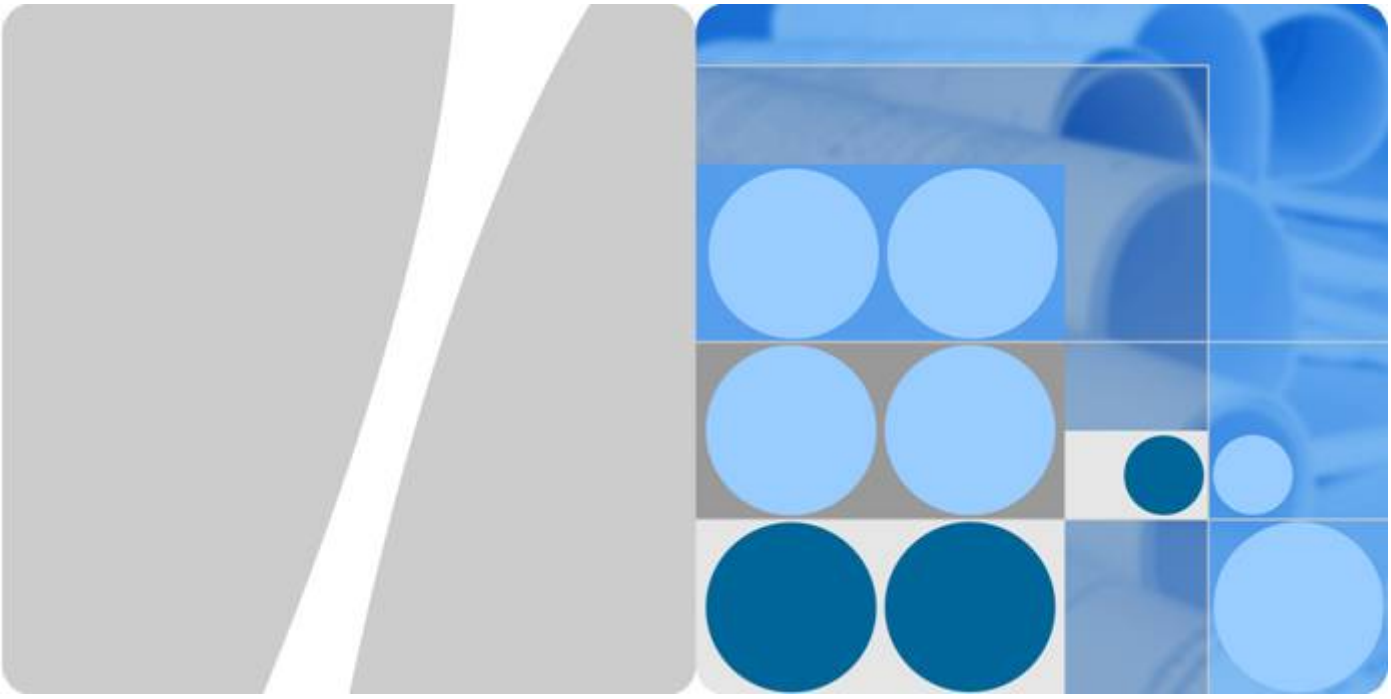

OceanStor 2800 V5

V500R007

Product Description

Issue 04

Date 2018-07-30

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About This Document

Purpose

This document describes the product positioning, features, architecture, technical specifications, environment requirement, standards compliance, and granted certifications of the OceanStor 2800 V5 storage system.

Intended Audience

This document is intended for a general audience.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

Symbol	Description
NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 04 (2018-07-30)

This issue is the fourth official release. The updates are as follows:

Made minor changes in specifications.

Issue 03 (2018-05-09)

This issue is the third official release. The updates are as follows:

Made minor changes in specifications.

Issue 02 (2018-01-30)

This issue is the second official release. The updates are as follows:

Made minor changes in specifications.

Issue 01 (2017-11-30)

This issue is the first official release.

Contents

1 Product Positioning

The OceanStor 2800 V5 storage system is a next-generation virtual storage product for video surveillance developed by Huawei and based on current storage application standards as well as current storage technology trends. This storage product is designed to meet enterprises' requirements for converged IT of computing and storage in video surveillance scenarios.

In the cloud computing era, virtualization technologies have been employed by over half of the severs deployed in business environments. These technologies enable more agile and efficient services with lowered costs and improved resource utilization. However, such technologies also demand skilled system and application engineers to operate them. The employment of virtualization architecture has changed the traffic model of data centers (DCs) while bringing new challenges to security management, network management, and assurance of performance and service level agreement (SLA). The Huawei OceanStor 2800 V5 storage system is an IT infrastructure product based on a converged architecture where virtual servers and high-performance storage are integrated by using SmartContainer feature for on-demand resource allocation and expansion. With the OceanStor 2800 V5 storage system, enterprise new service rollout period is greatly reduced, improving operation and maintenance (O&M) efficiency.

Based on flexible and scalable design principles, the OceanStor 2800 V5 storage system provides industry-leading hardware specifications and a RAID 2.0+ underlying virtualization architecture to meet the varying requirements of services.

In addition to providing outstanding storage performance that ensures smooth and secure operation of data services, the OceanStor 2800 V5 storage system offers easy-to-use management and convenient local/remote maintenance, greatly decreasing the management and maintenance cost.

Figure 1-1 shows the system architecture of the OceanStor 2800 V5 storage system.

