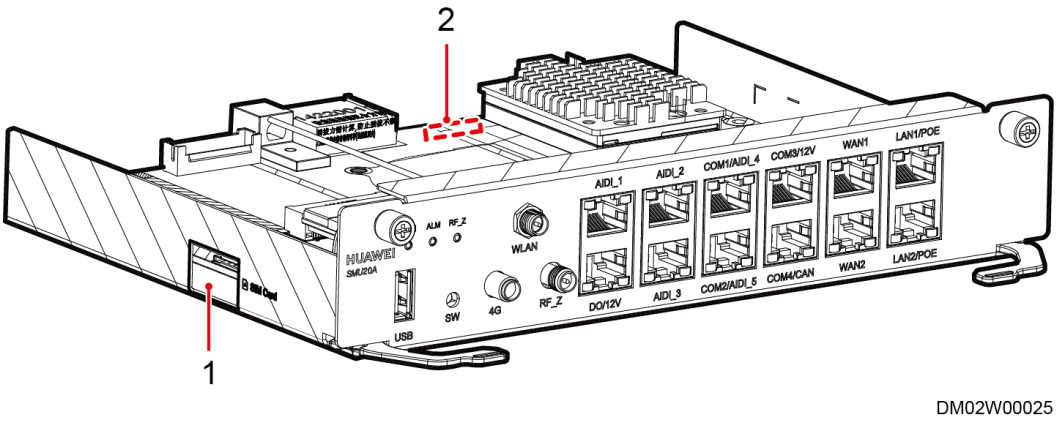
2.1.4.1 ECC800-Pro

Figure 2-8 ECC800-Pro collector main control module



(1) USB	(2) Status indicator	(3) AIDI_1	(4) AIDI_2
(5) COM1/AIDI_4	(6) COM3/12V	(7) WAN1	(8) LAN1/POE
(9) LAN2/POE	(10) WAN2	(11) COM4/CAN	(12) COM2/AIDI_5
(13) AIDI_3	(14) DO/12V	(15) RF_Z	(16) WLAN
(17) 4G	(18) SW button		

Figure 2-9 ECC800-Pro main control module (side view)



(1) SIM card slot (2) Micro-SD card slot (reserved)

Specifications

Table 2-9 Technical specifications of the ECC800-Pro main control module

Item	Specifications
Power input	• Supports one AC input or two AC inputs • Rated voltage: 200–240 V AC • Rated frequency: 50/60 Hz
Power output	• Output voltage: 42 - 58 V DC (rated voltage: 53.5 V DC) • Output power of two power module supplies: 2000 W (200–240 V AC); 940 W (linear derating at 85–175 V AC) • Output power of a single power module supply: 1000 W (200–240 V AC); 470 W (linear derating at 85–175 V AC)
WAN port	• Supports two WAN ports. WAN1 is used to connect to the management system, and WAN2 is used for maintenance. The ports support autonegotiation of 10/100/1000 Mbit/s communication rates. • Connect shielded network cables to the WAN ports.
LAN port	• Supports two LAN ports, which can be connected to the LAN. The ports support autonegotiation of 10/100/1000 Mbit/s communication rates. • Connect shielded network cables to the LAN ports.
RS485 serial port expansion	• Output voltage: 13–15 V DC (rated voltage: 14.5 V DC) • Four RS485 ports with the default communications rate of 9600 bit/s. • COM1–COM3 ports provide 12 V DC power. • The power supply can be switched on or off and is on by default.

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Item	Specifications
POE expansion	Supports two POE (GE) ports for expansion of the POE bus, and supports network isolation and ring network.
AIDI expansion (RJ45)	• Output voltage: 13–15 V DC (rated voltage: 14.5 V DC) • Provides five universal AIDI ports for connecting to sensors such as smoke sensors, water sensors, and NTC sensors. AIDI_1 to AIDI_3 are full-function AIDI ports, and AIDI_4 to AIDI_5 are simplified AIDI ports without type identification. • The power supply can be switched on or off and is on by default.
DO expansion (RJ45)	• Output voltage: 13–15 V DC (rated voltage: 14.5 V DC) • One DO port. Supports active DO. • The power supply can be switched on or off and is on by default.
Fault isolation	There are three groups of 12 V ports. A group has a maximum current of 660 mA, a route has a maximum current of 800 mA, and the maximum total current is 2 A. Group 1: 12 V of the AIDI_1 and DO/12V ports Group 2: 12 V of the AIDI_2, COM1/AIDI_4, and COM3/12V ports Group 3: 12 V of the AIDI_3 and COM2/AIDI_5 ports
Wireless communication	Supports wireless communication that complies with IEEE802.15.4.
4G	Supports the 4G module, SMS sending, and 3G communication, and provides a standard SIM card slot. 1. China: 2G and 4G networks support China Unicom or China Mobile SIM cards, and 3G networks support only China Unicom SIM cards. 2. Outside China: Select SIM cards according to the following wireless modes and frequency bands: • 4G: wireless mode (FDD-LTE and TDD-LTE), coverage frequency band (B1, B3, B5, B7, B8, and B20) • 3G: wireless mode (WCDMA), coverage frequency bands (B38, B40, and B41) • 2G: wireless mode (GSM), coverage frequency band (900/1800 MHz) **NOTE** • The prerequisite for using a SIM card is that the site has signal coverage. • Due to the performance limitation of the wireless module, China Telecom SIM cards are not supported.
USB	• Supports USB 2.0 and 5 V, 1 A power supply. • After installing the WiFi module, connect the WiFi module to the ECC800-Pro using the app on the mobile phone or tablet computer to view the basic information about the smart module, such as layout, resources, energy efficiency, environment, and alarms. • You can insert a USB flash drive to export historical data and configuration files and import configuration files.
SW button	• Restores the default IP address, factory settings, and user

Item	Specifications
	information. • Supports RF_Z networking.

Table 2-10 ECC800-Pro RF_Z parameters

Item	Specifications
RF_Z Operation Frequency	2405–2480 MHz
RF_Z EIRP (max.)	8 dBm

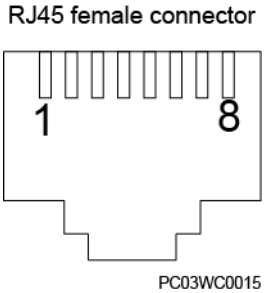
Table 2-11 ECC800-Pro 4G parameters

Item	Specifications
3G/4G operation frequency	LTE (FDD): BAND1, BAND2, BAND3, BAND4, BAND5, BAND7, BAND8, BAND20 DC-HSPA+/HSPA+/HSPA/UMTS: 850/900/1900/2100 MHz GSM/GPRS/EDGE: 850/900/1800/1900 MHz
3G/4G EIRP (max.)	23 dBm

Communications Port

The ECC800-Pro provides the following communications ports. Figure 2-10 shows the pins of the RJ45 port.

Figure 2-10 RJ45 port pins



There are four GE ports, that is, two WAN ports (WAN1 and WAN2) and two LAN ports (LAN1/POE and LAN2/POE).

Table 2-12 GE port pin definitions

Item		Description
Pin sequence	Pin1	GE1+
	Pin2	GE1-
	Pin3	GE2+
	Pin4	GE3+
	Pin5	GE3-
	Pin6	GE2-
	Pin7	GE4+
	Pin8	GE4-
Indicator	Green indicator	Linked, steady on
	Yellow indicator	ACT data communication, blinking

Table 2-13 COM1/AIDI_4, COM2/AIDI_5 port pin definitions

Item		Description
Pin sequence	Pin1	RS485+
	Pin2	RS485-
	Pin3	12V DC_OUT
	Pin4	RS485+
	Pin5	RS485-
	Pin6	DI-
	Pin7	DI+
	Pin8	GND
Indicator	Green indicator	Power output indicator • Steady on: The 12 V DC output is normal. • Off: No 12 V DC output is provided.

Table 2-14 COM3/12V port pin definitions

Item		Description
Pin sequence	Pin1	RS485+

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Item		Description
	Pin2	RS485-
	Pin3	12V DC_OUT
	Pin4	RS485+
	Pin5	RS485-
	Pin6	-
	Pin7	-
	Pin8	GND
Indicator	Green indicator	Power output indicator • Steady on: The 12 V DC output is normal. • Off: No 12 V DC output is provided.

Table 2-15 COM4/CAN port pin definitions

Item		Description
Pin sequence	Pin1	RS485+
	Pin2	RS485-
	Pin3	-
	Pin4	RS485+
	Pin5	RS485-
	Pin6	-
	Pin7	CAN_H
	Pin8	CAN_L

The following provides the AIDI_1, AIDI_2 and AIDI_3 ports pin definitions.

NOTE

- Pins 1, 2, 4, and 5 identify sensor types.
- Pin 3 and Pin 8 are power output ports.
- Pin 6 and Pin 7 collect sensor data. Pin 7 can detect current type sensors (4–20 mA). Pin 6 and Pin 7 can detect the output status of passive dry contact type sensors. Pin 3 and Pin 7 can detect temperature sensors.

Table 2-16 AIDI_1, AIDI_2 and AIDI_3 ports pin definitions

Item		Description
Pin sequence	Pin1	Type_1

Item		Description
	Pin2	Type_2
	Pin3	12V DC
	Pin4	Type_3
	Pin5	Type_4
	Pin6	DI-
	Pin7	DI+
	Pin8	GND
Indicator	Green indicator	Power output indicator • Steady on: The 12 V DC output is normal. • Off: No 12 V DC output is provided.

Table 2-17 DO/12V port pin definitions

Item		Description
Pin sequence	Pin1	-
	Pin2	-
	Pin3	12V DC_OUT
	Pin4	-
	Pin5	-
	Pin6	DO_OUT+
	Pin7	DO_OUT-
	Pin8	GND
Indicator	Green indicator	Power output indicator • Steady on: The 12 V DC output is normal. • Off: No 12 V DC output is provided.

Table 2-18 USB port pin definitions

Item		Description
Pin sequence	Pin1	5V
	Pin2	DM
	Pin3	DP

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Item		Description
	Pin4	GND

Indicators

Table 2-19 Indicators on the ECC800-Pro main control module

Indicator	Color	Name	Status	Description
RUN	Green	Running status indicator	Steady on	The power supply is normal, the program is being loaded.
			Off	The power supply is abnormal.
			Blinking at long intervals	The software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s) or the ECC800-Pro registers with the NetEco successfully.
			Blinking at short intervals	The ECC800-Pro does not register with the NetEco (the indicator blinks at 5 Hz, on for 0.125s and then off for 0.125s).
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	The system is normal.
RF_Z	Green	Communication status indicator	Blinking at long intervals	A network is set up, and no node access is allowed (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at super short intervals	A network is set up, and node access is allowed (the indicator blinks at 10 Hz, on for 0.05s and then off for 0.05s).

SW Button

Table 2-20 SW button description

Function Description	Operation Description	Indicator Status
Wireless network RF_Z (802.15.4) pairing	In non-wireless network (802.15.4) pairing mode, press and hold down the button for 3s to 5s to enter the wireless	The RF_Z indicator is blinking at super short intervals.

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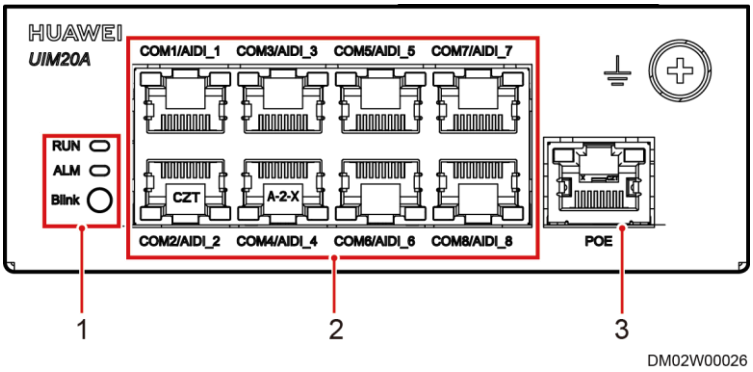
Function Description	Operation Description	Indicator Status
	network pairing mode.	
	In wireless network (802.15.4) pairing mode, press and hold down the button for 3s to 5s to exit the pairing mode; or the system automatically exits the pairing mode after 30 minutes without pressing the button.	The RF_Z indicator is blinking at long intervals.
	Press and hold down the button for more than 8s to clear network parameters.	The RF_Z indicator is steady on.
WLAN enabling	Press the button for less than 3s to enable WLAN.	None
Restoring the default IP address, factory settings, and user information	Press and hold down the button for 1 minute.	None

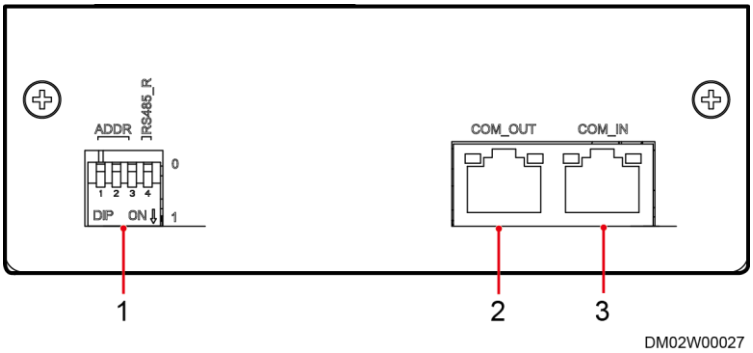
2.1.4.2 UIM20A Expansion Module

Figure 2-11 UIM20A expansion module front panel



(1) Indicators and button (2) COM1/AI/DI_1 - COM8/AI/DI_8 (3) POE

Figure 2-12 UIM20A expansion module rear panel



(1) DIP switch (2) COM_OUT (3) COM_IN

Table 2-21 UIM20A expansion module specifications

Item	Specifications
Width	120 mm
Depth	200 mm
Height	43 mm
Operating temperature	–30°C to +65°C
Installation requirements	Installed in a 19-inch rack
Environmental protection	RoHS5

Specifications

Table 2-22 User interface technical specifications

Item	Specifications
Power input	Supports the RS485 or POE power supply.
COM/AIDI (RJ45)	• Supports eight RS485 or AI/DI signal inputs. • Can connect to sensors such as the smoke sensor, water sensor, door status sensor, and infrared sensor. • Each port can supply power. Two RJ45 ports share one 12 V DC power supply that is controlled independently. The maximum output current is 900 mA when the voltage is 12 V. (COM1/AIDI_1 and COM2/AIDI_2 form a group, COM3/AIDI_3 and COM4/AIDI_4 form a group, COM5/AIDI_5 and COM6/AIDI_6 form a group, and

Item	Specifications
	COM7/AIDI_7 and COM8/AIDI_8 form a group). • The 12 V DC power supply can be switched on or off and is on by default.
POE	Connects to the ECC800-Pro through the POE port.
DIP switch	• One 4-bit DIP switch is used to set the RS485 address. • OFF indicates 0 and ON indicates 1. • Bit 1 is the least significant bit, and bit 4 is the most significant bit. For example, if the board address is 5, the corresponding bits are ON, OFF, ON, and OFF, and the corresponding binary number is 1010 (ON is 1 and OFF is 0).
E-label 4.0	Supported

Communications Port

The following table describes the pin assignment for ports COM1/AIDI_1 to COM8/AIDI_8.

Table 2-23 Pin assignment for ports COM1/AIDI_1 to COM8/AIDI_8

Item		Description
Pin sequence	Pin1	RS485+
	Pin2	RS485-
	Pin3	12V
	Pin4	RS485+
	Pin5	RS485-
	Pin6	D-
	Pin7	D+
	Pin8	GND

The following table describes the pin assignments for the COM_IN and COM_OUT ports.

Table 2-24 Pin assignment for the COM_IN and COM_OUT ports

Item		Description
Pin sequence	Pin1	RS485+
	Pin2	RS485-
	Pin3	12 V (input power, supplying power to the module)
	Pin4	RS485+

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Item		Description
	Pin5	RS485-
	Pin6	-
	Pin7	-
	Pin8	GND

Indicators and Buttons

Table 2-25 User interface indicators

Indicator	Status	Description
RUN	Steady on	A board application is being loaded.
	Off	The board is not running.
	Blinking at long intervals	The ECC800-Pro is successfully registered, and the software runs properly (blinking at long intervals (0.5 Hz), on for 1s and then off for 1s).
	Blinking at short intervals	The communication is interrupted or the ECC800-Pro is unsuccessfully registered (blinking at 2.5 Hz, on for 0.2s and then off for 0.2s).
	Blinking	Blinking at super short intervals for 0.5s and then off for 0.5s; last 10s (blinking at super short intervals: 10 Hz, on for 0.05s and then off for 0.05s)
ALM	Steady on	A system fault alarm is raised.
	Off	The system is normal.

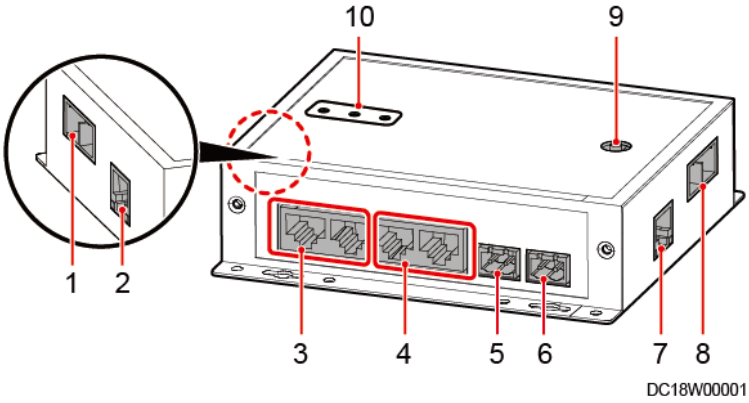
Table 2-26 BLINK button description

Function Description	Instructions	Indicator Status
Blinking	Press the button for less than 2s.	The RUN indicator blinks at super short intervals for 0.5s and then off for 0.5s; last 10s (blinking at super short intervals for 10 Hz, on for 0.05s and then off for 0.05s).

2.1.4.3 Smart ETH Gateway

A smart ETH gateway allows the extension of the 53.5 V DC power supply and FE communication for the ECC800-Pro and can be flexibly deployed in a smart module.

Figure 2-13 Smart ETH gateway



(1) PWR_IN cascading power port	(2) FE_1 cascading signal port	(3) POE_1–2 ports	(4) POE_3–4 ports
(5) 48V_OUT1 power output port	(6) 48V_OUT2 power output port	(7) FE_2 cascading signal port	(8) PWR_OUT cascading power port
(9) BLINK button	(10) Status indicator		

Specifications

Table 2-27 Technical specifications for a smart ETH gateway

Item	Specifications
Power input	PWR_IN D-type power input terminal, for power cascading, input voltage range: 45–55 V DC Power of a single smart ETH gateway: max (2.7 A, 48 V DC); power of cascaded smart ETH gateways: max (25 A, 48 V DC)
Power output	• PWR_OUT D-type power output terminal, for power cascading, output voltage range: 45–55 V DC • 48V_OUT1 and 48V_OUT2, terminal (1 A, 48 V DC), output voltage range: 45–55 V DC
FE port	Two FE ports, RJ45 terminal with an indicator, 10/100M communication rate, for the cascading between smart ETH gateways and the communication with the upper computer
PoE port	Four POE ports, RJ45 terminal with an indicator, 10/100M communications rate, complying with IEEE802.3, IEEE802.3u, IEEE802.3af/at
BLINK button	If you press the BLINK button, the RUN indicator blinks intermittently at super short intervals (blinking at super short intervals for 0.5s and then off for 0.5s) for 5 seconds.

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Indicators

Table 2-28 Indicators on a smart ETH gateway

Indicator	Color	Name	Status	Description
PWR	Green	Power input status indicator	Steady on	The power input is normal.
			Off	There is no power input.
RUN	Green	Module running status indicator	Off	The power supply is abnormal.
			Blinking at long intervals	The smart ETH gateway successfully registers with the ECC800-Pro and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking	The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 5s.
ALM	Red	Alarm indicator	Steady on	The PoE output current is overloaded.
			Off	The PoE output is normal or not connected.

2.1.5 Video Surveillance System

2.1.5.1 VCN510

- **Appearance**

Figure 2-14 VCN510 Appearance

- **Technical Specifications**

Table 2-29 Operating Specifications

Item	Specifications

Item	Specifications
Operating temperature	0°C to 45°C
Temperature gradient	10°C/h
Operating humidity	5% RH to 95% RH (no condensation)
Operating altitude	–30.5 m to +3000 m
Particle contaminants	ISOb 14664-1 Class8

Figure 2-15 Front panel of VCN510

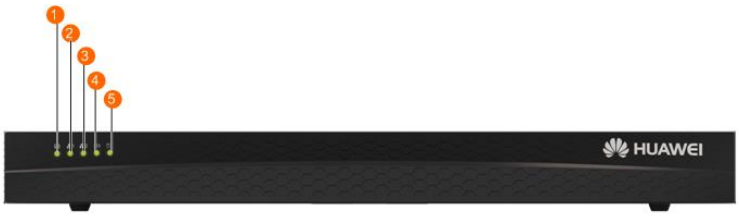

Table 2-30 Indicator description

No.	Indicator	Status Description
1	Power indicator	• Off: There is no power supply. • Steady on: There is power supply, and the system works properly. • Blinking: – Blinking green at a frequency of 0.5 Hz (1s on and 1s off): There is power supply, and the software is being loaded. – Blinking green at a frequency of 1 Hz (0.5s on and 0.5s off): A component other than the disk is faulty. – Blinking green at a frequency of 5 Hz (0.1s on and 0.1s off): The disk is faulty (whose priority is higher than that of other faults).
2/3	Network port LINK indicator	• Steady on: The network port is properly connected. • Off: The network port is improperly connected.
4/5	Hard disk status indicator	• Steady on: The hard disk is connected properly. • Blinking: The hard disk is transmitting data. • Off: The disk cannot be detected, is faulty, not installed, incorrectly installed, or not powered on.