Figure 1-1 Storage system architecture

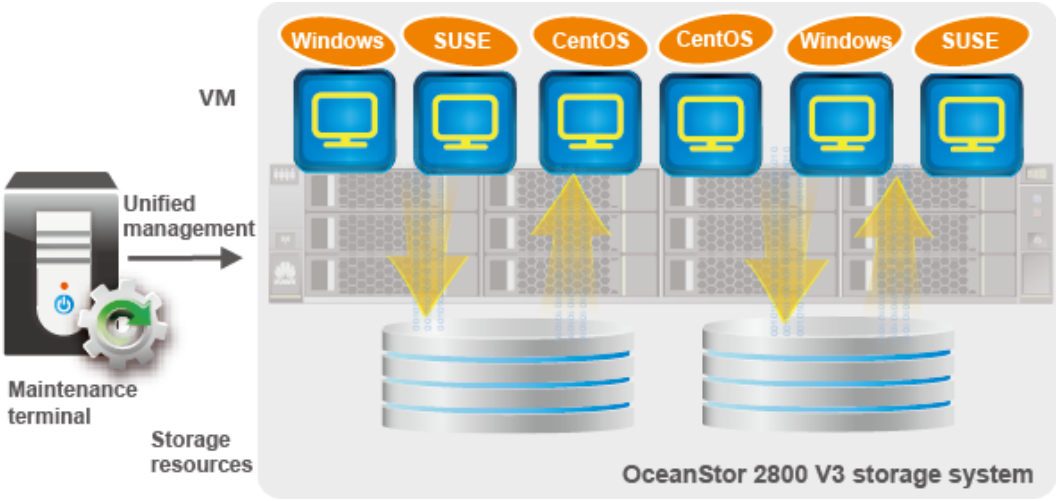
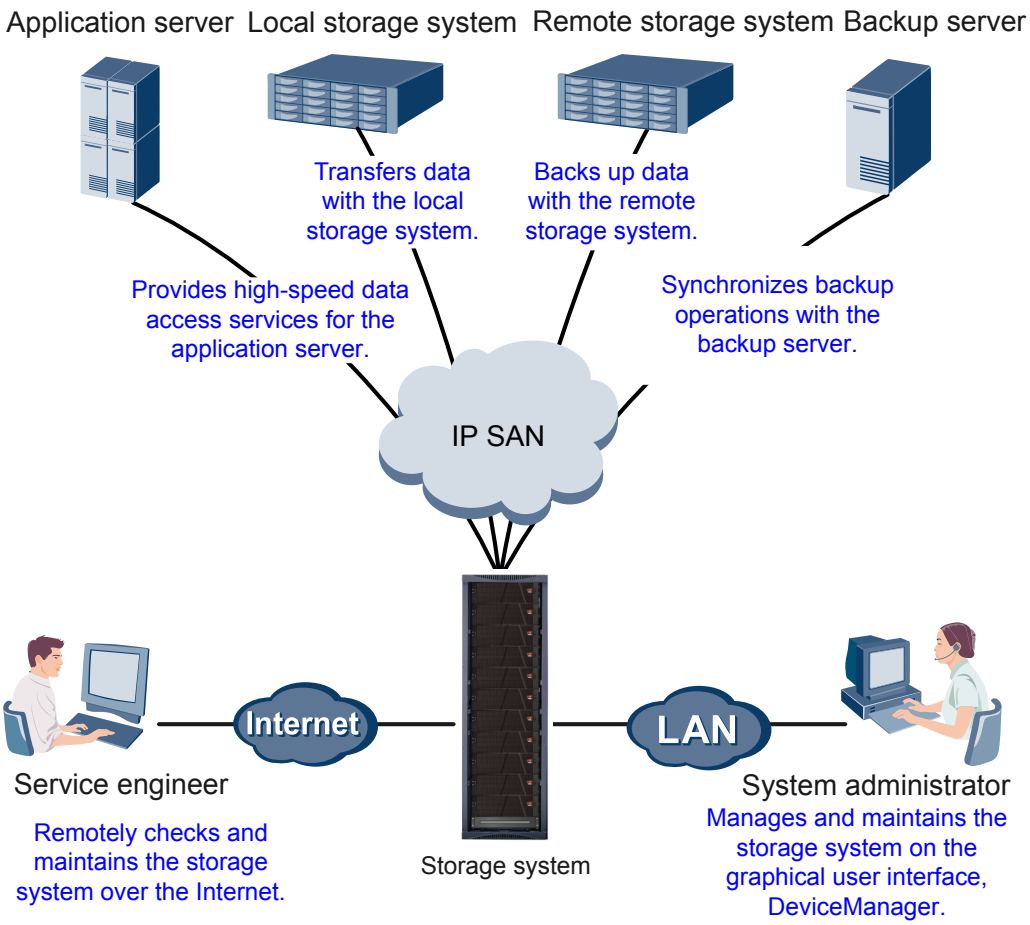


Figure 1-2 shows the position and application of OceanStor 2800 V5 storage system in a SAN network.

Figure 1-2 Position and application of the storage system in a SAN network



2 Product Highlights

With leading hardware specifications and multiple advanced data application technologies, the OceanStor 2800 V5 storage system supports integrated virtual machines (VM), application isolation, and resource control. With its high performance, robust reliability, and high availability, the OceanStor 2800 V5 storage system meets storage requirements of medium- and large-sized enterprises.

Integrated VMs

In most common application scenarios, storage systems require one or multiple servers to provide services. The purchase of this equipment is costly, providing a significant challenge to customers with budgetary constrictions. Moreover, different models of servers present compatibility issues during system deployment. These servers must be managed and maintained independently, incurring extra manpower and resource costs.

The OceanStor 2800 V5 storage system uses SmartContainer feature to provide VM functions for the traditional storage architecture. Operating systems and applications can be deployed on VMs and basic services such as video surveillance and document warehouse can be provided directly, without the need of independent server management.

Application Isolation

For economy and ease-of-use, an increasing number of enterprise IT applications are being integrated onto one hardware platform, even through such applications may affect each other. The OceanStor 2800 V5 storage system uses SmartContainer feature to address this problem. Operating systems and applications on one device are deployed on different VMs to isolate them, improving application stability and security.

Resource Control

The OceanStor 2800 V5 storage system can flexibly allocate resources to applications. Hardware resources are allocated to applications on VMs to maximize application performance while making full use of hardware resources.

High Performance

The OceanStor 2800 V5 storage system employs an advanced hardware acceleration technology and is equipped with 64-bit multi-core processors, a high-speed and large-capacity cache, and high-speed interface modules. Compared with traditional storage systems, the

OceanStor 2800 V5 storage system provides better storage performance and can tailor storage performance based on applications' storage requirements.

Robust Reliability

The OceanStor 2800 V5 storage system provides power failure protection and uses advanced technologies to minimize risks of disk failures and data loss, ensuring robust system reliability.

- RAID 2.0+ underlying virtualization

  This innovative technology is employed to automatically balance loads across disks. If a disk encounters a fault, all the other disks in the same disk domain help reconstruct the faulty disk's service data, achieving a 20-fold faster reconstruction speed than traditional RAID and significantly reducing the possibility of multi-disk failure.

- Power failure protection

  Two built-in backup battery units (BBUs) supply power to controller enclosures in the event of unexpected power failures. BBUs enable cache data to be migrated to coffer disks to avoid data loss.

- Bad sector repair

  Storage systems are prone to problems with bad sectors on hard disks. The OceanStor 2800 V5 storage system employs the bad sector repair technology to proactively detect and repair bad sectors, reducing the disk failure rate by 50% and prolonging the service life of disks.

- Disk pre-copy

  The disk pre-copy technology enables the storage system to routinely check hardware status and migrate data from any failing hard disk to minimize the risks of data loss.

- Data coffer disk

  Data coffer disks consist of the first four disks of a storage system's controller enclosure as well as each controller's built-in disk or disks. They stores three types of data: cache data requiring power failure protection, OceanStor OS system data, and system configuration information and logs.

High Availability

The OceanStor 2800 V5 storage system employs the TurboModule technology, online capacity expansion, and disk roaming to ensure uninterrupted services during routine maintenance. The functions of the TurboModule technology, online capacity expansion, and disk roaming are as follows:

- The TurboModule technology allows the hot swap of fans, power supplies, interface modules, BBUs, and disk modules. All these modules can be operated online.
- Online capacity expansion allows you to add disks to disk domains online with ease.
- Disk roaming enables the storage system to automatically identify relocated disks and resume their services.
- If one controller is faulty, the other one can automatically take over the VMs.
- If multiple disks in a storage pool are faulty, hosts can still read and write data.

High System Security

- Management channel security

All physical ports capable of executing management operations are controlled by the access authentication mechanism, and only authorized users are allowed to manage the storage system.

- Operating system security

  The storage system uses a dedicated operating system. Security of the operating system has been hardened before the storage system is delivered. The storage systems update security patches for their operating systems and open-source software based on site requirements, safeguarding users' data.

- Protection against protocol and port attacks

  Only ports that are mandatory for external communication and maintenance are enabled on the storage system. All ports in use are listed in the *Communication Matrix*, and no unopened port exists.

- Management and maintenance security

  Users can be disabled or enabled and all management operations are logged to ensure secure and controllable management and maintenance operations.

- Service and management port isolation

  Access control lists (ACLs) are used to isolate service ports from internal heartbeat ports and management ports from maintenance ports to protect the storage system against intrusions.

  In addition, trusted verification is enabled during the storage system startup to measure and verify **BIOS** > **Grub** > **Euler Linux Kernel** > **Euler Linux** > **Storage application software** level by level to prove integrity of loaded software at each level and to prevent software tampering. The storage system's power-on process will be verified to ensure that the system is not tampered with.

Virtualization, Intelligence, and Efficiency

The OceanStor 2800 V5 storage system employs the most advanced storage design principle in virtualization, intelligence, and efficiency. Compared with traditional storage systems, the OceanStor 2800 V5 storage system delivers higher storage space utilization, faster data reconstruction speeds, smarter performance allocation technology, and finer service quality control. RAID 2.0+ underlying virtualization technology divides disk storage space into small-sized data blocks and uses the blocks to create RAID groups for fine-grained resource management. This technology enables automatic load balancing, higher storage performance, better storage space utilization, faster disk reconstruction, and delicate storage space management, serving as a basis for a number of other advanced storage technologies.

Economy and Ease-of-Use

The OceanStor 2800 V5 storage system employs intelligent fan speed control and CPU frequency control technologies to achieve greater economy during operation. It also provides a series of management and maintenance tools to simplify operation and maintenance.

- Economy
  - Intelligent CPU frequency control

    This technology automatically changes the CPU frequency based on the system load, for example, it decreases the CPU frequency and power consumption during off-peak hours to lower operating costs and lengthen CPU service life.
  - Intelligent fan speed control

This technology dynamically adjusts the fan speed based on storage system temperature, lowering the noise and power consumption while saving device operation costs.