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Figure 2-16 Rear panel of VCN510

Table 2-31 Interfaces and buttons on the rear panel

No.	Name	Type	Usage
1	Ground terminal	-	Used to connect the ground cable.
2	Alarm input interface	IO terminal	Used to connect an external alarm input device, for example, access control system.
3	GE1 network port	RJ45	GE Ethernet interface used to connect to a network cable.
4	USB interface	USB2.0	Used to connect to one of the following USB devices: • USB flash drive • USB mouse
5	USB interface	USB3.0	Used to connect to one of the following USB devices: • USB flash drive • USB mouse • Mobile disk
6	Video Graphics Array (VGA) interface	DB-15	Used to connect to a display terminal, for example, monitor.
7	High-Definition Multimedia Interface (HDMI) interface	HDMI	Used for HDMI video output.
8	Audio input interface	BNC	Used to broadcast voice files or talk with users in the surveillance area where cameras with microphones are installed.
9	Power button	-	Users to power on or off the device.
10	Power cable interface	-	Used to connect to the power supply.
11	Audio output	BNC	Used for audio output.

No.	Name	Type	Usage
	interface		
12	GE2 network interface	RJ45	GE Ethernet interface used to connect to a network cable.
13	Alarm output interface	IO terminal	Used to connect an external alarm input device, for example, a smoke sensor.

Figure 2-17 Rear panel of VCN510

Table 2-32 Rear panel of VCN510

No.	Indicator	Status	Status Description
1	Network port ACT indicator	Blinking yellow	Data is being transmitted.
		Off	There is no data transmission.
2	Network port LINK indicator	Steady green	The link is connected.
		Off	The link is disconnected.

2.1.5.2 VCN520

- **Appearance**

Figure 2-18 VCN520 Appearance

- **Technical Specifications**

Table 2-33 Operating Specifications

Item	Specifications
Operating temperature	0°C to 45°C
Temperature gradient	10°C/h
Operating humidity	5% RH to 95% RH (no condensation)
Operating altitude	–30.5 m to +3000 m
Particle contaminants	ISOb 14664-1 Class8

Figure 2-19 Front panel of VCN520

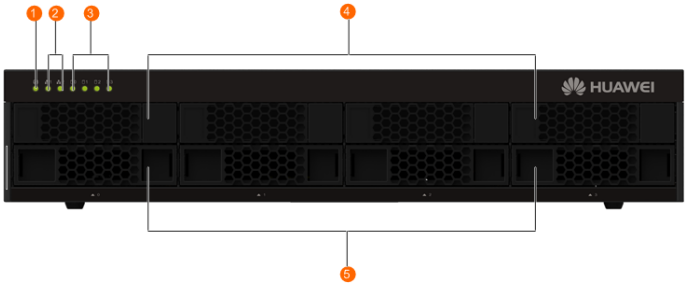

Table 2-34 Indicator description

No.	Indicator	Status Description
1	Power indicator	• Off: There is no power supply. • Steady on: There is power supply, and the system works properly. • Blinking: – Blinking green at a frequency of 0.5 Hz (1s on and 1s off): There is power supply, and the software is being loaded. – Blinking green at a frequency of 1 Hz (0.5s on and 0.5s off): A component other than the disk is faulty. – Blinking green at a frequency of 5 Hz (0.1s on and 0.1s off): The disk is faulty (whose priority is higher than that of other faults).
2	GE port LINK indicator (GE1 and GE2)	• Steady on: The network port is properly connected. • Off: The network port is improperly connected.
3	Disk status indicator (four disks)	• Steady on: The hard disk is connected properly. • Blinking: The hard disk is transmitting data. • Off: The disk cannot be detected, is faulty, not installed,

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No.	Indicator	Status Description
		incorrectly installed, or not powered on.
4	Disk	The four slots in the upper row are used to install disks. The following shows the four disk slot IDs.
5	Filler panel	The four slots in the lower row are used to install a filler panel. The filler panel is used to fill the vacant slots, which helps decrease the noise and enhance the fan heat dissipation effect.

Figure 2-20 Rear panel of VCN520

Table 2-35 Interfaces and buttons on the rear panel

No.	Name	Type	Usage
1	Ground terminal	-	Used to connect the ground cable.
2	KB interface	-	Used to connect a network keyboard.
3	RS-485 interface	-	Used to perform debugging or connect an external PTZ device or access control system.
4	GE1 network port	RJ45	GE Ethernet port used to connect to a network cable.
5	COM port	RJ45	Used for debugging.
6	USB interface	USB2.0	Used to connect to one of the following USB devices: • USB flash drive • USB mouse
7	USB interface	USB3.0	Used to connect to one of the following USB devices: • USB flash drive • USB mouse • Removable hard disk
8	Video Graphics	DB-15	Used to connect to a display terminal, for example, monitor.

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No.	Name	Type	Usage
	Array (VGA) interface		
9	High-Definition Multimedia Interface (HDMI)	HDMI	Used for HDMI video output.
10	Audio input interface	BNC	Used for audio input. Used to broadcast voice files or talk with users in the surveillance area where cameras with microphones are installed.
11	Power button	-	Used to power on or off the device.
12	Power cable interface	-	Used to connect to the power supply.
13	Audio output interface	BNC	Used for audio output.
14	GE2 network port	RJ45	GE Ethernet port used to connect to a network cable.
15	Alarm output interface	IO terminal	Used to connect an external alarm input device, for example, a smoke sensor.
16	Alarm input interface	IO terminal	Used to connect an external alarm input device, for example, access control system.

Figure 2-21 Rear panel of VCN520

Table 2-36 Rear panel of VCN520

No.	Indicator	Status	Status Description
1	Network port ACT indicator	Blinking yellow	Data is being transmitted.
		Off	There is no data transmission.

No.	Indicator	Status	Status Description
2	Network port LINK indicator	Steady green	The link is connected.
		Off	The link is disconnected.

2.1.5.3 VCN540

- **Appearance**

Figure 2-22 VCN540 Appearance

- **Technical Specifications**

Table 2-37 Operating Specifications

Item	Specifications
Operating temperature	0°C to 45°C
Temperature gradient	10°C/h
Operating humidity	5% RH to 95% RH (no condensation)
Operating altitude	–30.5 m to +3000 m
Particle contaminants	ISOb 14664-1 Class8

Figure 2-23 Front panel of VCN540

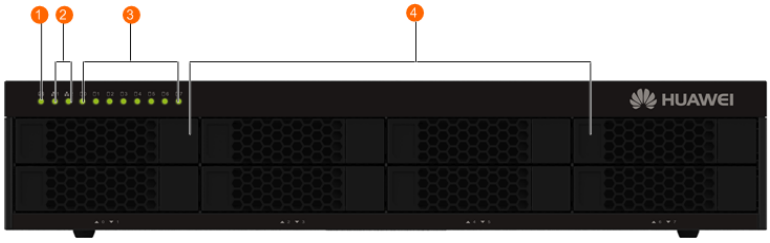

Table 2-38 Indicator description

No.	Indicator	Status Description
1	Power indicator	• Off: There is no power supply. • Steady on: There is power supply, and the system works properly. • Blinking: – Blinking green at a frequency of 0.5 Hz (1s on and 1s off): There is power supply, and the software is being loaded. – Blinking green at a frequency of 1 Hz (0.5s on and 0.5s off): A component other than the disk is faulty. – Blinking green at a frequency of 5 Hz (0.1s on and 0.1s off): The disk is faulty (whose priority is higher than that of other faults).
2	GE port LINK indicator (GE1 and GE2)	• Steady on: The network port is properly connected. • Off: The network port is improperly connected.
3	Disk status indicator (eight disks)	• Steady on: The hard disk is connected properly. • Blinking: The hard disk is transmitting data. • Off: The disk cannot be detected, is faulty, not installed, incorrectly installed, or not powered on.
4	Disk	Disk, the following figure shows the slot numbers of the eight hard disks:

Figure 2-24 Rear panel of VCN540

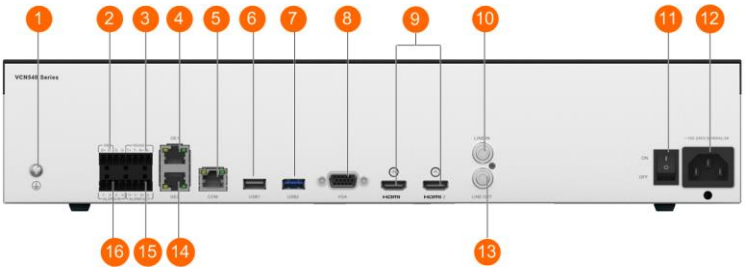

Table 2-39 Interfaces and buttons on the rear panel

No.	Name	Type	Usage
1	Ground terminal	-	Used to connect the ground cable.
2	KB interface	-	Used to connect a network keyboard.

No.	Name	Type	Usage
3	RS-485 interface	-	Used to perform debugging or connect an external PTZ device or access control system.
4	GE1 network port	RJ45	GE Ethernet port used to connect to a network cable.
5	COM port	RJ45	Used for debugging.
6	USB interface	USB 2.0	Used to connect to one of the following USB devices: • USB flash drive • USB mouse
7	USB interface	USB 3.0	Used to connect to one of the following USB devices: • USB flash drive • USB mouse • Removable hard disk
8	Video Graphics Array (VGA) interface	DB-15	Used to connect to a display terminal, for example, monitor.
9	High-Definition Multimedia Interface (HDMI)	HDMI	Used for HDMI video output.
10	Audio input interface	BNC	Used for audio input. Used to broadcast voice files or talk with users in the surveillance area where cameras with microphones are installed.
11	Power button	-	Used to power on or off the device.
12	Power cable interface	-	Used to connect to the power supply.
13	Audio output interface	BNC	Used for audio output.
14	GE2 network port	RJ45	GE Ethernet port used to connect to a network cable.
15	Alarm output interface	IO terminal	Used to connect an external alarm input device, for example, a smoke sensor.
16	Alarm input interface	IO terminal	Used to connect an external alarm input device, for example, access control system.

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Figure 2-25 Rear panel of VCN540

Table 2-40 Indicators on the rear panel

No.	Indicator	Status	Status Description
1	Network port ACT indicator	Blinking yellow	Data is being transmitted.
		Off	There is no data transmission.
2	Network port LINK indicator	Steady green	The link is connected.
		Off	The link is disconnected.

2.1.5.4 IPC6325 Camera

- **Appearance**

Figure 2-26 IPC6325 Appearance

- **Technical Specifications**

Table 2-41 Technical Specifications

Item	Specifications
Image sensor	1/2.7" two-megapixel progressive scan CMOS

Item	Specifications
Lowest illuminance	• Color: 0.01 lux (F1.4, AGC ON) • Black and white: 0.004 lux (F1.4, AGC ON) • 0 lux (infrared enabled)
Wide dynamic range	120 dB
Focal length	2.8–12 mm manual zoom, 4.3x optical zoom
Video coding format	H.265/H.264/MJPEG
Maximum resolution	1920 x 1080
Intelligent video analysis	Supports tripwire detection, loitering detection, intrusion detection, abandoned object detection, removed object detection, target color recognition, classifications of people and vehicles, and metadata backhaul.
Power supply	PoE (802.3at/af), 24 V AC±25%, 24 V DC±25%, 12 V DC±25% (polarity-insensitive DC power supply), applicable to DC/AC adapter and PoE hot backup
Protection level	IP66; complying with IEC 60529
Vandal-proof class	IK10; complying with IEC 62262

2.1.5.5 IPC6225 Camera

- **Appearance**

  Figure 2-27 IPC6225 Appearance

- **Technical Specifications**

Table 2-42 Technical Specifications

Item	Specifications
Image sensor	1/2.8" two-megapixel progressive scan CMOS
Lowest illuminance	Color: 0.008 lux (F1.4, AGC ON) B/W: 0.002 lux (F1.4, AGC ON), Zero lux with IR on
Window Self-cleaning	Supported
IR Coverage	50m
Window Self-cleaning	Supported
Video Compression	H.265/H.264/MJPEG
Max. Resolution	1,920 x 1,080
Intelligent Analytics	Tripwire detection, loitering detection, intrusion detection, abandoned object detection, removed object detection, target color recognition, distinguishes humans and vehicles
Power Supply	12V DC ±25%, 24V DC ±25%, 24V AC ±25%, and PoE (IEEE 802.3at) DC supply polarity is self-adaptive, DC/AC supply can be hot standby for PoE
IP Protection Class	IP66, complies with IEC 60529

2.1.6 Sensors

2.1.6.1 Infrared Sensor

The infrared sensor supports two sensing modes: infrared and microwave.

It generates an alarm if detecting that someone enters the monitored area.

- **Appearance**

Figure 2-28 Infrared sensor A

Figure 2-29 Infrared sensor B

- **Indicator Description**

Table 2-43 Infrared sensor indicator description

Indicator	Description
Green	The infrared sensing feature is triggered.
Orange-yellow	The microwave sensing feature is triggered.
Red	The infrared and microwave sensing features are triggered, and the sensor enters the alarm state.

- **Port Description**

Table 2-44 Infrared sensor port description

Silk Screen	Description
TAMPER	Reserved
ALARM	Alarm output
GND	Power input port
+12 V	

- **Technical Specifications**

Table 2-45 Technical specifications

Item	Specifications
Detection angle	90°
Detection distance	8 m

2.1.6.2 Hydrogen Detection System

The system detects the hydrogen density between batteries and supports fan linkage.

The control module uses the hydrogen sensor to detect the hydrogen density in the environment. When the hydrogen density exceeds the upper threshold, the control module starts the fan to lower the hydrogen density. When the hydrogen density drops to the preset value, the control module stops the fan. In this way, the hydrogen density is ensured to be within the proper range.

Technical Specifications

Table 2-46 Technical specifications

Item	Specifications
Operating temperature	–5°C to +50°C
Storage temperature	–40°C to +80°C
Relative humidity	5%–95% (non-condensing)
Operating voltage	110/220 V AC
Port type	RS485

2.1.6.3 Smoke Sensor

Smoke sensors are used to detect the smoke concentration.

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Figure 2-30 Smoke sensor

Table 2-47 Technical specifications of a smoke sensor

Item	Specifications
Operating voltage	DC12 V (9–16 V DC)
Quiescent current	< 8 mA
Alarm current	< 35 mA
Output mode	Relay output
Output contact capacity	3 A/120 V AC or 3 A/24 V AC
Operating temperature	–10ºC to +50ºC
Ambient humidity	< 95% RH (non-condensing)
Dimensions	Diameter: 112 mm, height: 41 mm

2.1.6.4 Cabinet Temperature Sensor

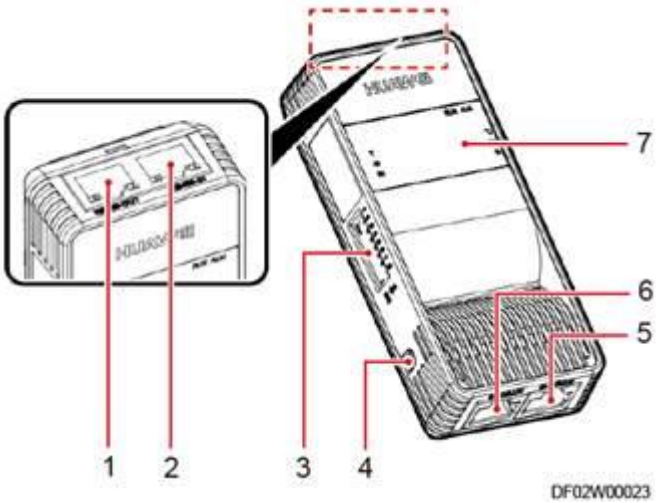
Figure 2-31 Cabinet temperature sensor

Table 2-48 Technical specifications of the cabinet temperature sensor

Item	Specifications
Temperature detection range	–20°C to +70°C
Temperature detection tolerance	• ±1°C (≥ –10°C, < 25°C) & (> 25°C, ≤ 55°C) • ±2°C (≥ -20°C, < –10°C) & (> 55°C, ≤ 70°C) • ±0.5°C (25°C)
Operating temperature	–20°C to +70°C
Operating humidity	5%–95% RH
Storage temperature	–40°C to +70°C
Storage humidity	≤ 95% RH, non-condensing

2.1.6.5 T/H Sensor (With a display)

Figure 2-32 Appearance



(1) RS485-OUT (2) RS485-IN (3) DIP switch (4) Button

(5) NTC1–3 (6) NTC4–6 (7) Display

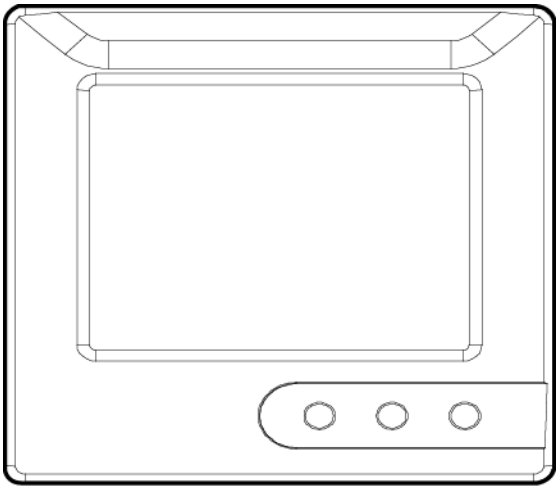
Table 2-49 T/H sensor specifications

Item	Temperature	Humidity
Measurement range	–40°C to +70°C	1%–99% RH
Measurement precision	≤ ±1°C (25°C)	≤ ±5% RH (25°C, 20%–80% RH)
Extended	Provides two RJ45 ports to connect to six NTC temperature sensors,	

Item	Temperature	Humidity
temperature collection port	each RJ45 port connecting to three NTC temperature sensors.	
Signal port	RS485	
Power supply	5–16 V DC (typical value 12 V DC)	
Power consumption	< 280 mW	
Storage environment	–40°C to +70°C	
Weight	About 85 g	

2.1.6.6 T/H Sensor

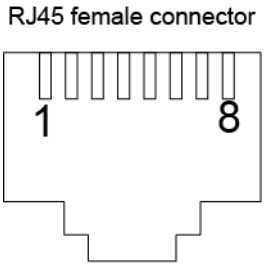
Figure 2-33 Appearance



DF02W00005

The T/H sensor uses an RJ45 connector.

Figure 2-34 Pins of an RJ45 connector



PC03WC0015

Table 2-50 Pin description of an RJ45 connector

Pin	Description
Pin1	A
Pin2	B
Pin3	V+
Pin4/5/6/7	Reserved
Pin8	V-

Table 2-51 T/H sensor specifications

Item	Specifications
Temperature measuring range	–20°C to +70°C
Temperature accuracy	≤ ±0.3°C (25°C)
Humidity measuring range	0%–100% RH
Humidity accuracy	≤ ±4% RH (25°C, 30%–80% RH)
Operating voltage	9–16 V DC
Storage temperature	–40°C to +80°C (non-condensing)
Output	RS485

2.1.6.7 WLDS600 Water Sensor

The WLDS600 water sensor consists of a water detection cable, a water detector with the BOM number of 33010556, an extension line, and a conversion cable.