- Ease-of-use
  - DeviceManager

    The DeviceManager is a storage system management tool based on a graphical user interface (GUI) and enables you to efficiently manage storage systems by wizard-based operations.
  - Multiple alarm notification modes are supported so that critical information can be sent in a timely manner.
  - Cloud-based operation and maintenance (Call Home service)

    Huawei provides the Call Home service to remotely connect OceanStor 2800 V5 storage system to the eService cloud platform, enabling centralized, remote, and intelligent operation and maintenance of storage devices. The Big Data analytics technology is used to prevent faults and locate faults quickly. In addition, it provides the optimal configuration, performance optimization suggestions, and troubleshooting solutions based on user service characteristics.

3 Typical Applications

About This Chapter

The OceanStor 2800 V5 storage system boasts industry-leading hardware specifications, flexible and reliable hardware design, and a virtualized underlying architecture, addressing the storage needs of different storage applications.

3.1 Converged Computing and Storage
The OceanStor 2800 V5 storage system seamlessly integrates the computing layer with the storage layer, without the need to construct two independent systems to deliver storage and computing functions.

3.2 Multi-Service Isolation and Flexible Resource Allocation
The OceanStor 2800 V5 storage system provides an outstanding service isolation mechanism and flexible resource allocation policies for service-intensive scenarios.

3.3 High-Availability Applications
The OceanStor 2800 V5 storage system employs a highly reliable design to achieve a long mean time between failures (MTBF), ensuring the high availability of storage applications.

3.1 Converged Computing and Storage

The OceanStor 2800 V5 storage system seamlessly integrates the computing layer with the storage layer, without the need to construct two independent systems to deliver storage and computing functions.

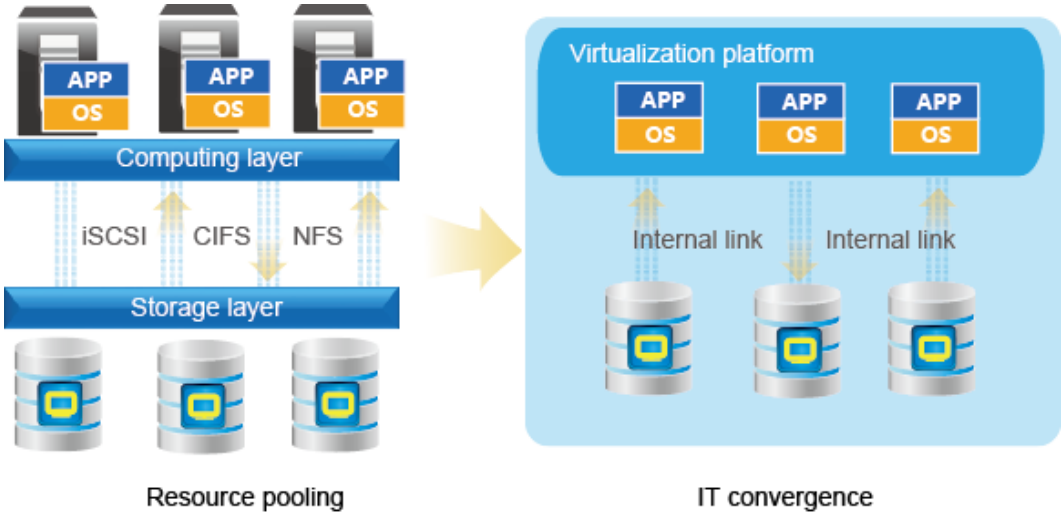
Traditional IT services such as video surveillance and database services work on a resource pool-based architecture, in which the computing layer and storage layer are independent from each other. Data is shared and transmitted between the two layers using network transmission protocols after the two layers have been physically connected. The cost of this architecture is high because devices must be purchased and deployed for the computing layer and storage layer separately. Also, maintenance is difficult because the two layers must be maintained separately. As a result, the data transmission rate and reliability between the two layers cannot be guaranteed.

Based on the innovative design principle of converged IT, the OceanStor 2800 V5 storage system integrates the computing layer and the storage layer into one system and has the following advantages:

- Unified resource allocation: Resources can be flexibly allocated among VMs based on service requirements, ensuring performance of critical services.
- Internal Efficient Data transmission: Data is transmitted between the computing layer and storage layer through direct internal links, remarkably improving performance and reliability.
- Efficient resource isolation: The resources of different services are isolated, preventing services from affecting each other.
- Easy maintenance: Provides easy-to-use maintenance. All configurations can be implemented based on site requirements.

Figure 3-1 shows the convergence of computing and storage.

Figure 3-1 Convergence of storage and computing



3.2 Multi-Service Isolation and Flexible Resource Allocation

The OceanStor 2800 V5 storage system provides an outstanding service isolation mechanism and flexible resource allocation policies for service-intensive scenarios.