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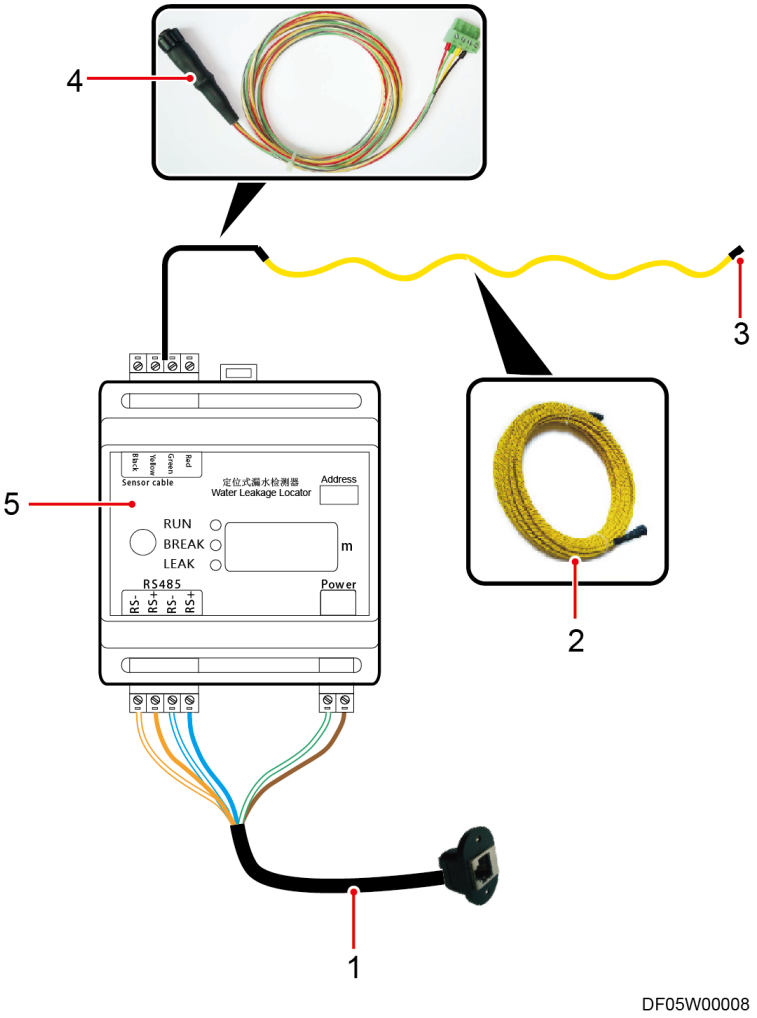
Figure 2-35 WLDS600 water sensor



(1) Tie line (2) Water leakage location cable (3) End cap A (B)

(4) Extension line (5) Water leakage locator

NOTE

- Two types (A and B) of end caps are delivered. The site may support only one type.
- Connect either end cap to the cable. After the cable is connected and the water leakage locator is powered on and initialized, if the buzzer keeps buzzing and the alarm location is a stable value that is greater than the total length of the water leakage location cable, replace the end cap with the other end cap.

Table 2-52 WLDS600 water sensor specifications

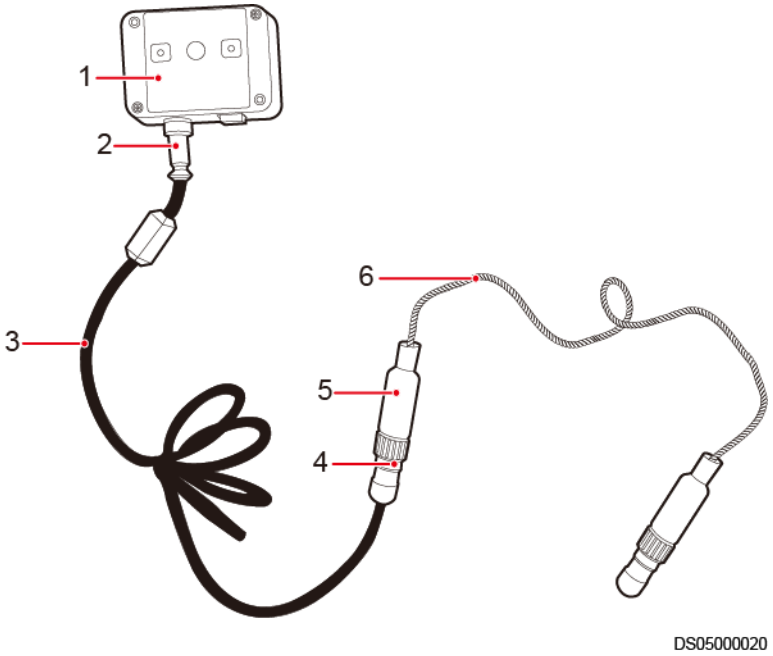
Item	Specification
Dimensions (L x W x H)	70 mm x 58 mm x 86 mm±1
Power supply	9–16 V DC or 9–16 V AC

Item	Specification
Impulse current	≤ 450 mA
Power dissipation	< 2 W
Power, communication connector	RJ45 female connector 1 piece
Protocol type	Modbus-RTU, data bits 8 bits, no parity
Baud rate, address	Default support 9600, baud rate configurable, address configurable, default address is 1, stop bit is 1 bit.
Detected distant	100 m (support cable connection in series)
Accuracy	±0.5 m (the cable length 0-10 m) 1 m±1% (the cable length 10-100 m)
Indicator status	When the power supply is working properly, the green indicator is on. When a fault occurs, the yellow indicator is on. When water leakage occurs, the red indicator is on.
Display	4-bits Nixie tube shows leaking position.
Adjustable Sensitivity	3 grade of sensitivity
Installation mode	DIN track install supported.

2.1.6.8 WLDS900 Water Sensor

The WLDS900 water sensor with the BOM number of 33010352 consists of a water detection cable, a water detector, and a conversion cable.

Figure 2-36 WLDS900 water sensor



(1) Water detector	(2) Conversion cable end A, connected to the water detector	(3) Conversion cable
(4) Conversion cable end B, connected to the water detection cable	(5) Water detection cable end A, connected to the conversion cable	(6) Water detection cable

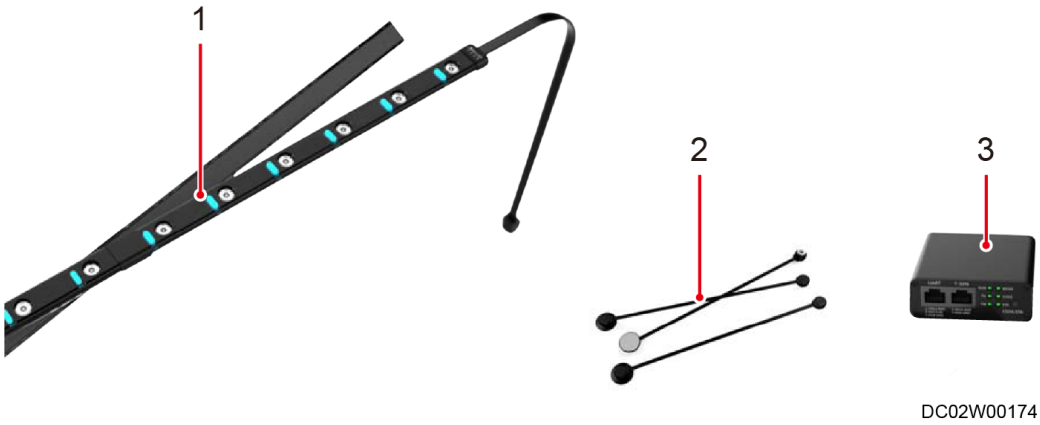
Table 2-53 WLDS900 water sensor specifications

Item	Specification
Operating voltage	12 V DC (9–16 V DC)
Operating temperature	–20°C to +70°C
Storage temperature	–40°C to +85°C
Humidity	10%–80% RH (non-condensing)

2.1.6.9 (Optional) Smart U Space Manager

The smart U space manager is designed for IT asset management of the data center. The system automatically detects the physical location of IT devices in the data center, collects IT asset codes and the information about U space usage.

Figure 2-37 Smart U space manager



(1) Asset detection strip (2) Asset label (3) Main control box

Table 2-54 Technical specifications of the smart U space manager

Item	Specifications
Characteristic	Applicable to 42 U cabinets
Communications port	RS485, Modbus-RTU
Communication	Rate: 9600 bit/s Communication format: one start bit, eight data bits, no parity bit, one stop bit
Power input	12 V DC±5% (RJ45)
Rated current and power consumption	250 mA
Data upload port	One RS485 route (two RJ45 ports)
Dimensions (mm)	Main control box: 71 mm x 70 mm x 25 mm Detection strip: 1867 mm x 18 mm x 6.5 mm (H x W x D)
Weight	≤ 0.2 kg (main control box), ≤ 0.35 kg (asset detection strip)
Installation mode	Magnet-based installation

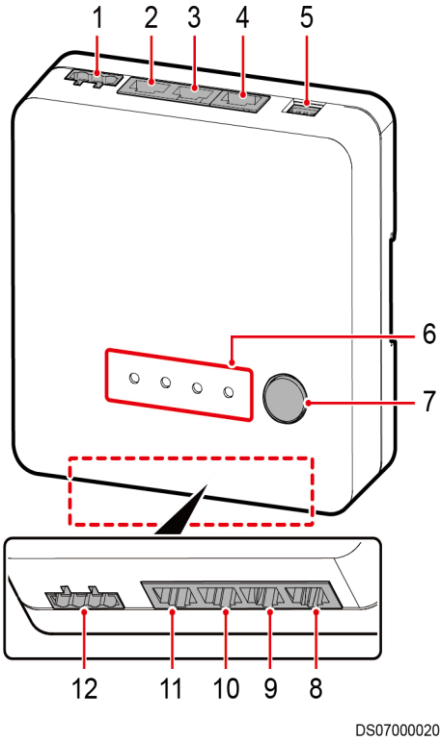
2.1.7 Access Monitoring System

2.1.7.1 Access Actuator

The access actuator is the control component for the aisle door in a smart module. It connects to the ECC800-Pro controller over FE port, wireless networking (802.15.4). It opens the magnetic lock by detecting the card swiping information of the card reader, door open button

information, and fire linkage information. It has access right management, access event record, and alarm record functions.

Figure 2-38 Access actuator



(1) 48 V power port	(2) PoE port	(3) RS485 port COM2
(4) RS485 port COM1	(5) Address DIP switch	(6) Status indicator
(7) BLINK button	(8) WG_2 Wiegand interface	(9) WG_1 Wiegand interface
(10) AI/DI_2 dry contact (reserved port for linkage control or third-party fire extinguishing system dry contacts)	(11) AI/DI_1 dry contact (reserved port for exit button)	(12) LOCK/GND/GATE/COM door status or magnetic lock port

Specifications

Table 2-55 Access actuator technical specifications

Item	Specifications
Power input	• DC input: terminal, with an input voltage of 36 V DC–60 V DC • PoE power supply: one PoE port that complies with IEEE802.3at
PoE port	FE communication with a communications rate of 10/100M
Wireless	One wireless communication port that complies with IEEE802.15.4,

Item	Specifications
communication	mutual backup with FE communication
AI/DI port	Two AI/DI ports, can connect to the fire alarm and exit button
DO/DI port	• One 12 V DC power output that controls magnetic locks, terminal • One DI input port for connecting to the door status switch
RS485 serial port expansion	Two RS485 ports (one route) with the default communications rate of 9600 bit/s, physical port cascading supported (reserved function)
Wiegand port	Two Wiegand ports, 12 V DC card reader operating power output; two routes of card readers can operate at the same time.
BLINK button	• Press the button for less than 1 second to start blinking. • Hold down the button for 1–5 seconds to search for a network and start networking. • Hold down the button for more than 10 seconds to clear network parameters.
Address DIP switch	4-pin address DIP switch
E-label	Supported

Indicators

Table 2-56 Access actuator indicators

Indicator	Color	Name	Status
PWR	Green	Power input status indicator	• Steady on: The power input is normal. • Off: There is no power input.
RUN	Green	Communicatio n status indicator	• Off: The power is abnormal or the board program is loading. • Blinking at long intervals: The access actuator successfully registers with the ECC800-Pro and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s). • Blinking at short intervals: The communication is disconnected or the access actuator fails to register with the ECC800-Pro (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s). • Blinking: The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 5s.
ALM	Red	Alarm indicator	• Steady on: A system failure alarm is

Indicator	Color	Name	Status
			generated. • Off: No system alarm is generated.
RF_Z	Green	Wireless communication status indicator	• Steady on: No network parameters exist, or a network is to be created. • Blinking at long intervals: A network is set up, and no node access is allowed (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s). • Blinking intermittently at super short intervals: The access actuator is searching for a network (the indicator blinks at super short intervals for 0.5s and then turns off for 0.5s).

Communications Ports

The access actuator provides one DO port (LOCK/GND) and one DI port (GATE/COM). Table 2-57 lists the LOCK/GND/GATE/COM port pin definitions.

Table 2-57 LOCK/GND/GATE/COM port pin definitions

Item		Description
LOCK/GND (control magnetic locks) pin sequence	LOCK	12V_OUT
	GND	GND
GATE/COM (door status) pin sequence	GATE	DI1
	COM	COM

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2.1.7.2 Fingerprint and Card Reader with a Keypad

Figure 2-39 Fingerprint and card reader with a keypad

(1) Fingerprint reader (2) LED indicator

Table 2-58 Specifications for the fingerprint and card reader with a keypad

Item	Specifications
Dimensions (L x W x H)	156 mm x 53 mm x 38 mm
Rated operating voltage	12 V DC±15%
Rated operating current	300 mA±15%
Card type supported	IC card
Authorized storage	A maximum of 3000 authorized users, with a maximum of 6000 fingerprints
Communications mode	RS485 and Wiegand communications ports

Table 2-59 Access control device operating status

Item		New Version
Standby	LED indicator	The indicator is steady blue.
	Fingerprint reader	The indicator is off.
Unauthorized fingerprint collection	LED indicator	The indicator blinks blue, red, blue, red, and blue in order.
	Fingerprint reader	The indicator turns on (white).
	Buzzer sounds	The buzzer sounds three.

Item		New Version
Authorized fingerprint collection	LED indicator	The indicator blinks blue, red, and blue in order.
	Fingerprint reader	The indicator turns on (white).
	Buzzer sounds	The buzzer sounds once.
Card swiping	LED indicator	The indicator blinks blue, red, and blue in order.
	Buzzer sounds	The buzzer sounds once.

2.1.7.3 Fingerprint and Card Reader

Figure 2-40 Fingerprint and card reader

(1) Fingerprint reader (2) LED indicator

Table 2-60 Specifications of a fingerprint and card reader

Item	Specifications
Dimensions (L x W x H)	156 mm x 53 mm x 38 mm
Rated operating voltage	12 V DC±5%
Rated operating current	300 mA±5%
Card type supported	IC card
Authorized storage	A maximum of 3000 authorized users, with a maximum of 6000 fingerprints
Communications mode	RS485 and Wiegand communications ports

Table 2-61 Access control device operating status

Item		New Version
Standby	LED indicator	The indicator is steady blue.
	Fingerprint reader	The indicator is off.
Unauthorized fingerprint collection	LED indicator	The indicator blinks blue, red, blue, red, and blue in order.
	Fingerprint reader	The indicator turns on (white).
	Buzzer sounds	The buzzer sounds three.
Authorized fingerprint collection	LED indicator	The indicator blinks blue, red, and blue in order.
	Fingerprint reader	The indicator turns on (white).
	Buzzer sounds	The buzzer sounds once.
Card swiping	LED indicator	The indicator blinks blue, red, and blue in order.
	Buzzer sounds	The buzzer sounds once.

2.1.7.4 Card Reader with a Keypad

Figure 2-41 Card reader with a keypad

Table 2-62 Specifications of a card reader with a keypad

Item	Specifications
Dimensions (L x W x H)	114 mm x 63 mm x 25 mm
Operating voltage	Operating voltage range: 10.8 V DC to 13.2 V DC; rated voltage: 12 V DC
Operating current	Stability standby current: 80 mA; working current of the card swiping button: 150 mA; minimum input current: 12 V DC/300 mA
Communications mode	Wiegand communications port

2.1.7.5 Finger Print Reader

- **Appearance**

Figure 2-42 Finger Print Reader

- **Technical Specifications**

Table 2-63 Technical Specifications

Item	Specifications
Dimensions (L x W x H)	156 mm x 53 mm x 38 mm ±5%
Net weight	0.2 kg ±5%
Rated operating voltage	5 V DC ±5% USB interface power supply

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Item	Specifications
Rated operating current	200 mA ±5%
Operating environment	-10°C to +55°C ,20%–90% RH, non-condensing
Storage environment	-20°C to +70°C ,5%–95% RH, non-condensing
Operating temperature	-10°C to +55°C
Storage temperature	-40°C to +70°C
Operating altitude	less than 3000m
Work status	When the fingerprint reader is standby, the blue LED indicator is on and the green indicator of the fingerprint collection probe is steady on. When the fingerprint reader is collecting a fingerprint, audible and visual signals are generated.
Communication method	The USB port is used as the serial port to set, read, or download fingerprint information.
Image size (pixels)	640X480
Image Resolution	500 DPI
Image distortion rate	≤2%

2.1.7.6 IC Card Reader

- **Appearance**

Figure 2-43 IC Card Reader

- **Technical Specifications**

Table 2-64 Technical Specifications

Item	Specifications
Hardware interface	USB interface
Working frequency	13.56 MHz
Card type supported	IC Card
Power supply	USB power supply, no need to connect an external power source
Card swipe distance	≥ 3 cm
Response to card swiping	≤ 0.1 s
Operating temperature	-10°C to +55°C
Storage temperature	-40°C to +70°C
Operating humidity	5%–95%RH, non-condensing
Operating altitude	< 3000m

2.1.7.7 Emergency Door Release Button

- **Appearance**

Figure 2-44 Emergency Door Release Button

- **Technical Specifications**

Table 2-65 Technical Specifications

Item	Specifications

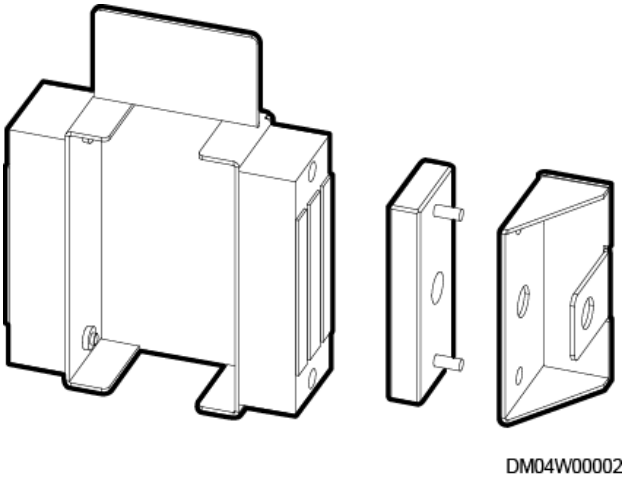
Item	Specifications
Dimensions (L x W x H)	86 mm x 86 mm x 50 mm
Weight	0.2 kg
Suitable for Door	Exit door, Emergence door
Output Contact	NO/ NC/ COM

2.1.7.8 Magnetic Lock

Figure 2-45 Double door magnetic lock

Figure 2-46 Single door magnetic lock

Figure 2-47 Magnetic lock for a sliding door



2.1.7.9 Door Status Sensor

- **Appearance**

Figure 2-48 Door Status Sensor

- **Technical Specifications**

Table 2-66 Technical Specifications

Item	Specifications
Connection mode	Wiring terminals
Rated current	500 mA
Opening distance	25 mm ≤ opening distance ≤ 45 mm
Rated power	10 W
Securing mode	Screws
Distance between mounting holes	40 mm ± 0.8 mm
Open-circuit voltage	100 V DC (maximum)

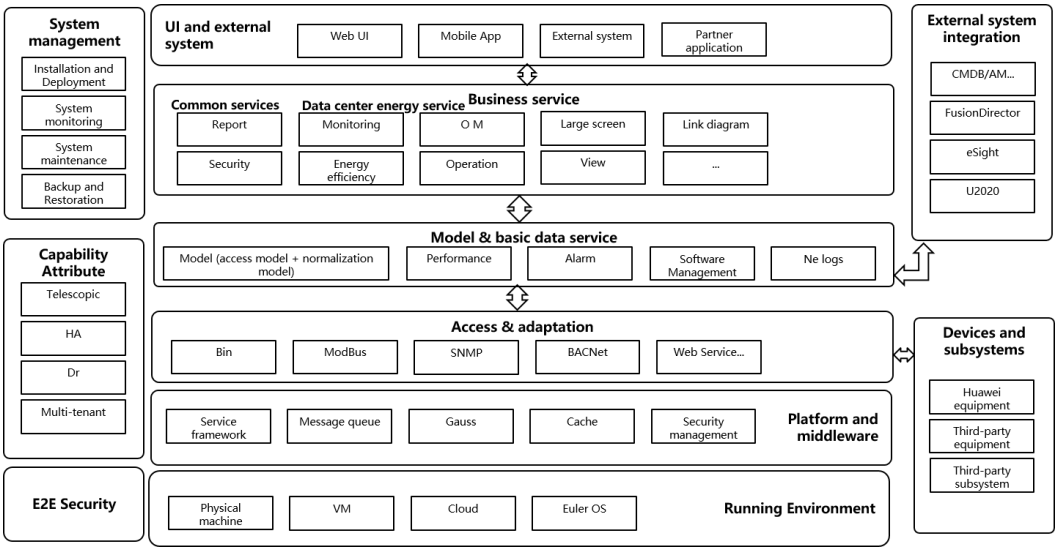
Item	Specifications
Contact withstand voltage	150 V DC (maximum)
Resistance	0.3 Ω
Switch mode	NO
Outer material	White acrylonitrile butadiene styrene (ABS) engineering plastic

2.2 Software Architecture

The NetEco software adopts the B/S architecture and consists of the access, public framework, application and service, and UI layers. It runs on the Euler OS operating system. Users can access the server in web mode on the Windows operating system (OS). To ensure data transmission security, the NetEco supports encrypted transmission.

Figure 2-49 shows the NetEco software architecture.

Figure 2-49 NetEco software architecture

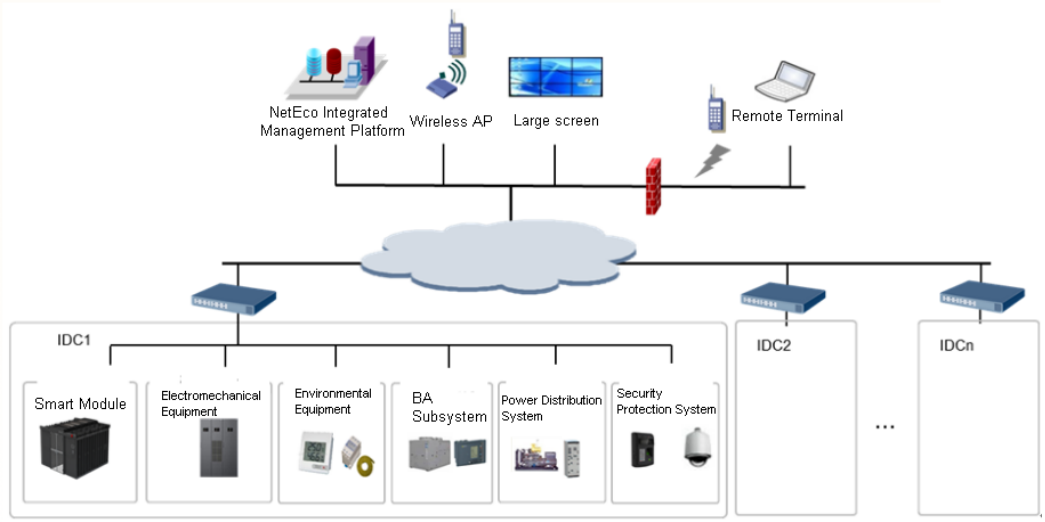


2.3 Networking Mode

The NetEco is able to manage the infrastructure of one data center or multiple data centers distributed in different regions.

Figure 2-50 shows the network diagram.

Figure 2-50 Networking mode



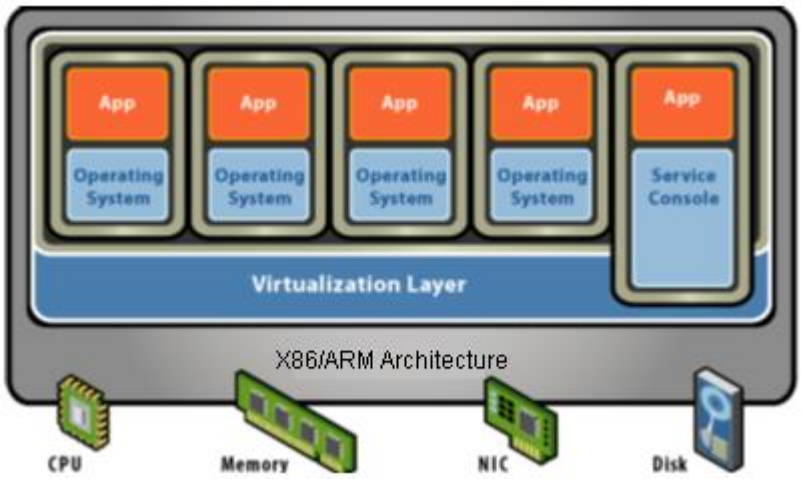
It is recommended that data center infrastructure management be implemented under independent networking, as shown in Figure 2-50, and not be open to a public network. If a public network needs to be connected, the customer should provide a firewall to ensure cyber security.

2.4 NetEco Virtualization Deployment Solution

The NetEco supports the virtualization deployment solution. With this solution, users can deploy NetEco applications on customers' virtual machines (VMs), improving the server resource utilization.

2.4.1 VM Construction Principle

Virtualization is a resource management technology that abstracts and converts various physical computer resources, such as servers, networks, memory, and storage, to break obstacles between entity structures. This enables users to apply these resources in a better way. The new virtual parts of these resources are not restricted by the way existing resources are built, by region, or by physical configuration. Virtual resources include computing capabilities and data storage. The virtualization technology enables multiple VMs to be virtualized on a computer. Different VMs may run different operating systems, and each operating system is installed on a VM. The virtualization layer is installed between the hardware and the VM. The layer uses the architecture based on the host or virtualization management program. The following figure shows the overall architecture.



Among them: App is the application software, Operating System is the operating system, Virtualization Layer is the virtualization deployment software, and Service Console is the service control platform.

2.4.2 VM Deployment Scenarios

The NetEco can be deployed on VMs. The following two types of VM specifications are available: basic configuration and standard configuration. The management scale is the same as that in the physical machine deployment scenario.

Basic configuration and standard configuration apply to single-server deployment, which requires one VM.

Table 2-67 Basic configuration (number of VMs: 1)

Item	Configuration	Remarks
vCPU	32vCPU	Provided by customers
Memory	64GB	Provided by customers
Hard disk (system disk)	92GB	Provided by customers
Hard disk (data disk)	1024 GB (recommended IOPS: ≥ 1500; recommended I/O bandwidth: ≥ 20 Mbit/s)	Provided by customers
Network adapter	• Scenario in which the southbound and northbound networks are not isolated: 1 PCS • Scenario in which the southbound and northbound networks are isolated: 2 PCS • Scenario in which the southbound and northbound networks are isolated (two southbound	Provided by customers

Item	Configuration	Remarks
	IP addresses): 3 PCS	
Virtualization software	• FusionSphere 6.5.1 or later • FusionCompute 8.0.RC2 or later	Provided by customers
Operating system	EulerOS V2.0	Purchased from Huawei
Database	GaussDB T	Purchased from Huawei
Application software	NetEco server application	Purchased from Huawei

Table 2-68 Standard configuration (number of VMs: 1)

Item	Configuration	Remarks
vCPU	64 vCPU	Provided by customers
Memory	128 GB	Provided by customers
Hard disk (system disk)	92 GB	Provided by customers
Hard disk (data disk)	7168 GB (recommended IOPS: ≥ 3000; recommended I/O bandwidth: ≥ 50 Mbit/s)	Provided by customers
Network adapter	• Scenario in which the southbound and northbound networks are not isolated: 1 PCS • Scenario in which the southbound and northbound networks are isolated: 2 PCS • Scenario in which the southbound and northbound networks are isolated (two southbound IP addresses): 3 PCS	Provided by customers
Virtualization software	• FusionSphere 6.5.1 or later • FusionCompute8.0.RC2 or later	Provided by customers
Operating system	EulerOS V2.0	Purchased from Huawei
Database	GaussDB T	Purchased from Huawei
Application software	NetEco server application	Purchased from Huawei

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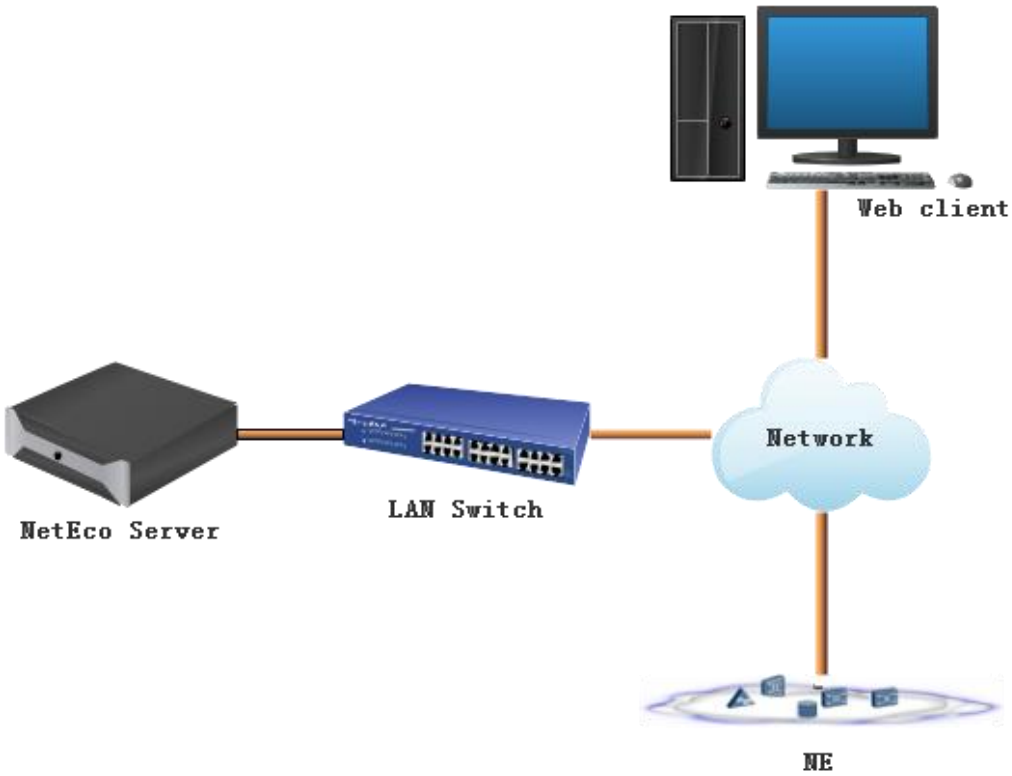
2.5 NetEco Single-Server Deployment Solution

The NetEco can be deployed on a physical server or VM to form a NetEco single-node system. The NetEco supports basic configuration and standard configuration.

Figure 2-51 shows the single-node system networking.

Figure 2-51 Single-node system networking

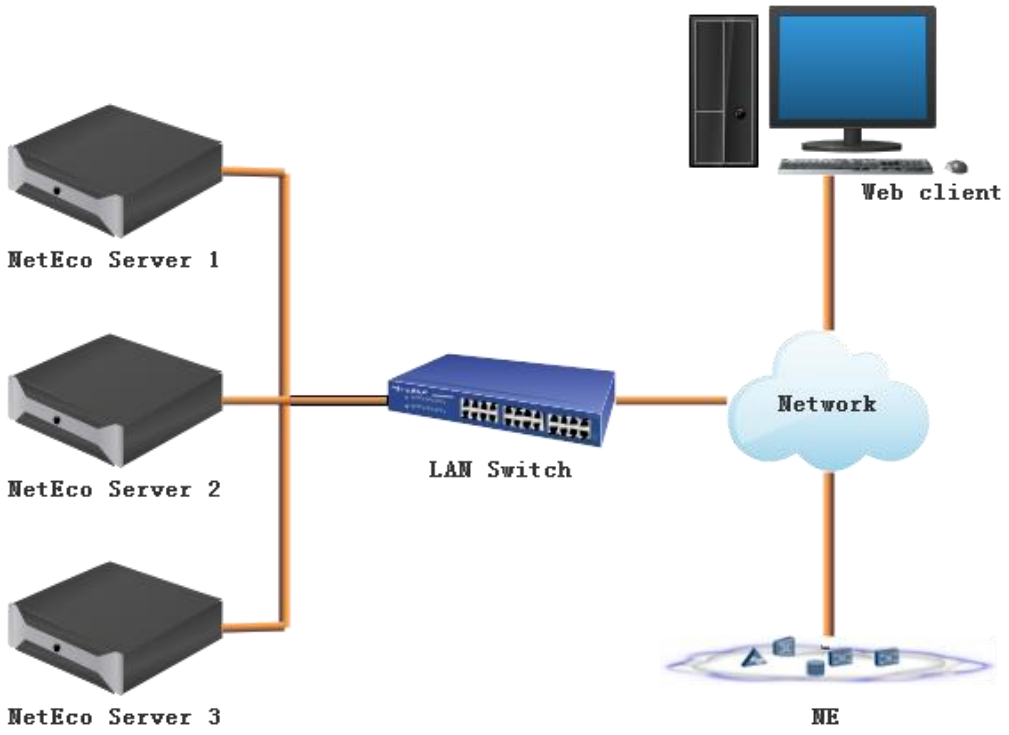


2.6 NetEco local cluster deployment solution

The NetEco supports three servers configured in a cluster to form a local cluster system, improving the reliability of NetEco services.

Figure 2-52 shows the networking for local cluster deployment.

Figure 2-52 Networking for local cluster deployment



The NetEco cluster system consists of three servers.

- Platform services are deployed in cluster mode. Multiple service instances are evenly distributed on three servers. If one server is faulty, platform services are not interrupted.
- The database runs on two servers and is deployed in master/slave mode. The master server runs database services and provides the read and write capabilities. The slave server runs database services and provides the data backup capability. When the master server is faulty, database services are automatically switched over to the slave server, and the slave server provides database services. Database services are interrupted for a short time. The database service switchover takes less than 1 minute.
- NetEco services run on two servers and are deployed in active/standby mode. The active server runs NetEco services and provides services, and the standby server does not provide services. When the active server is faulty, NetEco services are automatically switched over to the standby server, and the standby server provides services. NetEco services are interrupted for a short time. The NetEco service switchover takes less than 5 minutes.

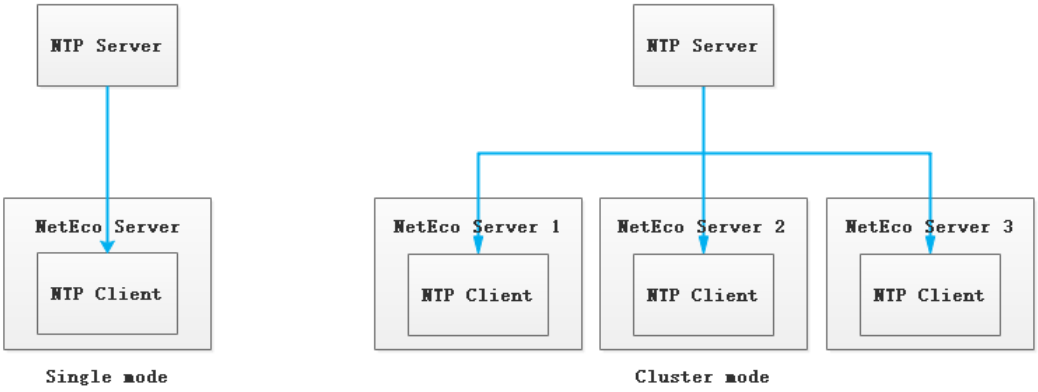
NOTE

When a hardware fault (such as a CPU, memory, or hard disk fault) or a software fault (such as an operating system, file system, or key service process fault) occurs on the master server, services on the master server are automatically switched over to the slave or standby server, and the slave or standby server provides services.

2.7 Server Time Synchronization

The NetEco server supports enabling the NTP time synchronization service and configuring the upper-level NTP server so that the time between the NetEco server and the upper-level NTP server can be synchronized.

Figure 2-53 Time synchronization framework



3 Products and Application Scenarios

3.1 Product Funcions

3.1.1 Basic Feature

3.1.1.1 Workbench

The workbench is the page displayed after an O&M engineer, O&M director, or operation director logs in. The page allows the login user to view the information of concern to the user's role and to-do tasks of the role.

O&M engineers, O&M directors, and operation directors have different concerns. This feature enables them to quickly obtain key information of concern to their roles. The key information on the workbench is as follows:

- Information portals for monitoring, energy efficiency, O&M, and operation
- Platform notices
- To-do tasks

3.1.1.2 Real-Time Monitoring

3.1.1.2.1 Real-Time Monitoring View

Two display modes are available: 2D and 2.5D. The NetEco visualizes the equipment room, smart module, and container scenarios.

- **Equipment room view monitoring**
  - 2.5D view drill-down: provides 2.5D view for different hierarchies (such as park -> building -> floor -> equipment room -> rack -> device, or park -> cluster -> container -> cabinet -> device) for you to quickly query information or locate faults.
  - Topology visualization: supports topology display of parks, buildings, floors, equipment rooms, smart modules, and containers as well as the display of the cooling view and power distribution view.
- **Device view monitoring**
  - Multi-dimensional monitoring: manages devices by overview, alarm, signal monitoring, and monitoring view, and allows you to view the physical locations, configurations, and running status of power supply and distribution devices, cooling devices, environmental devices, access control systems, and video surveillance systems.

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- Energy flow diagram: displays the running status of the UPS, air conditioner, power distribution cabinet (PDC), chiller, DG, and cooling tower in an energy flow diagram.
- Cabinet view: displays the layout of devices in a cabinet in a view.
- Customized monitoring counters: displays key monitoring counters of devices in a table. The NetEco can monitor one counter for multiple objects or multiple counters for one object.

3.1.1.2.2 Data Center Planning

A data center planning tool is provided for deploying and configuring devices for the equipment room, smart module, and container. You can use the tool to deploy devices and components including storage devices, network devices, collectors, modular UPSs, and filler panels in a cabinet.

- Park and building design: You can add, delete, and modify management domains such as parks, buildings, and equipment rooms, and set the background images for parks and buildings. In the background image of a park or building, you can create and design a park or building in ShapeNode form.
- Data center planning: You can construct and deploy a data center using the provided structural components (such as walls, doors, and load-bearing pillars) and basic devices (such as the power supply and distribution devices, cooling devices, and sensors). You can drag and drop a device to deploy it in an equipment room, container, or smart module. You can also import devices and smart modules in batches.
- Cabinet planning: provides basic devices that can be installed in cabinets, including storage devices, network devices, collectors, UPSs, ATSs/STSs, sensors, fan boxes, power distribution boxes, and filler panels. During cabinet planning, you can drag and drop a basic device to deploy it in a cabinet. In addition, the basic devices in a cabinet can be added, deleted, modified, and migrated.
- Automatic view adaptation: After smart module is connected to the ECC800, the NetEco automatically creates a view for the smart module.

3.1.1.2.3 Association Policy

This feature allows you to flexibly customize association control requirements based on the input event, association policy algorithm, and output action.

- Event policy customization: supports generation of an event after operation using the received alarm or generated threshold alarm and counters.
- Counter operation event: supports generation of an event after comparison between the sum, average value, maximum value, or minimum value among multiple counters measured in the same unit for the same device and the configured threshold condition. The threshold condition includes equal, greater than, greater than or equal to, less than, equal to or less than, and not equal.
- Association policy customization: allows you to flexibly create association policies based on the configured event and action output. The action corresponds to a specific device control signal. One policy implements one or more actions.
- Policy implementation query: Provides the function of logging linkage policy configurations and allows users to query the policy implementation.

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3.1.1.3 Alarm Management

3.1.1.3.1 Alarm Browsing

The following introduces the browsing of current alarms, historical alarms, and masked alarms as well as redirection from an alarm page:

- **Browsing current alarms**
  - Alarm browsing: You can view changes in current alarms in real time, view alarm details, and directly switch to the device monitoring page to identify the device for which an alarm is generated. When the number of current alarms exceeds 20,000, the earliest alarms are converted to historical alarms.
  - Alarm severity: There are four alarm severities: critical, major, minor, and warning. Different alarm severities are indicated by alarm indicators with different colors.
    - Critical alarm: alarms that affect the entire system, endanger normal operation of the system, and require immediate handling. If the alarms are not handled, the system may break down.
    - Major alarm: board or circuit alarms that happen in a partial area. Alarms of this severity affect service quality of the system and need to be handled promptly. Otherwise, services will not operate properly.
    - Minor alarm: alarms that do not affect service quality of the system. However, you need to ask maintenance personnel to locate alarm causes promptly to eliminate potential faults.
    - Warning: potential faults that may affect system services. Handle warnings based on the actual situation.
  - Batch alarm operations: include alarm acknowledging, unacknowledging, clearing, locking, updating, and exporting.
  - Single alarm operation: alarm masking
  - Filter and query: The system lists all current alarms when no filter criteria are specified and provides multiple filter criteria. After a query or filter is performed, only new alarms meeting the filter criteria are displayed on the current page.
    - Alarm query by filter criteria: You can set filter criteria by filtering the alarm severity (critical, major, minor, or warning), acknowledging status (acknowledged or unacknowledged), clearing status (cleared or uncleared), alarm type (all, communication, device, or environment), alarm occurrence time (number of days or time period), and alarm source. You can add, modify, or delete the filter criteria.
    - Query alarms based on a specified field.
  - Column display setting: You can specify the columns to be displayed in the current list.
  - Export: You can export alarms as a CSV file.
- **Browsing historical alarms**
  - Browsing: You can browse historical alarms and view alarm details on the historical alarm page.
  - Sort: You can sort historical alarms and set sorting rules.
  - Filter and query: You can filter and query alarms by criteria such as device, alarm name, time, and alarm severity.
  - Column display setting: You can specify the columns to be displayed in the current list.

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  - Export: You can export historical alarm data as a CSV file.
  - Historical alarms cannot be edited or modified (to ensure data security and authenticity).
- **Browsing masked alarms**
  - Browsing: displays masked alarms in real time for you to view alarm details.
  - Filter and query: You can filter and query alarms by device, alarm name, time, and alarm severity.
  - Sort: You can sort masked alarms by combined criteria.
  - Column display setting: You can specify the columns to be displayed on the masked alarm page.
- **Redirecting to the alarm locating page**

  After viewing a current alarm, you can switch to the real-time overview page of the corresponding device to identify the device location.
- **Real-time alarm reminder**
  - The system supports real-time reminder by alarm sound. You can set the sound files (provided by the system) for critical, major, minor, and warning alarms, sound play duration, and enablement status. After alarm sounds are set and saved, the settings are applicable to all users.
  - Alarm information can be refreshed and displayed in real time. The total number of current alarms of different severities can be displayed independently.
  - Alarms of different severities are displayed in different colors on the topology and real-time monitoring pages.

3.1.1.3.2 Alarm Processing

The NetEco allows alarm acknowledgment and unacknowledgment, and manual and automatic alarm clearance. Users can rectify faults based on alarm clearance suggestions and the maintenance experience library.