Multi-Service Isolation

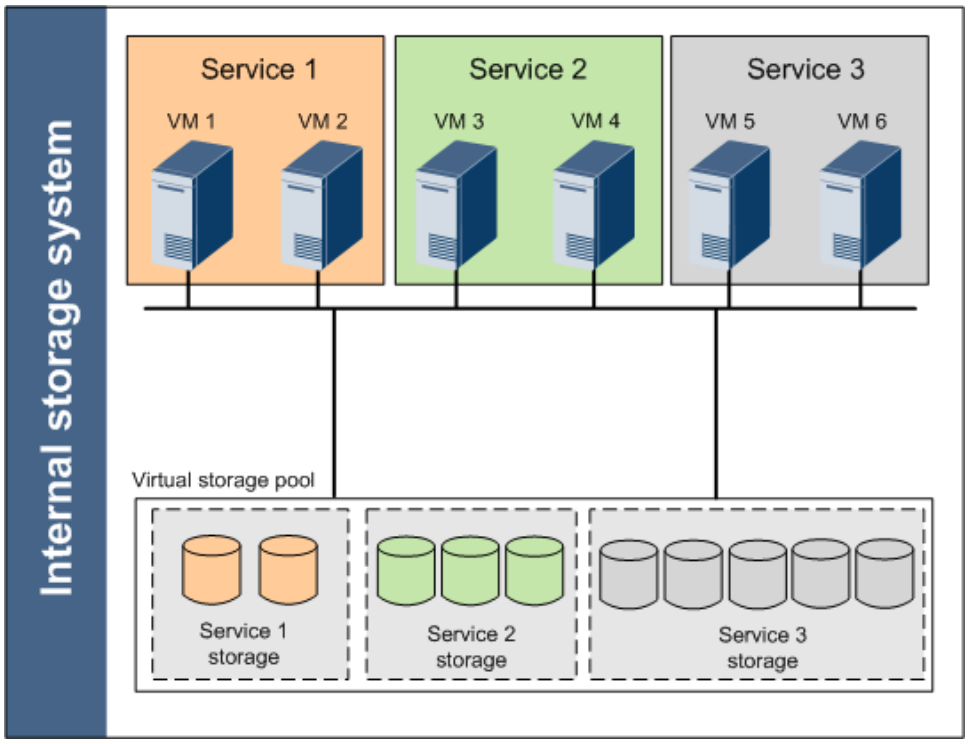
When multiple enterprise IT applications are run on the same hardware platform for lowered cost and easy maintenance, an effective service isolation mechanism is needed to ensure service stability, reliability, and security.

The OceanStor 2800 V5 storage system uses SmartContainer feature applications of multiple services.

- Mainstream operating systems and their applications can be deployed on different VMs for isolation.
- The operating systems and applications deployed on VMs are independent from each other, and VMs have their own storage resources. Services and applications are securely isolated.

Figure 3-2 shows a multi-service isolation scenario.

Figure 3-2 Multi-service isolation scenario



Flexible Resource Allocation

The virtual machine (VM) technology has become popular in many scenarios because it greatly improves application server utilization and lowers deployment costs and operation expenditure (OPEX) of services. However, as an increasing number of applications and virtual desktops are deployed in VMs, VM density naturally increases. High VM density indicates a significant increase (in some cases several orders of magnitude) in the amount of service data and data bandwidth than a single server would. This poses ever demanding requirements for storage capacity and performance.

Nowadays, it is a tendency for one storage system to process a diversified range of applications. However, those applications often have different storage requirements, so the storage system must be highly flexible in resource allocation.

The following lists the storage requirements of different types of server applications:

- Database server

  Processes structured data and requires high storage performance, data integrity, and system stability.
- Email server

  Processes a large number of random and concurrent accesses and requires high storage performance, data integrity, and system stability.
- Video server

  Stores a large amount of data and requires high storage performance, continuous data access, and continuous high bandwidth.

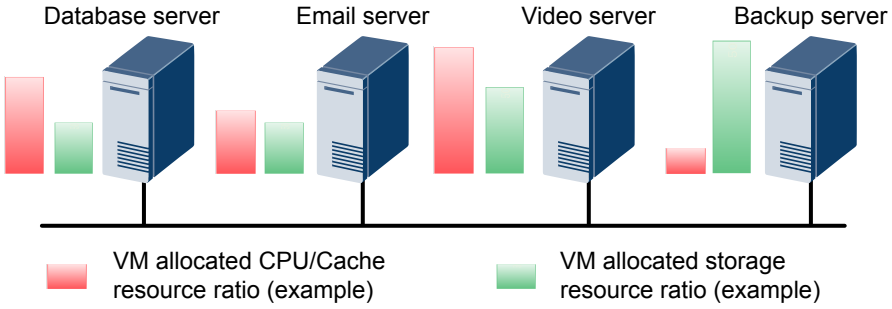
- Backup server

  Has low requirements on storage performance and bandwidth.

The OceanStor 2800 V5 storage system can allocate hardware resources such as different sizes of caches, and CPU resources to VMs carrying different applications. You can customize hardware configurations based on service and storage performance requirements.

Figure 3-3 shows a flexible resource allocation scenario.

Figure 3-3 Flexible resource allocation scenario



3.3 High-Availability Applications

The OceanStor 2800 V5 storage system employs a highly reliable design to achieve a long mean time between failures (MTBF), ensuring the high availability of storage applications.

In-Service Routine Maintenance

Routine maintenance of traditional storage system, for example, replacing components, expanding capacity, and relocating disks, typically involved interrupting ongoing services. The OceanStor 2800 V5 storage system uses the following technologies for in-service routine maintenance:

- TurboModule technology

  This technology allows online replacement of components without system restart.

- Online capacity expansion

  This technology allows online addition of disks to storage pools for smooth capacity expansion.

Tolerance of Single Points of Failures

All hardware components of the OceanStor 2800 V5 storage system are redundant. If a component fails, the other takes over its services.

4 Hardware Architecture

About This Chapter

The OceanStor 2800 V5 storage system hardware is the basis of data storage. A storage unit typically consists of a controller enclosure or a controller enclosure plus disk enclosures.

4.1 Device Composition
A storage system consists of a controller enclosure and one or more disk enclosures, and it provides an intelligent storage platform that features robust reliability, high performance, and large capacity.

4.2 2 U Controller Enclosure
This section describes a controller enclosure in terms of its hardware structure, component functions, front and rear views, and indicators.

4.3 4 U Disk Enclosure (3.5-Inch Disks)
This section describes a disk enclosure in terms of its hardware structure, component functions, front and rear views, and indicators.

4.4 High-Density Disk Enclosure
This chapter describes a high-density disk enclosure in terms of its hardware structure, component functions, front and rear views, and indicators.

4.5 Coffer Disk
The storage system has two kinds of coffer disks: built-in coffer disk and external coffer disk. Coffer disks are used to store three types of data: cache data requiring power failure protection, OceanStor OS system data, and system configuration information and logs.

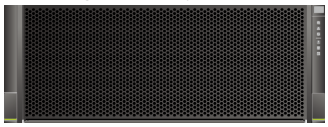
4.6 Device Cables
Device cables used in the storage system include power cables, ground cables, and signal cables. This section displays their appearances and describes the functions and specifications of various cables.

4.1 Device Composition

A storage system consists of a controller enclosure and one or more disk enclosures, and it provides an intelligent storage platform that features robust reliability, high performance, and large capacity.

Table 4-1 lists the controller enclosures and disk enclosures.

Table 4-1 Controller enclosures and disk enclosures

Product Model	Controller Enclosure	Disk Enclosure
OceanStor 2800 V5	2 U disk enclosure with 12 disk slots 	• 4 U disk enclosure with 24 disk slots  • 4 U High-density disk enclosure 

4.2 2 U Controller Enclosure

This section describes a controller enclosure in terms of its hardware structure, component functions, front and rear views, and indicators.

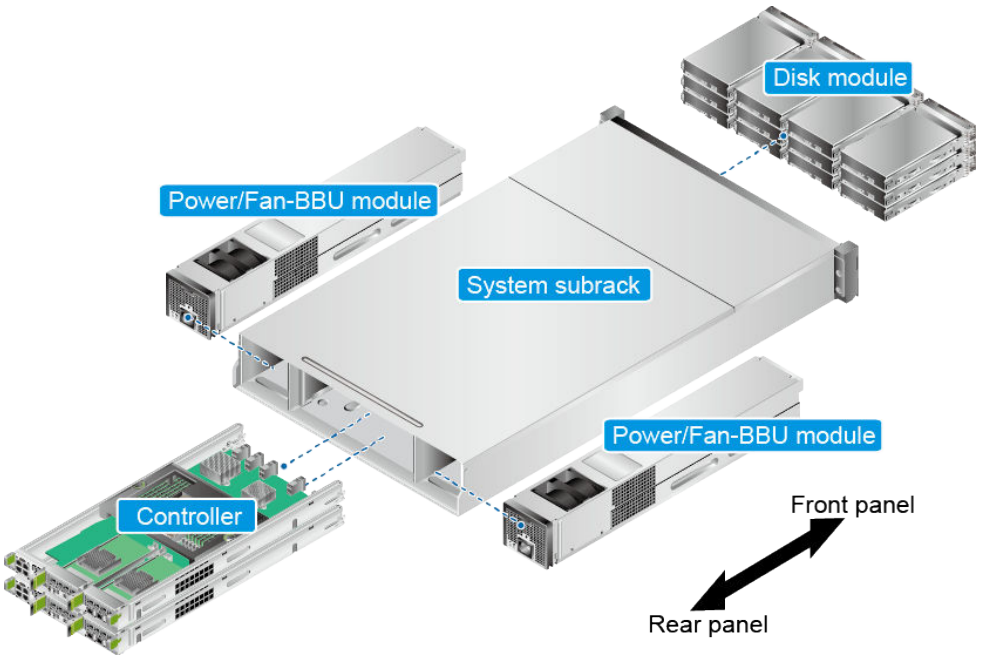
4.2.1 Overview

The controller enclosure adopts a modular design and consists of a system subrack, controllers, Power/Fan-BBU modules, and disk modules.

Overall Structure

Figure 4-1 shows the overall structure of a 2 U 12-disk controller enclosure.

Figure 4-1 Overall structure of a controller enclosure



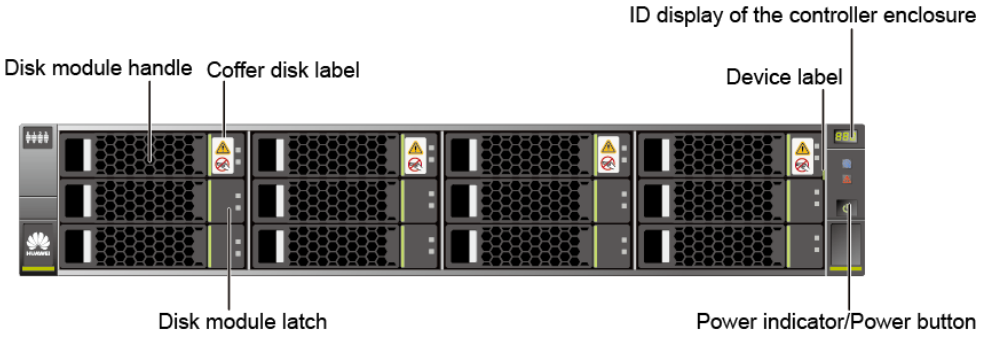
NOTE

In the rear view of a controller enclosure, controller A is above controller B. Controllers communicate with each other using internal heartbeat links and do not need cable connections.

Front View

Figure 4-2 shows the front view of a 2 U 12-disk controller enclosure.