- Alarm acknowledgment and unacknowledgment
  - Alarm acknowledgment: Alarms can be acknowledged. After an alarm is acknowledged, its status automatically changes to **Acknowledged**. Users can acknowledge alarms manually. In this situation, users can select and acknowledge alarms in the alarm browsing window.
  - Alarm unacknowledgment: Alarms that have been acknowledged can be unacknowledged. After an alarm is unacknowledged, its status changes to **Unacknowledged**.

NOTE

The NetEco records the operation time and operator information.

- Manual alarm clearance

  The NetEco allows users to manually clear specified alarms. After an alarm is cleared, the NetEco changes the status of this alarm to **Cleared** on the NetEco. Users can use this function to clear alarms that cannot be automatically cleared or alarms that users confirm to be cleared.
- Automatic alarm clearance

  After faults on a device or on the NetEco are rectified, an alarm clearance notification is reported to the NetEco. Then, the NetEco sets the state of the corresponding alarms to **Cleared**.
- Alarm clearance suggestions and expert maintenance experience library

Users can click the hyperlink in the alarm details window to obtain the online help. In the online help, they can view the impacts of alarms on the system, possible causes, handling suggestions, and troubleshooting experts' maintenance experience library, and add new handling methods to the experience library for closed-loop management and intelligent, simple, and traceable troubleshooting.

3.1.1.3.3 Alarm Setting

- **Alarm masking rule setting**

  You can browse, add, modify, delete, enable, or disable an alarm masking rule.

  You can create an alarm masking rule based on the effective date, device, alarm name, alarm duration, additional information, and location information.

- **Identification rule setting**

  Alarms that meet specified conditions can be set to the maintenance or invalid state. When monitoring or querying alarms, you can set filter criteria to filter out these alarms. This narrows down the alarm scope and improves alarm handling efficiency. For example, the alarms generated during commissioning can be set as the maintenance state, and other useless alarms can be set as the invalid state.

- **Alarm redefinition**

  You can redefine alarm names, types, and severities and specify devices for these settings to take effect.

- **Alarm correlation setting**

  If an alarm causes other alarms, you can set correlation rules to define the root and correlative relationships between the alarms. When monitoring or viewing alarms, you can filter out correlative alarms and focus on only the root alarms to be handled. By default, the version provides correlation rules in the mains outage scenario. You can customize more rules. A maximum of 1000 rules are supported.

- **Intermittent/Toggling rule setting**

  By creating this rule, you can discard intermittent or toggling alarms or display them in **Masked Alarms** to reduce the interference on O&M caused by a large number of repeated alarms.

- **Aggregation rule setting**

  If the same alarm or event is reported repeatedly, you can configure aggregation rules to aggregate the repeated alarms or events reported in a specified period to the same alarm or event. This reduces the impact of a large number of repeated alarms or events on O&M. When monitoring or viewing alarms, you can filter out original alarms that are aggregated and focus only on the alarms to be handled.

- **Event-to-alarm setting**

  You can set events of your concern as alarms so that you can monitor and view them on the **Current Alarms** page.

- **Alarm highlight setting**

  You can set a rule so that an alarm is highlighted in the alarm list if the alarm is not handled within a specified period (that is, the alarm status does not change).

- **Alarm sound setting**

  You can set the sound files (provided by the system) for critical, major, minor, and warning alarms, sound play duration, and enablement status.

  After alarm sounds are set and saved, the settings are applicable to all users.

- **Threshold alarm setting**

  You can set performance data thresholds for alarm generation.

- **Remote alarm notification**

  Remote notifications can be sent by SMS and email. You can customize the notification content template.

  You can create a notification sending rule based on the effective date, device, alarm severity, or alarm name, set the notification mode (SMS or email), and specify the recipients.

3.1.1.4 Performance and Report

3.1.1.4.1 Data Collection and Storage

The NetEco provides a device monitoring template for collecting key device data. After you create a device, the NetEco automatically generates data collection tasks and collects data based on the preset template.

Monitoring template settings

- You can modify or save the collection cycle and storage cycle in batches.
- The NetEco collects data of all signals.

3.1.1.4.2 Historical Data

Historical data of one specific counter in one specific period can be displayed by search criterion, such as management object or measurement object.

- **Historical data query**
  - Supports query by management object, counter, and time.
  - Supports historical data display in tables or line charts.
  - Supports performance data export to an Excel file.
- **Supplementary collection of historical data**

  The NetEco can automatically create a supplementary collection task to obtain performance data generated during disconnection. If the automatic supplementary collection task fails, you can manually perform the task.
- **Storage policy**

  The NetEco uses the InfluxDB database to store performance data. The system automatically deletes data based on the data retention policy of the InfluxDB database.

3.1.1.4.3 Reports

The NetEco provides multiple predefined reports and customized performance data reports.

- Performance reports

  You can customize performance reports
- Asset reports
  - Asset Quantity by Type Report
  - Asset Warranty Period Before Expiration Report
  - Asset Life Cycle Before End-of-life Report
  - Cabinet Inventory Report
- Capacity reports
  - Available Consecutive U Space for Customer
  - Capacity Usage Statistics Report

- Power consumption reports
  - Server Power Consumption Report
  - Server Power Consumption Trend Report
- Alarm report

  Alarm Severity Statistics Report
- Resource reports
  - Type Report
  - Device Real-Time Signal Inspect Report
  - Device Inventory Report
- Energy report

  Energy Efficiency Report
- **Report task management**
  - Reports can be displayed in pie charts, curves, and bar charts.
  - Reports can be exported as PDF, Excel, and CSV files.
  - You can set the storage space and customize the logo.
  - Reports can be automatically sent by email at a scheduled time (configurable).
- **Storage policy**

  The following data is stored: hourly report data of the past 120 hours, daily report data of the past 190 days, weekly report data of the past 104 weeks, monthly report data of the past 24 months, quarterly report data of the past 20 quarters, and yearly report data of the past five years.

3.1.1.5 Security Management

3.1.1.5.1 Video Integration Management

The NetEco can connect to IP cameras for integrating into the VCN video management system.

- The NetEco supports the following functions after being integrated into the VCN video management system:
  - Camera management: allows you to manage cameras by adding, deleting, modifying, or querying their information. You need to add a camera into the system if you want to query its real-time information.
  - Real-time viewing for one camera: allows you to view the picture in one of the cameras in real time.
  - Real-time viewing for multiple cameras: allows you to view the pictures of one, four, six, eight, or nine cameras at the same time.
- Visual management can be implemented for cameras in the equipment room view.

3.1.1.5.2 Access Control Authorization Management

You can create, set, and manage users and rights groups. You can also monitor access events.

- Access user management: For example, you can create an access user, import users in batches, and modify, delete, and authorize users.
- Access rights group management: For example, you can add, modify, delete, synchronize, and grant access rights.

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- Access control management: For example, you can create, view, modify, and synchronize access control devices. The system supports remote door opening and closing, alarm generation for unauthorized door opening, and door open delay setting.
- Event management: Monitors various events, including access records and event records. You can view, export, and search for events. Events are saved for one year.
- Access control management at the equipment room, channel, and cabinet levels
- Access control devices of smart module 2.0 or smart module 3.0 support automatic discovery.

3.1.1.5.3 Diversified Access Control Authentication Modes

The NetEco supports card, password, and fingerprint authentication modes and their combinations.

- User fingerprints can be recorded and delivered.
- The NetEco supports the following authentication modes: **Card**, **Dual cards**, **Fingerprint**, **Card + password**, **Card + fingerprint**, **Fingerprint + password**, **Card + password + fingerprint**, and **Card or Password or Fingerprint**.

3.1.1.6 Large-Screen Display

This feature applies when the following information needs to be displayed on a large screen:

- Monitoring views: layout, power transformation and distribution topology view, and chiller group control topology view.
- Alarms: device alarm statistics by quantity and current alarm statistics by severity.
- Energy efficiency analysis: energy consumption change curve, power usage effectiveness (PUE) change trend, real-time energy efficiency data, and daily energy consumption.
- Capacity: real-time capacity data.
- Battery: state of health (SOH), state of capacity (SOC), and other information of cells and battery strings.
- By default, the following resolutions are supported: 1280 x 1024, 1366 x 768, 1600 x 1200, 1680 x 1050, and 1920 x 1080.
- The number of split screens supported is as follows: 1 x 1, 2 x 2, 3 x 3, 4 x 4, and 5 x 5.

3.1.1.7 Availibility Management

3.1.1.7.1 Power Supply Link Management

The NetEco displays the status of the power distribution link in an end-to-end manner and provides the power distribution logic analysis capability, facilitating emergency handling.

This feature applies to emergency handling for large data centers and daily power distribution management.

- Power supply and distribution link of a smart module:
  - Automatically generates power supply links for Huawei-developed smart modules and displays the entire power distribution link from the mains to each cabinet.
  - Allows you to display or hide the power distribution link of some cabinets to facilitate query.
  - Displays the number and severity of current alarms for each power distribution node.

  - Displays real-time KPIs of each power distribution node, the status of each power distribution switch, and the power flow direction (in a dynamic flow diagram).
  - Supports fault analysis based on the power distribution link. When a fault occurs, the NetEco can intelligently analyze and associate related alarms. For example, when the mains input of a Huawei integrated UPS is powered off, alarms can be automatically correlated, and correlative alarms of each output branch are automatically shielded to highlight the root alarm.
- Power supply and distribution link of a data center:
  - Supports view configuration to display the entire power distribution link from the mains to each PDC based on the power distribution topology of the project.
  - Displays real-time KPIs of each power distribution node and the power flow direction (in a dynamic flow diagram).
  - Displays the number and severity of current alarms for each node.
  - Provides a power distribution component library for you to select various components when drawing a power supply and distribution link. The components include the UPS, PDC, ATS, generator set, power distribution route, and circuit breaker.

3.1.1.7.2 Cooling Link Management

The NetEco displays the operating status of the cooling system in an end-to-end manner, which facilitates emergency handling and fault locating.

This feature applies to routine monitoring and troubleshooting of data centers.

- Cooling link of a smart module
  - Automatically generates cooling links for Huawei-developed smart modules and displays the cooling system running panorama of a single smart module.
  - Displays the layout of air conditioners and cabinets in the smart module so that you can know which cabinets are affected when an air conditioner is faulty.
  - Displays the operating status of the indoor and outdoor units of each air conditioner, and dynamically displays the air inlet and outlet directions of an air conditioner.
  - Displays the average temperature and humidity of the cold aisle in the smart module as well as the outdoor temperature.
  - Displays the number and severity of current alarms for each device.
- Chilled water system topology
  - Supports view configuration to display the entire link of the chilled water system based on the chilled water system topology of a project.
  - Provides a cooling component library for you to select various components when drawing a cooling system topology diagram. The components include the chiller, cooling tower, chilled water pump, cooling pump, air conditioner, valve, and pipe.
  - Displays real-time KPIs of each cooling node, the start/stop status of each node, and the supply and return water temperatures.
  - Displays the chilled water flow direction in a dynamic flow diagram.

3.1.1.7.3 Battery Management

The battery management function enables you to know the battery string working status, battery string capacity, battery voltage, internal resistance, temperature, SOC, and SOH in real time to detect battery faults in a timely manner.

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- SOH: monitors the SOH, SOC, voltage, and current of battery strings, and displays the SOH, SOC, voltage, current, temperature, and internal resistance of cells in bar graphs and tables.
- Historical data query: displays the SOH, SOC, voltage, and current of battery strings as well as the SOH, SOC, voltage, current, temperature, and internal resistance of cells in tables and curves.
- Discharging curve: displays the discharge voltage of each battery string in tables and curves.

3.1.1.8 Distributed deployment

Three servers are deployed in distributed cluster mode. If one server is faulty, the other two servers can provide services.

3.1.1.9 System Management

3.1.1.9.1 System Security Management

System security is the service focus, including customer network and system maintenance security.

The NetEco system security includes the following:

- Network security: The network transmission is encrypted. The web can access the server in HTTPS mode to defend against denial of service (DoS) attacks.
- Operating system security: You can use Huawei security hardening tools to customize security policies for the NetEco server to improve operating system security. You can use Nmap to scan ports, Nessus to scan vulnerabilities, Codenomicon to test protocol robustness, AppScan to perform web security tests, and NGS Auditor to scan database security to ensure that no high-risk vulnerability exists in the product. The operating system patch can be updated periodically, and sound patch maintenance and release processes are available.
- Protocol and port security: A secure protocol is used between the NetEco and the controller. A two-way authentication mechanism is added.
- Product development, release, and installation security: Before product release, five types of mainstream antivirus software (Symantec, Trend Micro OfficeScan, McAfee, Avira AntiVir, and Kaspersky) are used to scan NetEco 6000 version for viruses. The integrity of the software package can be verified to prevent the software package from being maliciously tampered with.
- Database security: The security of the database is hardened to protect the database service. The database patch can be updated periodically, and sound patch maintenance and release processes are available.
- Sensitive data protection: Sensitive data is encrypted using secure encryption algorithms to prevent unauthorized disclosure and ensure that data content cannot be obtained by unauthorized entities or individuals.
- System management and maintenance security: Complete hardening tools and measures are provided to support system security hardening. A complete port matrix is provided and all used ports are manageable. Complete security related materials are available to provide guidance on network design and deployment as well as system maintenance.

3.1.1.9.2 Rights- and Domain-based Management

This feature provides role-based user management functions such as adding, deleting, and modifying users as well as assigning user rights to implement centralized user management

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and authentication. Management is divided into two types: device and operation. Device rights and operation rights are assigned to users as required.

- **Centralized user management and authentication**
  - You can add and delete users, and bind user roles and access policies.
  - Centralized authentication with the LDAP server is supported.
- **Role management**
  - Role-based management is supported.

    A role is a group of users who have the same management objects and operation rights. The NetEco assigns rights to roles, and then to users based on the binding relationship between roles and users. One user can be bound to multiple roles.

    Example: If user a needs to have the rights to view or edit equipment room 1 and view equipment room 2, assign the corresponding rights for equipment room 1 and equipment room 2 to roles A and B and bind user a to roles A and B.
  - Role management allows you to assign rights to management objects by subnet and device. You can assign operation rights by network management function.
  - You can add, delete, and modify roles, and copy operation rights and management rights of roles.

3.1.1.9.3 Access Security Management

This feature allows you to set security policies for the NetEco system based on security requirements. The security policies include password policies, account policies, access control lists, mobile terminal login access control, and online user management. You can also assign corresponding access control rights to roles and bind roles to specific users.

- **Security policy**

  The password policies that can be set include the following:
  - Number of historical passwords from which the new password must be different.
  - Maximum number of occurrences of a character in a password.
  - Minimum number of characters that a password contains.
  - The password must contain at least one of the following special characters: !"#$%&'()*+,-./:;<=>?@[\]^`{_|}~ and space.
  - Minimum password change interval (minutes).
  - Forcible password expiration policy: password validity period (days) and the number of days in advance users are notified that the password is about to expire.
  - Validity period of the initial password, in hours.
  - SMS or email notification sending when a user is created or a password is set.

  The account policies that can be set include the following:
  - Minimum account length
  - Disabling accounts if not used for specified consecutive days
  - Lockout upon consecutive login failures
  - Time range for consecutive login
  - Account lockout threshold
  - Account lockout duration (or permanent lockout)
- **Online user management**

You can view the status of all online users of the NetEco in real time. The user name, login IP address, login time, and role group are displayed. The security administrator can forcibly log out specified users.

- **Access control list**

  You can add, modify, or delete the NetEco access control list. You can add the list in two ways: specify the time range for access or specify the start IP address and end IP address. The security administrator can forcibly log out specified users.

3.1.1.9.4 Log Management

This feature allows you to query the operation logs, system logs, and security logs of the NetEco.

The NetEco allows you to manage NetEco logs, including the operation logs, system logs, and security logs.

- **Operation logs**

  Operation logs record the information about all user operations, including the operation name, risk level, user, time, source, operation client, operation object, operation result, and other details.

- **System logs**

  System logs record the system running information, including the basic information, risk level, time, source, operation result, and other details.

- **Security logs**

  Security logs record the events that affect the system security, including account management events, account login events, system events (system restart or shutdown, or other events that affect the system security or security logs), and resource access events. Security logs record information including the operation name, risk level, user, time, operation client, operation object, operation result, and other details.

- **Storage policy**

  When the database space usage reaches the threshold (default value: 70%), logs are dumped. The dump files are stored for 15 days by default. Logs can also be dumped by storage period. When the database space usage or log storage period reaches the threshold, logs are dumped. Both the database space usage and log storage period thresholds are configurable.

3.1.1.9.5 Data Backup and Monitoring

This feature allows NetEco databases and files to be backed up and restored.

This feature provides data backup and restoration for NetEco system files and applications. The backup data is stored in the specified backup directory of the NetEco server disk.

The NetEco supports manual backup and automatic backup.

- Manual backup: You can back up data on the graphical user interface (GUI) of the maintenance tool.
- Automatic backup: The NetEco backs up data automatically every day.
- Storage policy: Data manually or automatically backed up is saved for two days.
- Manual restoration: You can restore data on the GUI of the maintenance tool.

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3.1.1.9.6 Maintenance Tool

The NetEco provides a web-based maintenance tool to monitor the running status of the NetEco server and upgrade the system.

The maintenance tool is required during delivery or system upgrade.

3.1.1.9.7 Software and Hardware Environments and Common Functions

Software and hardware environments as well as basic services and management functions including online help and license management are provided to ensure normal running of the NetEco.

- **Software and hardware environments**
  - The following Huawei servers can be used: TaiShan 200.
  - A common PC can be used as a client to access the NetEco, latest Chrome(Stable Channel) and Firefox (ESR Release) are recommended, To ensure data transmission security, the NetEco supports encrypted transmission using HTTPS.
- **Online help**

  The NetEco provides abundant online help functions.
- **License management**
  - Controls authorization of optional functions and network resource capacity using licenses. The NetEco license consists of the function control item and resource control item. You can view the license authorization information and remotely update the license file.
  - Function control item: Optional NetEco features that are authorized and controlled by function.
  - Resource control item: NetEco features that are authorized and controlled by resource as well as resource capacity that can be managed and the number of resources that have been used. If the number of network resources managed by a resource control item exceeds the limit of the license, a NetEco alarm will be triggered.
- **Disk redundancy backup**

  TaiShan 200(Model 2280) server supports local disk RAID1+RAID10 (2 x 1200 GB+8 x 1800 GB) for redundancy backup.

3.1.2 Optional Feature

3.1.2.1 3D Monitoring View

The NetEco displays the real-time running status of equipment rooms and devices in a 3D view.

- **Hierarchical 3D view:**
  - Supports 3D views of various data center layers including buildings, floors, smart modules, and cabinets to display the device layout, alarm information, and running status.
  - Displays the IT devices in the cabinet and the temperatures at the front and rear of the cabinet in the cabinet 3D view.
  - Allows you to click to enter the 3D view of the next layer.
  - Allows you to click to switch between 2D, 2.5D, and 3D views.

- **Operations in a 3D view:**
  - Allows you to perform common operations in a 3D view, such as zooming in or out a view, fitting a view to window, and rotating a view.
  - Allows you to make equipment room walls transparent to highlight key information.
- **Centralized KPI display:**
  - Displays the KPIs of the equipment room and smart module, including the capacity, energy consumption, alarms, environment parameters, and O&M index.
  - Displays the space, power distribution, and cooling capacity of each cabinet in a 3D view.
  - Displays the number and severity of current alarms for each device.

3.1.2.2 Temperature Map Management

The NetEco displays the overall temperature distribution of the equipment room in a temperature map.

- The temperature map can be displayed in a 2D or 3D view.
- Temperature distributions on top, middle, and bottom horizontal planes of cabinets are analyzed.
- The map displays the temperature of the point where the pointer is placed as well as the information about the device at the point.
- Top 5 temperature points (overheat points and supercooling points) are analyzed.

3.1.2.3 Mobile App Management

The NetEco provides a mobile app for you to view alarm, performance, energy consumption, and resource data of data centers.

- **Viewing a management domain**

  You can query the alarms, energy consumption, monitoring data, and resources of devices in a management domain, such as a park, equipment room, container, or smart module.

  You can also query the PUE and energy consumption proportion of a management domain and analyze the PUE trends.
- **Alarm browsing**

  You can view current and historical alarms and the alarm details and set automatic alarm update.
- **Device monitoring**

  You can monitor the running status of devices in the power supply and distribution, cooling, cabinet, and environment systems and query alarm distribution, device details, and alarm details.
- **Viewing resource information about a management domain**

  You can query the space, power, and cooling resources in a management domain created on the NetEco, such as a service equipment room, high-voltage power distribution equipment room, low-voltage power distribution equipment room, substation and power distribution equipment room, electric battery room, generator room, cooling room, or container.

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3.1.2.4 O&M Activities

3.1.2.4.1 Electronic Inspection Management

This feature digitizes inspection tasks, processes, and activities. The management system instead of the manual inspection approach is used to formulate, dispatch, execute, and evaluate the entire inspection. The digital maintenance template is used to standardize the field inspection process, improve the inspection quality, identify security risks in advance, and facilitate tracking and management.

For daily routine inspection of data center infrastructure:

- **Inspection configuration**
  - Customize inspection routes and points: The QR code is bound to the inspection device or area. You can edit the inspection sequence.