Figure 4-2 Front view of a 2 U 12-disk controller enclosure



NOTE

- The disk slots of a 2 U 12-disk controller enclosure are numbered 0 to 11 from left to right and from top to bottom. The four coffer disks are located in slot 0 to slot 3. The type of the four coffer disks must be SAS.
- Slots are used to accommodate and secure disks, interface modules, controller modules, and power-BBU modules.
- The device label records device information.

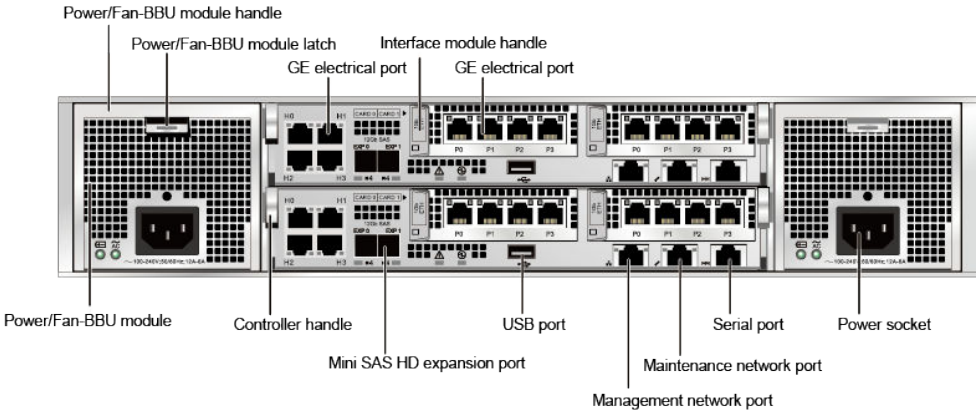
Rear View

Figure 4-3 shows the rear view of a controller enclosure.

NOTE

A controller enclosure supports GE electrical interface modules, 10GE electrical interface modules, SmartIO interface modules, and 12 Gbit/s SAS expansion modules. The following figure uses GE electrical interface modules of a 2 U controller enclosure as an example.

Figure 4-3 Rear view of a controller enclosure



4.2.2 Component Description

This section provides the detailed illustration and description for each component.

4.2.2.1 System Subrack

The system subrack houses a midplane that provides reliable connections for interface modules and distributes power and signals to inner modules.

Appearance

Figure 4-4 shows the appearance of a system subrack.

Figure 4-4 System subrack

4.2.2.2 Controller

A controller is the core component of a storage system. It processes storage services, receives configuration management commands, saves configuration data, connects to disk enclosures, and saves critical data onto coffer disks.

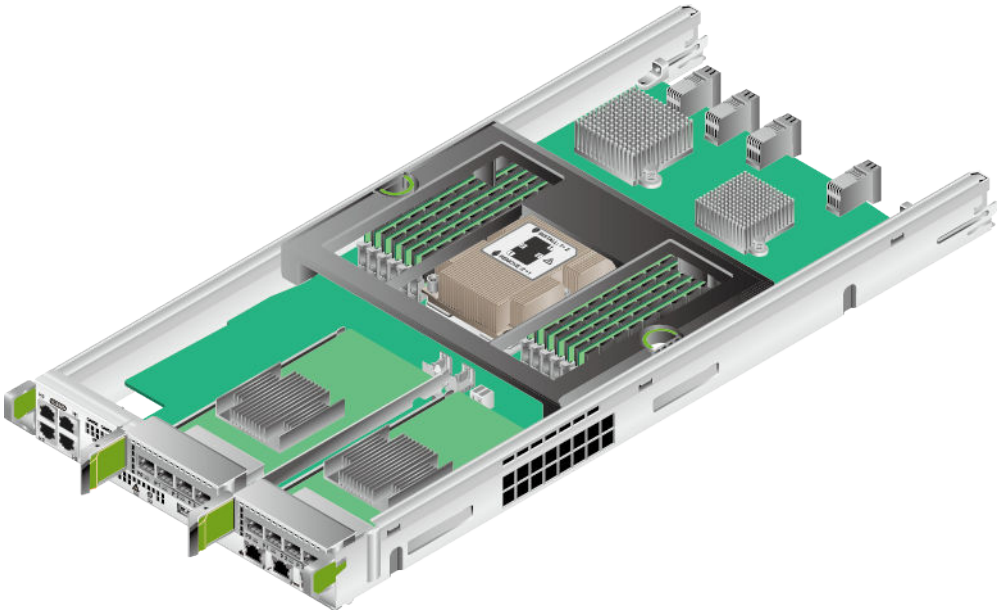
NOTE

Each controller has one or more built-in disks to store system data. If a power failure occurs, such disks also store cache data. The disks built in one controller and those built in another are redundant for each other.

Appearance

Figure 4-5 shows the appearance of a controller.

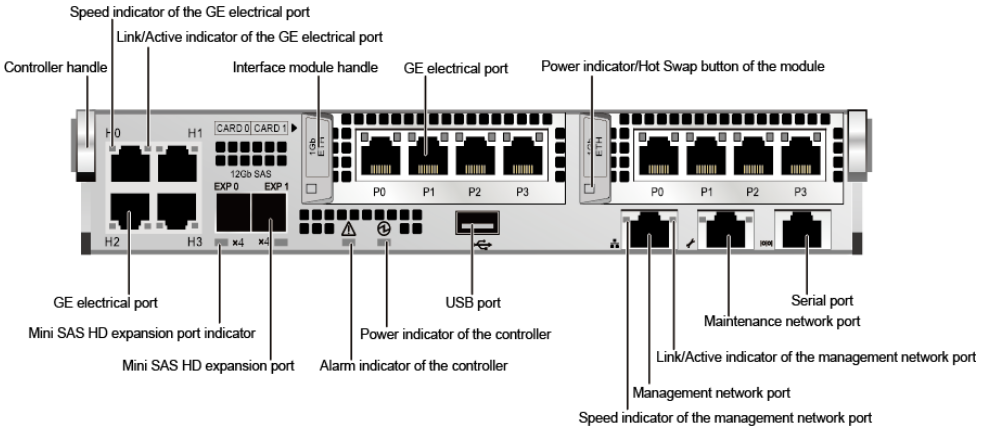
Figure 4-5 Controller



Ports

Figure 4-6 describes the ports of a controller.