  - Scheduled and automatic generation of inspection tasks
  - Automatic receiving of inspection tasks by mobile phone app
- **Automatic meter reading**
  - The inspection personnel scan the asset bar code or QR code label on the device panel or at the entrance of an area.
  - The app automatically displays the device information and inspection items. The inspection data on the app is automatically recorded on the NetEco.
  - Each device is a patrol point. This ensures that the inspection personnel do not omit any inspection item. The inspection personnel cannot submit the inspection information on the app if any inspection item is omitted.

- **Inspection report**
  - The inspection personnel submit the inspection result.
  - The NetEco generates inspection reports in one-click mode and automatically collects statistics on inspection items whose results are abnormal.

For routine O&M management of large data centers:

- The inspection plan can be customized and automatically dispatched. The inspection plan includes the inspection frequency, date and time, inspection personnel, start time and end time, and approval status of the inspection plan.
- Problems that cannot be handled temporarily during inspection on the app need to be recorded and manually created after being reviewed by maintenance engineers.

3.1.2.4.2 Conserve Inspection

This feature applies to routine O&M management of large data centers.

- Maintenance task configuration
  - Allows you to configure the device maintenance plan and tasks for key infrastructure to specify information including the execution time, owner, and maintenance content.
  - Supports scheduled generation of device maintenance tasks and delivery to specified owners.
- Mobile maintenance execution
  - The electronic maintenance app is supported. The app is provided for the service provider to fill in the maintenance content. Key information needs to be manually entered.
  - Allows you to view and approve created, completed, and to-do maintenance tasks.
  - Allows you to view the current notification tasks to learn the execution progress of maintenance tasks.
- Maintenance statistics and calendar
  - Collects statistics on the execution of maintenance tasks by day, week, or month, including the total number of tasks, the number of completed tasks, and the number of pending tasks.
  - Provides a maintenance calendar for you to collect statistics on and view maintenance tasks that need to be performed at each time point.

3.1.2.4.3 Electronic Drill Management

This feature applies to routine O&M management of large data centers.

- Emergency drill plan
  - Allows you to configure yearly and quarterly data center emergency drill tasks and specify the execution time, owner, and content.
  - Supports scheduled generation of emergency drill tasks and delivery to specified owners.
  - Allows you to upload attachments such as Word and Excel files to an emergency drill task to guide the emergency drill.
- Emergency drill tracking
  - Allows you to view created, completed, and to-do emergency drill tasks.
  - Allows you to view the current notification tasks to learn the execution progress of emergency drill tasks.
  - Automatically generates data center emergency drill reports.
- Emergency drill statistics

  Collects statistics on the execution of emergency drill tasks by day, week, or month, including the total number of tasks, the number of completed tasks, and the number of pending tasks.

3.1.2.4.4 Process Management

This feature applies to routine O&M of large data centers.

- Event management
  - Allows you to create different types of event work orders and define event work order levels.
  - Supports the approval and handling of event work orders by level. You can specify an owner for each phase and transfer the owner.
  - Allows you to view to-do and processed event work orders as well as notification tasks.
  - Collects statistics on the total number of event work orders and the number of completed, to-do, and expired event work orders by time segment.
- Change management
  - Allows you to create different types of change work orders, including standard, urgent, and major changes.
  - Supports the approval and handling of change work orders by level. You can specify an owner for each phase and transfer the owner.
  - Allows you to view to-do and processed change work orders as well as notification tasks.
  - Collects statistics on the total number of change work orders and the number of completed, to-do, and expired change work orders by time segment.
- Problem management
  - Allows you to create different types of problem work orders and define problem severities.
  - Supports the approval and handling of problem work orders by level. You can specify an owner for each phase and transfer the owner.
  - Allows you to view to-do and processed problem work orders as well as notification tasks.
  - Collects statistics on and analyzes problem work orders, and collects statistics on the total number of problem work orders and the number of completed, to-do, and expired problem work orders by time segment.
- Process configuration
  - Allows you to customize configuration processes, add process types, or adjust process nodes in existing processes.
  - Allows you to import and export process configuration files, simplifying configuration.

3.1.2.4.5 Risk Management

This feature applies to routine O&M management of large data centers.

- Allows you to create a risk work order by the app.
- Allows you to customize SLA elements such as the approver, owner, and deadline of the risk work order.
- Allows you to browse and query risk items and status.
- Allows you to close risk work orders for closed-loop management.

3.1.2.4.6 Repair Management

This feature applies to routine O&M management of large data centers.

- Device repair tracking
  - Allows you to create device repair work orders, and sends the work orders automatically to specified owners at the scheduled time.
  - Allows you to customize the content of device repair work orders and record repair instructions and suggestions.
- Device repair statistics

  Collects statistics on the device repair progress by period, including the total number of tasks and the number of completed tasks.

3.1.2.4.7 Knowledge Base

This feature enables data center O&M knowledge and experience to be recorded, queried, and shared. It provides a knowledge base for Huawei-developed devices and a knowledge base maintained by users.

This feature applies to routine O&M of data centers.

- Provides guidance on troubleshooting and maintenance of Huawei-developed devices.
- Allows you to customize O&M knowledge, upload various device operation guides and typical cases to the expert knowledge base, and use the supervisor approval mechanism to control knowledge release.
- Allows you to comment on, share, favorite, and reference O&M knowledge items, and quickly search for O&M knowledge items based on keywords.
- Allows you to manage O&M knowledge items by group (a group provided by default, such as the power supply and distribution system or HVAC system group, or a customized group).

3.1.2.4.8 Personnel and Shift Scheduling Management

This feature allows you to manage the information and shift scheduling of data center personnel and formulate an O&M plan.

This feature applies to routine O&M of data centers.

- Allows you to manage personnel information, including basic information (such as name and age), position information, contact information, and group to which O&M personnel belong.
- Allows you to set groups and shifts based on personnel information and add O&M personnel to or remove O&M personnel from existing groups.
- Supports shift scheduling management and provides a calendar for you to quickly view shifts and set the on-duty and off-duty time for each group.
- Allows you to create and record the shift handover content and submit the content to the personnel on the next shift. The NetEco collects statistics on and analyzes shift handover exceptions.

3.1.2.5 Asset Management

3.1.2.5.1 Asset Inventory

This feature allows you to manage the information and status of data center assets.

- **Asset inventory**
  - Basic operations: You can track and manage the status and attributes of assets, including IT devices and infrastructure in IT racks and warehouses. You can add, delete, and modify asset items. You can also import an Excel file to create asset items in batches.
  - Predefined IT device model library: allows you to clone a new model based on an existing IT device model.
  - Asset attribute customization: allows you to add attribute fields.
- **Asset search**

  Information such as asset and resource usage of devices is required for routine operation and maintenance of equipment rooms. For example:
  - Before troubleshooting a faulty device, you need to obtain the device location so that the faulty device can be located for local maintenance.
  - Before changing a device, you need to obtain the device location to prevent misoperations, which may cause other devices to become unavailable.
  - You can search all assets using various search criteria, such as an asset name, serial number (SN), or owner, for the required devices and installation positions.
  - **Model management**

    The NetEco provides the model management function to manage asset categories, device models, and asset attributes.

    Category management: **Facility**, **IT Device**, **Telecom Equipment**, and **Office Device** are default level-1 categories, and categories of common subdevices are provided under **Facility** and **IT Device**. You can customize a maximum of three levels of categories under a level-1 category. You can create an asset of a preset or customized asset category and manage the asset.

    Model management: allows you to manage asset manufacturers and models. You can create and manage device models based on preset or customized asset categories.

    Asset attribute management: The system presets standard attribute information for assets. You can customize asset attributes according to service requirements. You can also define group information for attributes and display asset attributes by group under **Asset Inventory**.

    Customer management: defines customer information. Customers are classified into internal customers and external customers. You can manage customer attribute information about assets.
  - **O&M information display**

    During the life cycle of an asset, you need to perform O&M management on the asset. The overview information about four types of O&M-related work orders (risk, change, problem, and maintenance work orders) is displayed in the device details under **Asset Inventory**. This function requires the IT O&M license.
  - **QR code scanning**

    The mobile app provides the asset scanning function. By scanning the QR code of an asset, you can easily view the key attributes about the asset.
  - **Implementation principles**

    Asset management functions are based on the configuration management database (CMDB). The CMDB records all data of assets and provides an internal Restful interface for invoking by functions. The CMDB records the following asset information:

i. Tracking information: SN, asset name, asset label, asset owner and department, and maintenance information

ii. Device specifications: dimensions, weight, and power

3.1.2.5.2 Component Management

This feature allows you to manage the component information about assets.

The asset management module manages component information of infrastructure devices and provides basic data for O&M and management of components.

3.1.2.5.3 Asset Audit

Cabinet asset audit: The U space manager collects onsite data and compares the collected data with the data in the NetEco database to generate an audit report. The report includes the overview information and details about the assets in normal and shortage states.

Warehouse asset audit: audits the devices, spare parts, tools, and consumables in the warehouse and generates an audit report.

- **Audit plan**

  In most cases, the O&M manager develops the annual audit plan, and O&M engineers perform audit according to the plan. There are two types of audit plans: one-off and monthly.

- **My to-do**

  When the audit plan execution time arrives, the NetEco automatically creates audit tasks. In the to-do task list of O&M engineers, the O&M engineers can view the audit tasks to be processed.

- **Audit handling**

  O&M engineers handle audit tasks. An O&M engineer exports the devices to be audited, performs onsite audit, and records the audit results in the system. The audit is finished and an audit report is generated.

- **Audit using the mobile app**

  The NetEco mobile app provides the asset audit function. You can view audit tasks, audit summary, and list of audited assets on the app. You can audit assets manually or by scanning codes. For high-value assets, you can also take and upload pictures to further ensure a standard audit process and accuracy of audit data.

- **Audit history**

  The audit history records the audit results of closed audit tasks. You can download historical audit reports to an Excel file.

3.1.2.5.4 Asset Change

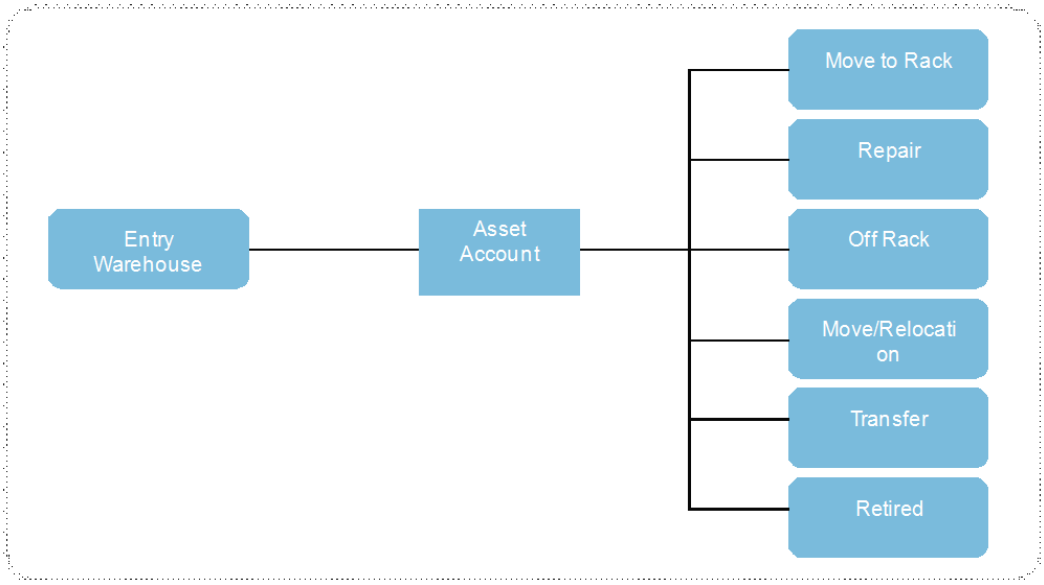
This feature enables you to manage changes in data center assets.

Asset change

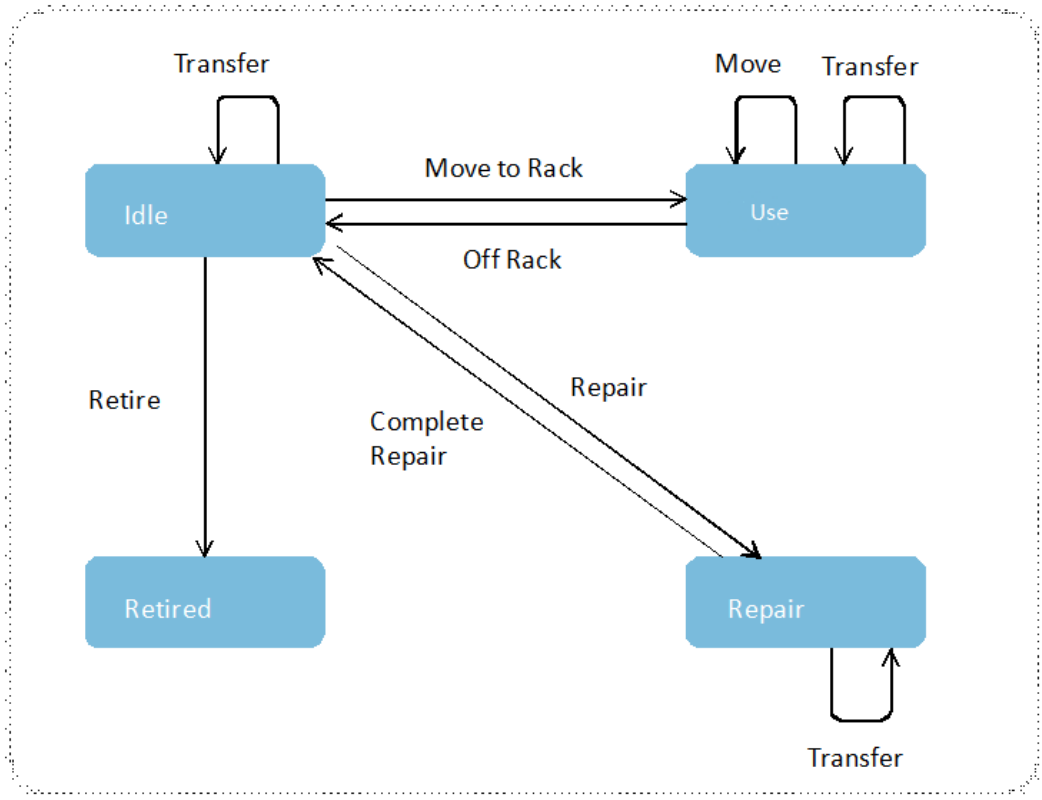
Device assets are changing during the entire life cycle. Status and attributes of device assets may change. Change management allows you to track the status of assets.

During the life cycle of assets, asset change is classified as follows:

Asset changes include allocation, unallocation, and moving. Theses changes affect the capacity of the data center.



Asset status is classified into four types: in use, idle, in maintenance, and retired. The following figure shows the relationship between asset status and change.



3.1.2.5.5 Asset View and Report

The NetEco provides asset overview and statistics by category as well as asset reports.

This feature applies to asset statistics scenarios.

- **Asset analysis**

  Assets are analyzed from the following four aspects:

- IT device quantity and usage status statistics
- Number of IT devices and infrastructure devices
- IT device allocation trend
- Maintenance and life cycle information of IT devices and infrastructure devices

The NetEco collects statistics on the quantity, usage status, maintenance status, and service status (beyond the life cycle) of assets, providing important support for safe and efficient running of assets.

- **Asset report**

  Device reports can be generated by specified range (such as equipment room or floor) or device type. The following reports can be generated:

  - IT asset report whose content is collected by device type
  - Infrastructure asset report whose content is collected by device type
  - Asset maintenance status report
  - Asset life cycle expiration report
  - Cabinet asset report

3.1.2.5.6 Spare Parts Management

The feature provides overview inventory information about spare parts and consumables, allows users to query the information such as inventory quantity and location of spare parts and consumables by (but not limited to) type, and is associated with processes such as spare parts pickup.

- Allows you to manage the spare parts of IT and infrastructure devices. For example, you can warehouse and ex-warehouse spare parts.
- Provides processes such as spare parts warehousing and pickup to manage the inventory changes of spare parts and consumables and improve the standardization of the management process and the accuracy of inventory data.
- Supports real-time collection of inventory statistics and provides a message for spare parts and consumables with insufficient inventory, consumables whose validity period is about to expire, and spare parts and consumables that have been out of the warehouse for a period about to expire.
- Allows you to manage the categories and models of spare parts and add or delete the attributes of various spare parts.

3.1.2.5.7 Tool Management

This feature provides the equipment room infrastructure tool overview information, allows users to query the inventory location and pickup status of tools by (but not limited to) type, and is associated with processes such as tool borrowing and return.

- Allows you to manage the warehousing, borrowing, and return of data center O&M tools and associate with tool borrowing applications.
- Allows you to query the number, type, and location of tools in the warehouse.
- Allows you to categorize tools and add or delete the attributes of various tools.

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3.1.2.6 Capacity Mangement

3.1.2.6.1 Capacity Visualization

The NetEco collects statistics on and analyzes the used and remaining capacities of the space, power, cooling, and network (SPCN) in an equipment room, and generates KPI dashboards and reports.

This feature applies when you need to assess the current capacity usage for the equipment room and learn the capacity growth trend. If capacity usage is low, you need to strengthen promotion efforts and reduce costs. If capacity usage is high, you need to consider capacity expansion for the equipment room.

This feature applies when you need to learn the capacity usage of each room and cabinet. The capacity usage of rooms and racks can facilitate the planning of available or preferred rooms or racks for new services.

This feature provides the following functions:

- **Capacity KPI dashboard**

  The KPI dashboard can be generated by specified scope (such as equipment room or floor). The dashboard contains the following information:

  - Capacity usage (space: cabinet, U space, power, and cooling)
  - Capacity usage trend
  - Capacity warning: The system warns users of the capacity usage that exceeds the threshold. The threshold is user-defined.

- **Setting the cabinet capacity threshold**

  You can set capacity thresholds for elements such as space (cabinet space and U space), load bearing capacity, power, and network ports of a cabinet. A message is displayed if the capacity threshold is exceeded. The default capacity threshold is 60% (for Warning) and 80% (for Critical).

3.1.2.6.2 Capacity Allocation

This feature provides you with suggestions on device allocation in an IT equipment room based on SPCN and tracks the whole process of allocation and unallocation.

This feature applies to IDCs and enterprise data centers (EDCs) where IT services are brought online.

If you want to bring new services online, you need to install new IT equipment such as ARM servers in a vacant cabinet. Before installing the IT devices, you can use management software to plan the cabinet or U space, and determine the installation position based on IT device requirements of space, power, and ports. Install other devices in the planned installation position.

- **Guidance for device allocation**
  - Cabinet capacity checking: You can check capacity usage of each cabinet in the equipment room or cabinet view and obtain the information of cabinet quantity and location. You can perform the following operations about cabinet capacity:
    - View cabinet capacity information (space, power, cooling, and network).
    - View connections between racks (power and network connections).
    - Set capacity threshold of racks (power, space, load bearing capacity, and network ports).

- Design of device allocation: You can simulate the process of allocation as required and obtain information of available locations, instructions, and capacity changes. You can perform the following operations about device allocation design:
  - Set cabinet locations and configure power and network connections.
  - Update the cabinet capacity based on the result of device allocation.
- Work order of device allocation: A work order is generated automatically based on the design result of allocation. You can perform the following operations about the work order.

- **Searching for the optimal cabinet location**

  You can search for information of available racks, such as the cabinet location and available U space, in specified equipment rooms or areas based on the number of devices to be allocated and capacity requirements. The available cabinet should satisfy device allocation requirements of space, power, cooling, and network. You can perform the following operations about the search:
  - Search multiple servers and cabinets at the same time.
  - Search racks considering factors such as U space, power or network ports, power supply, and load bearing capacity.
- **Device connections**

  Asset connection: You can manage connection between different devices, including power and network connection as well as port connection on devices. Management of power connection applies between the RPDU and IT equipment, and management of network connection applies between server/storage systems and LAN switches.

3.1.2.6.3 Automatic Capacity Identification (U Space)

The NetEco automatically collects statistics on U space usage in real time based on the U space detection bar and radio frequency identification asset label.

- **Precise U space management**

  You can precisely manage capacities.
- **Asset binding**

  You can use the NetEco app to bind the device SN to the radio frequency identification asset label. This feature is used to bind a U space label to an existing asset in the resource inventory.
- **Asset check**

  You can use the NetEco app to check the consistency between the device SN and the radio frequency identification asset label. If the information is inconsistent, use the app to modify the information.
- **Asset entry**

  You can use the NetEco app to enter the asset information, and record the radio frequency identification asset label, (optional) SN, device type, model, and location in the asset inventory.

3.1.2.6.4 Capacity Report

The following capacity reports can be generated by specified scope (such as equipment room or floor) and time:

- Capacity usage report
- Capacity change report

3.1.2.7 Tenant Management

3.1.2.7.1 Sales-Oriented Resource Allocation

The NetEco enables you to allocate white space, cabinet, or U space resources to specified tenants in the colocation scenario. Allocated resources cannot be used by other tenants.

This feature applies to customers' cabinet leasing in the colocation scenario. When an IDC carrier signs a contract with an IDC tenant, the IDC carrier can pre-allocate or allocate resources to the tenant to ensure that the resources are not occupied by other tenants.

- Cabinet/U space reservation
  - Cabinet and U space resource reservation and occupying are supported for the business model (whole tenancy by cabinet and shared tenancy by U space) in the colocation scenario.
  - Cabinet resources can be reserved for external or internal customers. Customers are classified into internal and external customers.
  - Based on the reservation and occupying mechanism of racks and U space, racks can be classified into the following types: open, reserved, closed, and internal.
    - Open: the number of cabinets for leasing
    - Reserved: the number of cabinets reserved for potential customers
    - Closed: the number of leased cabinets
    - Internal: the number of cabinets for use by internal customers
- White space leasing
  - White space resource reservation and occupying are supported for the white space leasing business model in the colocation scenario.
  - Cabinet resources can be reserved for external or internal customers. Customers are classified into internal and external customers.
  - Based on the area reservation and occupying mechanism, areas can be classified into the following types: open, reserved, closed, and internal.
    - Open: the number of areas for leasing
    - Reserved: the number of areas reserved for potential customers
    - Closed: the number of leased areas
    - Internal: the number of areas for use by internal customers
- Reservation and occupying validity period management
  - The NetEco manages the reservation validity period and displays a message when the validity period expires.
  - The NetEco manages the validity period of an order and displays a message prompting you to process the expired resources when the validity period expires.

3.1.2.7.2 Management-Oriented Operation Analysis

This feature applies to the management of tenants' rented resources (equipment room, cabinet, and U space) for you to understand the running status and meet customer SLA requirements.

Tenant Value Analysis

- Trends of lease rate and customer development

  Trends of lease rate and customer development are important indicators that reflect the operation of a data center. The analysis helps managers to formulate operation policies.

This feature allows you to analyze the leasing status and leasing trends of areas, cabinets, and U spaces to learn resource leasing.

- Customer value migration

  The four quadrant analysis method is used to analyze high-value customers in terms of scale and power concurrent-usage coefficient. This feature allows you to identify high-value customers (in terms of scale and power concurrent-usage coefficient), analyze sources for profits, and focus on key services. Based on the analysis of industry characteristics, the actual cost estimation can be provided during bidding.

3.1.2.7.3 Service Operation-Oriented Statistical Analysis

This feature allows you to manage equipment room resources by tenant or contract and provides statistical analysis.

Tenant reports

- Tenant power consumption report

  You can query cabinet energy consumption reports by hour, day, week, or month. You can specify a period for querying daily, weekly, and monthly reports, to collect statistics on cabinet power consumption in different periods and analyze energy saving based on period-based energy consumption statistics.
- Tenant asset report

3.1.2.8 Energy Efficiency Management

3.1.2.8.1 PUE Calculation and Display

This feature allows the assessment of the data center PUE by multiple indicators.

- **Hierarchical energy consumption assessment**

  In the power distribution view, you can customize energy consumption nodes as required to collect energy statistics on power consumption of different management objects, such as campus, floor, equipment room, smart module, containerDC, netecoSite, container and building, and assess PUE in multiple dimensions. PUE threshold alarms are supported.
- **PUE-related content displayed on the dashboard**
  - Total energy consumption, IT energy consumption, PUE, and data center infrastructure efficiency (DCiE).
  - PUE trends.
  - Power utilization efficiency, local electric energy utilization efficiency, cooling/power supply load coefficient, and so on.

3.1.2.8.2 E2E all-electrical link display

The NetEco calculates and displays the cPUE and pPUE of all links in the data center, and displays abnormal energy consumption.

- Supports the configuration of energy consumption links based on the actual designed links of the data center, and calculates and displays the cPUE of each key component group, including the transformer group, UPS group/HVDC group, and chiller; calculates and displays the pPUE of the equipment room group and smart module.
- Provides the cPUE and pPUE reference ranges (user configurable).
- Displays an alarm if the cPUE or pPUE value exceeds the reference value.

3.1.2.8.3 Energy Consumption Monitoring and Display of IT Devices

This NetEco collects and analyzes the energy consumption of servers through monitoring to find out Top N energy-consuming devices.

Power consumption of devices needs to be analyzed and optimized to achieve energy saving goals set for equipment rooms.

- **Server energy consumption report**
  - This feature allows you to generate the server power consumption report that contains the average power consumption, peak power consumption, and owner of each server within a specified period.
  - The minimum period of energy consumption data collected in reports is 1 hour.
- **Server power trend diagram**

  This feature allows you to generate the power trend diagram for a specific server.

3.1.2.9 Energy Efficiency Optimization

3.1.2.9.1 Water-cooled System Cooling Optimization

This feature allows you to dynamically adjust the parameters for the chilled water system based on the energy consumption monitoring and real-time analysis of the chilled water system, to decrease the PUE.

This feature applies to large data centers that use chilled water cooling. The built-in iCooling energy-saving algorithm can adjust the chiller, water pump, and cooling tower based on the load and temperature to achieve optimal PUE. This feature supports intra-frequency control optimization, optimal water temperature optimization, cooling mode optimization, quantity optimization, power optimization, and cold storage control optimization.

3.1.2.9.2 Air-cooled System Cooling Optimization

This feature allows you to dynamically adjust the air conditioner parameters based on the energy consumption monitoring and real-time analysis of the air-cooled system, to decrease the PUE.

This feature applies to small- and medium-sized equipment rooms that use air-cooled cooling. The built-in iCooling energy-saving algorithm can adjust the operating parameters of air-cooled air conditioners in real time based on IT loads and inlet and outlet temperatures of a cabinet. In this way, the PUE can be optimized to ensure that the air-cooled air conditioners work in the optimal working state.

3.1.2.10 Northbound Interface

3.1.2.10.1 SNMP NBI

The NetEco supports the SNMP northbound interface (NBI) for alarms and performance data.

This feature applies when alarms received by the NetEco need to be sent to the upper-layer NMS in trap mode. The upper-layer NMS obtains performance data from the NetEco system over an SNMP interface.

3.1.2.10.2 WebService NBI

The performance, alarm, and configuration NBIs support WebService.

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- The NetEco needs to send the received alarm data to the upper-layer NMS in WebService mode.
- The upper-layer NMS needs to obtain performance data from the NetEco system over a WebService interface.
- The NetEco needs to provide the upper-layer system with a northbound interface for asset information query.

3.1.2.10.3 FTP NBI

The performance and configuration NBIs support FTP.

The upper-layer NMS needs to obtain performance and configuration data from the NetEco system over a FTP interface.

3.1.2.11 Southbound Interface

3.1.2.11.1 3rd party device monitor

This feature allows you to monitor third-party devices, such as the UPSs and air conditioners.

- Support for multiple standard protocol interfaces

  The NetEco supports multiple standard protocol interfaces, such as Modbus and SNMP interfaces. It can interconnect with third-party devices to obtain real-time monitoring counters and alarm data of each device.
- Compatibility with multiple networking schemes

  The NetEco supports two types of monitoring networking schemes: RS485 and FE. When connecting to a third-party system, you are advised to use the following networking schemes:

  SNMP device: device -> LAN switch -> NetEco (FE networking scheme)

3.1.2.11.2 3rd party system integrate

This feature allows you to integrate the NetEco with a third-party subsystem.

This feature applies to large DCs.

- **Support for multiple standard protocol interfaces**

  The NetEco supports various standard protocol interfaces, such as Modbus, SNMP, BACnet, C, and WebService interfaces. The recommended interfaces for integrating with different types of subsystems are as follows:
  - Power distribution monitoring subsystem: Modbus-TCP/SNMP protocol. The SNMP protocol supports SNMPv1, SNMPv2C, and SNMPv3. SNMPv3 is recommended.
  - Chiller group control/BA subsystem: Modbus-TCP and BACNet protocols.
  - Video subsystem: Only Hikvision is currently supported.
  - Access control subsystem: Only the WebService interface defined by Huawei is supported.
  - Power and environment monitoring subsystem: SNMP, C, and WebService interfaces. The SNMP protocol supports SNMPv1, SNMPv2C, and SNMPv3. SNMPv3 is recommended. The C interface China Telecom version supports 3.5.1 and 4.0.0, and the China Mobile version supports 3.5.1 and 4.0.0.
- **Integration with a power distribution monitoring subsystem**

  - The NetEco can be integrated with the power distribution monitoring subsystem to obtain real-time counters and alarm information of each monitored device.
  - The NetEco displays the power distribution system alarms in the alarm management module, and supports alarm notification, processing, and masking.
  - The NetEco displays real-time monitoring indicators of related devices in the power supply and distribution link diagram.
- **Integration with chiller group control/BA subsystem**
  - The NetEco can be integrated with the chiller group control/BA subsystem to obtain real-time indicators and alarm information of each monitored device.
  - The NetEco displays the power distribution system alarms in the alarm management module, and supports alarm notification, processing, and masking.
  - The NetEco displays real-time monitoring indicators of related devices in the power supply and distribution link diagram.
  - When the license of the iCooling module is available, the NetEco can deliver control instructions to the chiller group control/BA subsystem specified by Huawei to adjust the running process of the chilled water system in real time.
- **Integration with video subsystem**
  - The NetEco can be integrated with the video subsystem to obtain real-time and historical video streams of each camera.
  - You can view real-time and historical video streams in the video management and monitoring view.
  - You can configure and view camera location information.
- **Integration with access control subsystem**
  - The NetEco can be integrated with the access control subsystem to obtain card swiping records of each access control system.
  - You can view the location, enabling status, card swiping records, and persons who swipe cards of each access control system in the access control management module.
- **Integration with power and environment monitoring subsystem**
  - The NetEco can be integrated with the power and environment monitoring subsystem to obtain real-time indicators and alarm information of each monitored device.
  - The NetEco displays the power distribution system alarms in the alarm management module, and supports alarm notification, processing, and masking.
  - You can view the real-time counters, alarms, and locations of each device in the device monitoring view.

3.2 Application Scenarios

3.2.1 Large Data Centers Application Scenarios

A large data center is one whose equipment room area is more than 500 square meters and which manages over 20,000 monitoring points (each monitoring point is defined as a signal, such as a water sensor signal or a temperature value of a point).

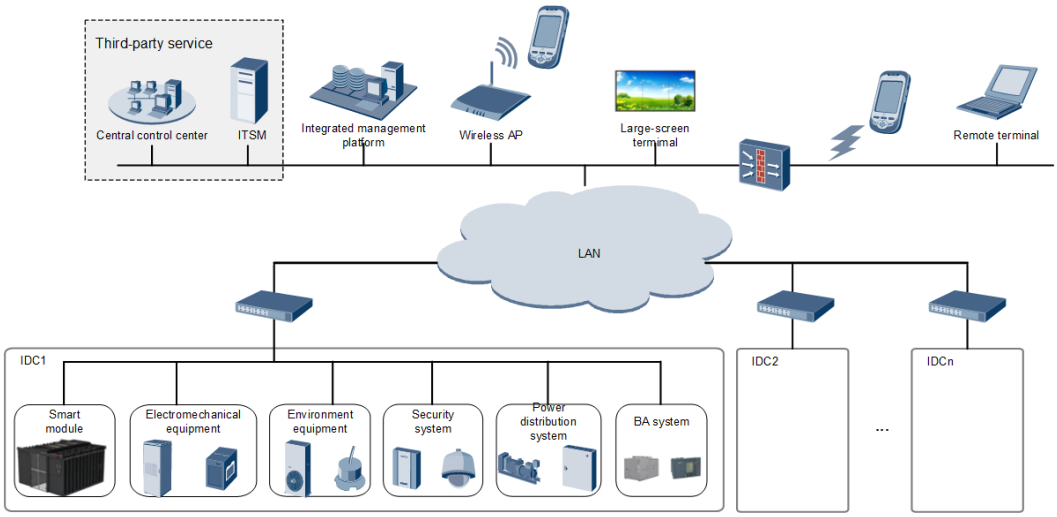
A large data center solution covers various customer scenarios. It integrates the cabinet, power supply and distribution, cooling, fire extinguishing, building automation, video, and access

control systems, and centrally manages the linked equipment and system to implement the E2E connection and convergent management for power supply and distribution, cooling, and load, thereby ensuring intelligent and efficient running of the whole data center system.

A large data center can be deployed in a park, building, or warehousing container.

Figure 3-1 shows the NetEco in a large data center.

Figure 3-1 NetEco in a large data center



As the management system of the large data center, the NetEco has the following functions:

1. Access of complicated subsystems, such as the power distribution, chiller group control, building automation, security, and fire extinguishing.
2. Hierarchical deployment of maintenance and operations.
3. Integration into third-party applications and interconnection with inventory application service systems, such as central control, process system, and 3D visualization.
4. Cross-regional central management.
5. Mobile O&M.

3.2.2 Medium Data Centers Application Scenarios

A medium data center is one whose equipment area is from 100 square meters to 500 square meters, which manages from 10,000 to 20,000 monitoring points, and which is a smart module used in container delivery.

3.2.2.1 Smart Module Deployment

The management system works with FusionModule2000 to provide a complete data center solution that consists of the cabinet, power supply and distribution, and fire extinguishing.

Through convergent management over power distribution, cooling, and IT loads, the NetEco manages the power and cooling capacity of all links, monitors the reliability and health status of devices prior to end-of-life, and manages the devices in a refined manner.

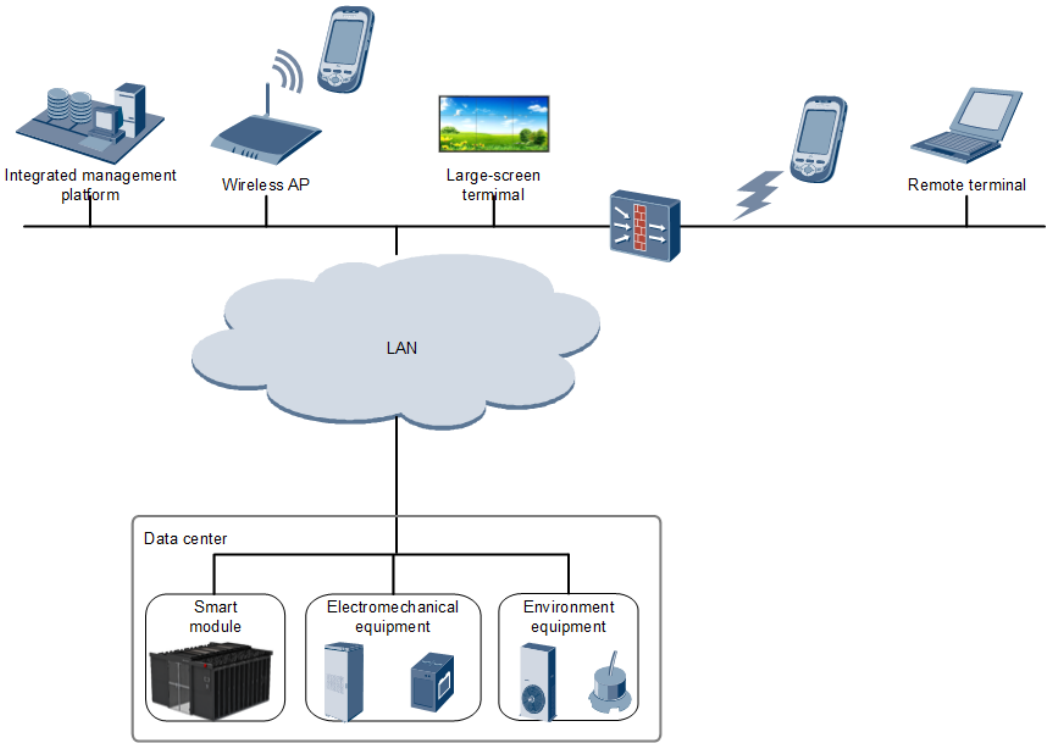
In this scenario, the NetEco is required to have the following functions:

1. Monitors the matched electromechanical equipment and environment parameters.

2. Supports fast deployment.
3. Supports integration with the upper-level NMS.
4. Manages the reliability and health status of devices, and supports decision making of the upper-level O&M systems.

Figure 3-2 shows the NetEco in a medium modular data center.

Figure 3-2 NetEco medium modular data center



3.2.2.2 Container Deployment

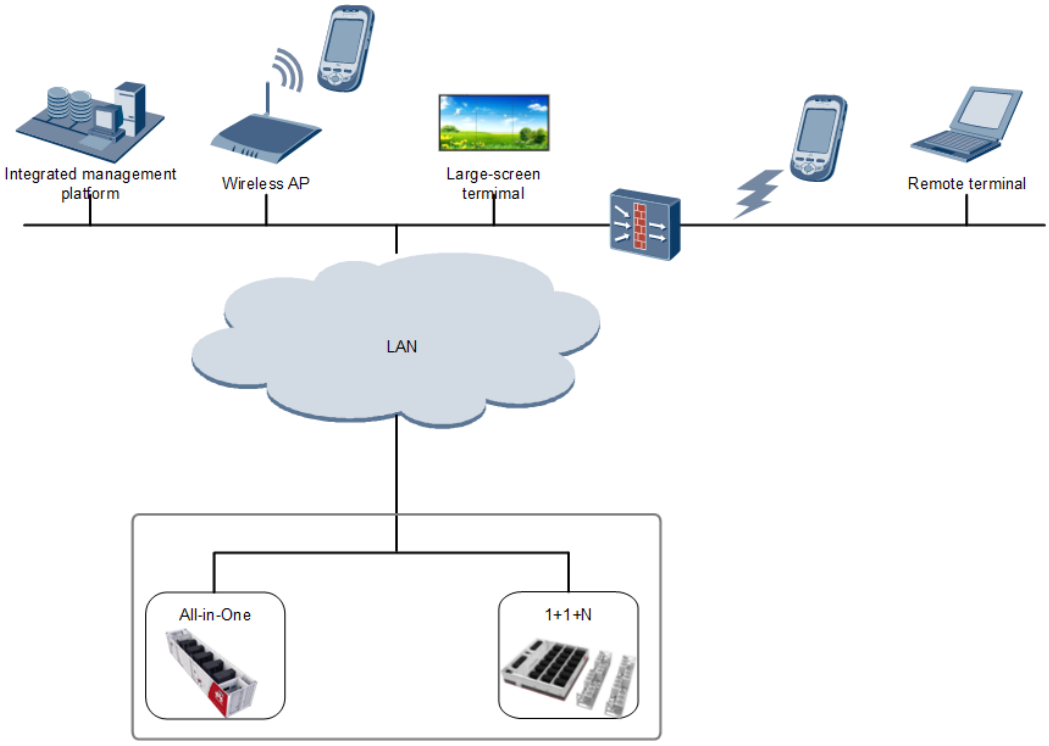
The management system is used in All-in-One and 1+1+N scenarios, providing a data center solution of complete features, such as the cabinet, power supply and distribution, and fire extinguishing.

Container data centers can meet the energy conservation and fast deployment requirements of industry users, such as telecom carriers and Internet carriers. Container data centers have distinctive advantages in disaster relief, military affairs, oil exploration, and enterprise data, and can be used outdoors.

- Independent application in outdoor scenarios: Has no local monitoring center or distributed monitoring nodes; management server is deployed inside the container.
- Cluster application in outdoor scenarios: Distributed monitoring nodes are deployed inside the container, and the central management platform is deployed in the monitoring center.

The NetEco is deployed in a medium data center container, as shown in Figure 3-3.

Figure 3-3 Medium data center container



Through convergent management over power distribution, cooling, and IT loads, the NetEco manages the power and cooling capacity of all links, monitors the reliability and health status of devices prior to end-of-life, and manages the devices in a refined manner.

In this scenario, the NetEco is required to have the following features:

1. Monitors the matched electromechanical equipment and environment parameters.
2. Supports fast deployment.
3. Manages the reliability and health status of devices.

3.2.3 Smart Small and Mini Data Centers Application Scenarios

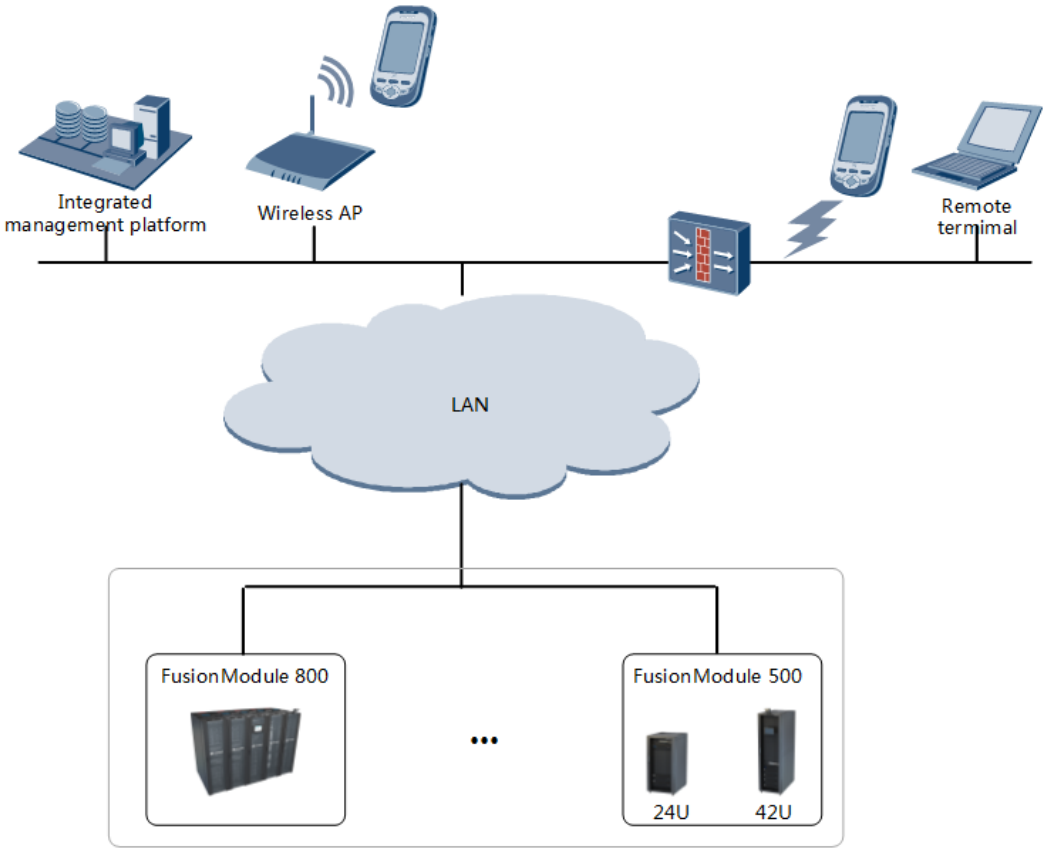
A smart small or mini data center is generally defined as a node or endpoint whose area is less than 100 square meters and which manages less than 10,000 monitoring points. Huawei provides two types of smart small and mini data centers: FusionModule500 and FusionModule800.

Main applications:

1. Governments, smart city data centers, and district- and county-level equipment rooms.
2. Small-sized second-level branches and large-sized offices in the financial, insurance, and transportation vertical industries.
3. Equipment rooms of small- and medium-sized enterprises.

The smart module is located at the edge of a network and integrates computing, storage, and network service functions. The smart mini data center is the basic of the entire data center solution. The NetEco centrally manages the mini data center and flattens the networking structure.

Figure 3-4 of smart small and mini data centers



4 Configuration

4.1 Server Configuration

4.1.1 Configuration in Single-Node Scenarios

In the single-node system scenario, the server with standard configuration can be used.

- The TaiShan 200 server

Table 4-1 Basic configuration

Item	Configuration
CPU	1 x Kunpeng 920 CPU,32 cores, 2.6 GHz
Memory	2 x 32 GB
Hard disk	2 x 1200 GB
Network adapter	4 x GE
Power supply	2 x 900 W
Operating system	EulerOS V2.0 SP8
Database	GaussDB T
Application software	NetEco server application

Table 4-2 Standard configuration

Item	Configuration
CPU	2 x Kunpeng 920-48-core@2.6GHz
Memory	4 x 32 GB
Hard disk	2 x 1200 GB + 8 x 1800 GB
Network adapter	8 x GE

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Item	Configuration
Power supply	2 x 900 W
Operating system	EulerOS V2.0 SP8
Database	GaussDB T
Application software	NetEco server application

- The 2288X V5 server

Table 4-3 Basic configuration

Item	Configuration
CPU	2 x Intel 4208-8-cores@2.1GHz
Memory	2 x 32GB
Hard disk	2 x 1200GB
Network adapter	8 x GE
Power supply	2 x 900W
Operating system	EulerOS V2.0 SP5
Database	GaussDB T
Application software	NetEco server application

Table 4-4 Standard configuration

Item	Configuration
CPU	2 x Intel 5218-16-cores@2.3GHz
Memory	4 x 32GB
Hard disk	2 x 1200GB + 8 x 1800GB
Network adapter	8 x GE
Power supply	2 x 900W
Operating system	EulerOS V2.0 SP5
Database	GaussDB T
Application software	NetEco server application

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4.1.2 Configuration in Local Cluster Scenarios

In the NetEco local cluster scenario, three servers in cluster configuration are required.

Table 4-5 describes the cluster configuration.

Table 4-5 Cluster configuration(TaiShan 200 server)

Item	Configuration
CPU	2 x Kunpeng 920-48-cores@2.6GHz
Memory	4 x 32 GB
Hard disk	2 x 1200 GB + 8 x 1800 GB
Network adapter	8 x GE
Power supply	2 x 900W
Operating system	EulerOS V2.0 SP8
Database	GaussDB T
Application software	NetEco server application

Table 4-6 Cluster configuration(2288X V5 server)

Item	Configuration
CPU	2 x Intel 5218-16-cores@2.3GHz
Memory	4 x 32GB
Hard disk	2 x 1200GB + 8 x 1800GB
Network adapter	8 x GE
Power supply	2 x 900W
Operating system	EulerOS V2.0 SP5
Database	GaussDB T
Application software	NetEco server application

4.2 Client Configuration

A common PC can be used as the client for NetEco. Table 4-7 provides the recommend configurations. When visiting the NetEco system through a client. You are advised to use the latest Chrome browser (Stable Channel version) or Firefox browser (ESR version).

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Table 4-7 Recommended configuration of the NetEco client

Item	Configuration
CPU	A6-5400B, 3.6 GB or above
Memory	8 GB
Hard disk	500 GB or above
Video card memory	1.0 GB above
USB	USB2.0 or above, 2 PCS
Accessory	DVDRW/Ethernet adapter/Audio adapter/Sound box/21.5-inch wide LCD
Operating system	Windows 7 Professional 64-bit, provided by the customer.

The hardware configuration requirements for the PC in the 3D view are as follows:

- When less than 500 cabinets are managed:

  The recommended configuration is I5 or higher CPUs, GTX1050 and later graphics cards, 16 GB or higher memory, and 128 GB or higher capacity common hard disks.

  The minimum configuration is I5 or higher CPUs, GTX1030 and later graphics cards, 16 GB or higher memory, and 128 GB or higher capacity common hard disks.
- When more than 500 cabinets are managed:

  The recommended configuration is I7 or later CPUs, GTX1070 and later graphics cards, 32 GB or higher capacity memory, and 128 GB or higher capacity SSDs.

  The minimum configuration is I5 or higher CPUs, GTX1050 and later graphics cards, 16 GB or higher memory, and 128 GB or higher capacity SSDs.
- Brand machine recommendation: Lenovo, HP, and Dell. Provided by the customer.

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5 Technical Specifications

5.1 Performance Specifications

5.1.1 Management Capability

Table 5-1 lists the management capabilities of IP devices and Modbus-RTU connected devices supported by the NetEco in single-server configuration.

Table 5-1 NetEco Server Configuration Management Capability

Server Model	Number of Servers	Deployment Mode	Number of Devices	Number of Concurrently Connected Clients
basic configuration	1	Single-node system	500	20
standard configuration	1	Single-node system	10000	50
cluster configuration	3	Distributed cluster	10000	100

NOTE

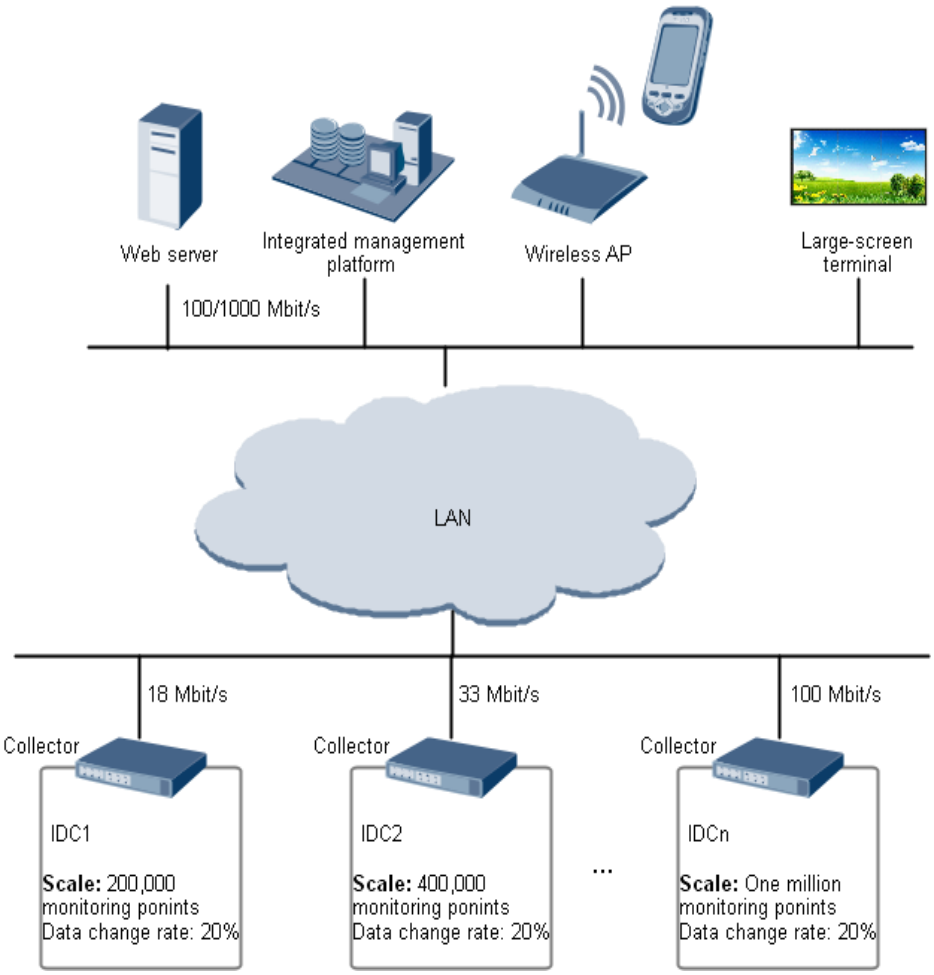
The preceding management capability of the large-configuration server is evaluated based on the current NetEco delivery models.

5.1.2 Bandwidth Requirements

For large, ultra-large, and cross-regional management data centers, they typically use the following networking modes: central management deployment.

Figure 5-1 lists the NetEco in the central management deployment.

Figure 5-1 Central management deployment network



For the central management of large data centers, deploy clusters of collectors in data centers and use flattened management network. Real-time data collection of IDCs through the comprehensive management platform has high requirements for bandwidth. Figure 5-1 lists the bandwidth requirements based on scale.

For specifications about outgoing bandwidth between the NetEco and the browser, see Table 5-2.

Table 5-2 Requirements for the Bandwidth Between the NetEco and Network Devices

Number of Devices	500	1000	2000	5000
Required Bandwidth (Kbit/s)	2048	3072	6144	15360

Table 5-3 Requirements for the Bandwidth Between the NetEco and the Northbound System

Number of Devices	500	1000	2000	5000
Required Bandwidth (Kbit/s)	2048	4096	8192	20480

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The export bandwidth between the NetEco and the browser is affected by the number of devices and video channels. The requirements are as follows:

If the video is not included, the bandwidth between the client and the NetEco server must be greater than or equal to 10Mbit/s.

Table 5-4 Requirements for the Bandwidth Between the NetEco and Clients (Excluding Videos)

Number of Devices	500	1000	2000	5000
Required Bandwidth (Kbit/s)	4096	6144	12288	30720

Table 5-5 Requirements for the Bandwidth Between the NetEco and Client (Video)

Number of video channels	1	4	9	16
Required Bandwidth (Kbit/s)	25	100	225	400

If you browse videos on the browser, the bandwidth between the client and the NetEco server is configured according to Table 5-5 NetEco and the bandwidth requirements of the client egress (video).

5.2 System Specifications

The following table lists the NetEco server specifications.

Table 5-6 Specifications of a server in basic configuration

Item	Specifications(TaiShan 200 Server)	Specifications(2288X V5 Server)
Server Dimensions	mm(Height x Width x Depth) 86.1x447x790	mm(Height x Width x Depth) 86.1x447x748
Server Weight	29kg	29kg
Input Voltage	110V/220V AC	110V/220V AC
Power Consumption	500W	250W
System BTU Per Hour	670.69 BTU/hour	945.43 BTU/hour
Carbon Dioxide Emissions	0.20 kg/hour	0.28 kg/hour

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Table 5-7 Specifications of a server in standard configuration

Item	Specifications(TaiShan 200 Server)	Specifications(2288X V5 Server)
Server Dimensions	mm(Height x Width x Depth) 86.1x447x790	mm(Height x Width x Depth) 86.1x447x748
Server Weight	30kg	30kg
Input Voltage	110V/220V AC	110V/220V AC
Power Consumption	700W	500W
System BTU Per Hour	1471.96 BTU/hour	1669.14 BTU/hour
Carbon Dioxide Emissions	0.43 kg/hour	0.49 kg/hour

Table 5-8 Specifications of a server in cluster configuration

Item	Specifications(TaiShan 200 Server)	Specifications(2288X V5 Server)
Server Dimensions	mm(Height x Width x Depth) 86.1x447x790	mm(Height x Width x Depth) 86.1x447x748
Server Weight	30kg	30kg
Input Voltage	110V/220V AC	110V/220V AC
Power Consumption	700W	500W
System BTU Per Hour	1471.96 BTU/hour	1669.14 BTU/hour
Carbon Dioxide Emissions	0.43 kg/hour	0.49 kg/hour

NOTE

Workloads have a great impact on power consumption. That is, the power consumption of the same CPU usage may vary significantly in different workloads. Therefore, the data may be slightly different. The power consumption values in the preceding table are for reference only. You are advised to measure the power consumption values in actual environments and loads.

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6 Standards Compliance

6.1 Safety Standards

The NetEco complies with the following safety specifications and standards:

- IEC 60950-1
- IEC/EN41003
- EN 60950-1
- UL 60950-1
- CSA C22.2 No 60950-1
- AS/NZS 60950-1
- BS EN 60950-1
- IS 13252
- GB4943

6.2 EMC Standards

The NetEco complies with the following electromagnetic compatibility (EMC) standards:

- CISPR22 Class A
- EN55022 Class A
- EN50024
- ETSI EN 300 386 Serial Class A
- ETSI EN 301 489 Class A
- ICES 003 Class A
- AS/NZS CISPR22 Class A
- GB9254 Class A
- VCCI Class A
- CNS 13438 Class A

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6.3 Environment Standards

The environmental requirements of the NetEco involve three types of environments: storage environment, shipping environment, and operating environment. The NetEco complies with the following specifications:

- GB 4798 Application environmental conditions of electric and electronic products
- ETS 300019 Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment
- IEC 60721 Classification of environmental conditions

6.4 Storage Environment

6.4.1 Climatic Requirements

Table 6-1 Climatic requirements

Item	Value Range
Temperature	0–40°C
Temperature change rate	≤ 1°C/min
Relative humidity	10%–90%
Altitude	≤ 5000 m
Atmospheric pressure	70–106 kPa
Solar radiation	≤ 1120 W/s²
Heat radiation	≤ 600 W/s²
Wind speed	≤ 30 m/s

6.4.2 Waterproof Requirements

- Field equipment must be stored indoors.
  - Water does not accumulate on the ground or fall on the package.
  - The equipment is kept away from water sources such as a hydrant and air-conditioner.
- In the case of outdoor storage, the following requirements must be met:
  - The package is intact.
  - Waterproof measures are taken to prevent water penetration.
  - Water does not accumulate on the ground or fall on the package.
  - The package is not exposed directly to sunlight.

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6.4.3 Biological Requirements

- The environment should not be conducive to the growth of fungus or mildew.
- There should be no rodents such as rats.

6.4.4 Air Purity Requirements

- The air must be free of explosive, conductive, magnetic conductive, or corrosive dust.
- The density of physically active materials must comply with the requirements listed in Table 6-2.

Table 6-2 Requirements for the density of physically active materials

Physically Active Material	Unit	Density
Suspended dust	mg/m^3	≤ 5.00
Deposited dust	$mg/m^2 \cdot h$	≤ 20.0
Sand	mg/m^3	≤ 300
NOTE • Suspended dust: diameter ≤ 75 μm • Deposited dust: 75 μm ≤ diameter ≤ 150 μm • Sand: 150 μm ≤ diameter ≤ 1000 μm		

- The density of chemically active materials must comply with the requirements listed in Table 6-3.

Table 6-3 Requirements for the density of chemically active materials

Chemically Active Material	Unit	Density
SO_2	mg/m^3	≤ 0.30
H_2S	mg/m^3	≤ 0.10
NO_2	mg/m^3	≤ 0.50
NH_3	mg/m^3	≤ 1.00
Cl_2	mg/m^3	≤ 0.10
HCl	mg/m^3	≤ 0.10
HF	mg/m^3	≤ 0.01
O_3	mg/m^3	≤ 0.05

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6.4.5 Mechanical Stress Requirements

Table 6-4 Mechanical stress requirements

Item	Sub-Item	Value Range	
Sinusoidal vibration	Offset	≤ 7.0 mm	-
	Accelerated speed	-	≤ 20.0 m/s²
	Frequency range	2–9 Hz	9–200 Hz
Unsteady impact	Impact response spectrum II	≤ 250 m/s²	
	Static payload	≤ 5 kPa	

NOTE
- Impact response spectrum: Refers to the maximum acceleration response curve generated by the equipment under specified impact excitation. Impact response spectrum II means that the duration of semi-sine impact response spectrum is 6 ms.
- Static payload: Refers to the capability of the equipment in package to bear the pressure from the top in normal pile-up method.

6.5 Shipping Environment

6.5.1 Climatic Requirements

Table 6-5 Climatic requirements

Item	Value Range
Temperature	0–40°C
Temperature change rate	≤ 3°C/min
Relative humidity	5%–100%
Altitude	≤ 5000 m
Atmospheric pressure	70–106 kPa
Solar radiation	≤ 1120 W/m²
Heat radiation	≤ 600 W/m²
Wind speed	≤ 30 m/s

6.5.2 Waterproof Requirements

Before shipping the equipment, ensure that the following requirements are met:

- The package is intact.
- Waterproof measures are taken to prevent water penetration.
- No water is accumulated inside the shipping vehicle.

6.5.3 Biological Requirements

- The environment should not be conducive to the growth of fungus or mildew.
- There should be no rodents such as rats.

6.5.4 Air Purity Requirements

- The air must be free of explosive, conductive, magnetic conductive, or corrosive dust.
- The density of physically active materials must comply with the requirements listed in Table 6-6.

Table 6-6 Requirements for the density of physically active materials

Physically Active Material	Unit	Density
Suspended dust	mg/m^3	-
Deposited dust	$mg/m^2 \cdot h$	≤ 3.0
Sand	mg/m^3	≤ 100
NOTE • Suspended dust: diameter ≤ 75 μm • Deposited dust: 75 μm ≤ diameter ≤ 150 μm • Sand: 150 μm ≤ diameter ≤ 1000 μm		

- The density of chemically active materials must comply with the requirements listed in Table 6-7.

Table 6-7 Requirements for the density of chemically active materials

Chemically Active Material	Unit	Density
SO_2	mg/m^3	≤ 0.30
H_2S	mg/m^3	≤ 0.10
NO_2	mg/m^3	≤ 0.50
NH_3	mg/m^3	≤ 1.00
Cl_2	mg/m^3	≤ 0.10
HCl	mg/m^3	≤ 0.10
HF	mg/m^3	≤ 0.01
O_3	mg/m^3	≤ 0.05

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6.5.5 Mechanical Stress Requirements

Table 6-8 Mechanical stress requirements

Item	Sub-Item	Value Range		
Sinusoidal vibration	Offset	≤ 7.5 mm	-	-
	Accelerated speed	-	≤ 20.0 m/s²	≤ 40.0 m/s²
	Frequency range	2–9 Hz	9–200 Hz	200–500 Hz
Random vibration	Spectrum density of accelerated speed	10 m²/s³	3 m²/s³	1 m²/s³
	Frequency range	2–9 Hz	9–200 Hz	200–500 Hz
Unsteady impact	Impact response spectrum II	≤ 300 m/s²		
	Static payload	≤ 10 kPa		

NOTE
- Impact response spectrum: Refers to the maximum acceleration response curve generated by the equipment under specified impact excitation. Impact response spectrum II means that the duration of semi-sine impact response spectrum is 6 ms.
- Static payload: Refers to the capability of the equipment in package to bear the pressure from the top in normal pile-up method.

6.6 Operating Environment

Table 6-9 Temperature and humidity requirements for operation

Temperature		Relative Humidity	
Long term	Short term	Long term	Short term
15–30°C	0–40°C	20%–80%	20%–90%

NOTE
- The values are measured 1.5 m above the floor and 0.4 m in front of the equipment, without protective panels in front of or behind the cabinet.
- Short-term operation means that the continuous working hours are shorter than 48 and the total working days per year are fewer than 15 days.

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Table 6-10 Other climatic requirements for operation

Item	Value Range
Altitude	≤ 4000 m
Atmospheric pressure	70–106 kPa
Temperature change rate	≤ 3°C/min
Solar radiation	≤ 700 W/m²
Heat radiation	≤ 600 W/m²
Wind speed	≤ 1 m/s

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7 Acronyms and Abbreviations

Abbreviation	Full Name
ATS	Automatic Transfer Switching
DB	Database
KPI	Key Performance Indicators
NetEco	Network Ecosystem
IVS	Intelligent Video Surveillance
OS	Operating System
PDU	Power Distribution Unit
RPDU	Remote Power Distribution Unit
PUE	Power Usage Effectiveness
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SSO	Single Sign On
TCP/IP	Transmission Control Protocol/Internet Protocol
UPS	Uninterruptible Power Supply

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