Figure 4-6 Ports of a controller



Indicators

Table 4-2 describes the states and corresponding meanings of indicators on a controller after it is powered on.

Table 4-2 Checklist for indicators on a controller

Indicator	Status and Description
Speed indicator of the GE electrical port	● Steady orange: The data transfer rate between the storage system and the application server is 1 Gbit/s. ● Off: The data transfer rate between the storage system and the application server is less than 1 Gbit/s.
Link/Active indicator of the GE electrical port	● Steady green: The link to the server is normal. ● Blinking green: Data is being transferred. ● Off: The link to the application server is down or no link exists.
Power indicator/Hot Swap button of the module	● Steady green: The interface module is working correctly. ● Blinking green: There is a hot swap request to the module. ● Steady red: The module is faulty. ● Off: The module is powered off or hot swappable.
Link/Active indicator of the management network port	● Steady green: The port is connected properly. ● Blinking green: Data is being transferred. ● Off: The port is connected abnormally.
Speed indicator of the management network port	● Steady orange: Data is being transferred at the highest rate. ● Off: The data transfer speed is lower than the highest speed.
Power indicator of the controller	● Steady green: The controller is powered on. ● The Power indicator blinking green and the Alarm indicator blinking red: The controller is being located. ● Blinking green (0.5 Hz): The controller enclosure is powered on and in the BIOS boot process. ● Blinking green (2 Hz): The controller is in the operating system boot process, or the controller is in the power-off process. ● Off: The controller is absent or powered off.
Alarm indicator of the controller	● Steady red: An alarm is generated on the controller. ● The Alarm indicator blinking red and the Power indicator blinking green: The controller is being located. ● Off: The controller is working correctly.

Indicator	Status and Description
Mini SAS HD expansion port indicator	● Steady blue: The data transfer rate between the controller enclosure and the disk enclosure is 4 x 12 Gbit/s. ● Steady green: The data transfer rate between the controller enclosure and the disk enclosure is 4 x 6 Gbit/s or 4 x 3 Gbit/s. ● Steady red: The port is faulty. ● Off: The link is down.

4.2.2.3 GE Electrical Interface Module

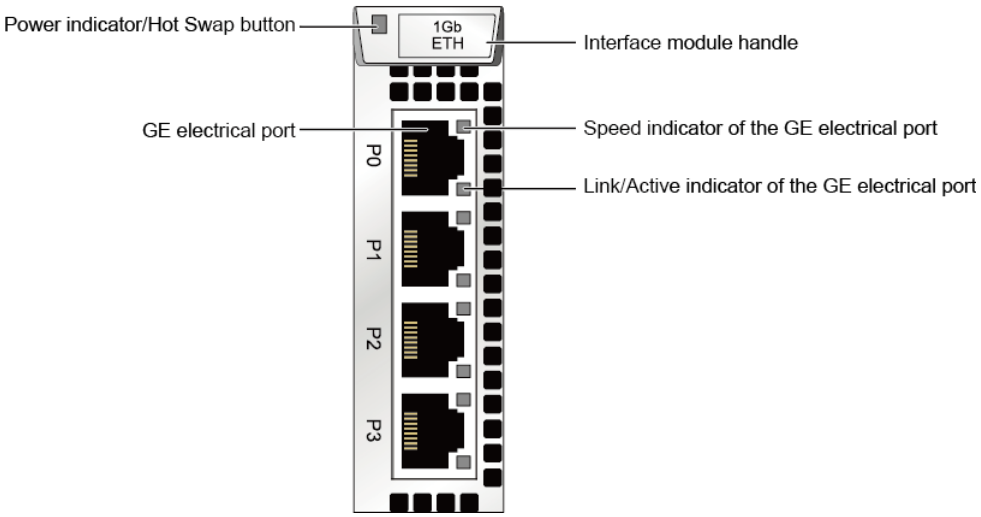
Function

A GE electrical interface module has four 1 Gbit/s electrical ports.

Ports

Figure 4-7 shows the appearance of a GE electrical interface module.

Figure 4-7 GE electrical interface module



Indicators

Table 4-3 describes indicators on a GE electrical interface module of a powered-on storage system.

Table 4-3 Indicators on a GE electrical interface module

Indicator	Status and Description
Power indicator/Hot Swap button	● Steady green: The interface module is working correctly. ● Blinking green: There is a hot swap request to the module. ● Steady red: The module is faulty. ● Off: The interface module is powered off or hot swappable.
Link/Active indicator of the GE electrical port	● Steady green: The link to the application server is normal. ● Blinking green: Data is being transferred. ● Off: The link to the application server is down or no link exists.
Speed indicator of the GE electrical port	● Steady orange: The data transfer rate between the storage system and the application server is 1 Gbit/s. ● Off: The data transfer rate between the storage system and the application server is less than 1 Gbit/s.

4.2.2.4 10GE Electrical Interface Module

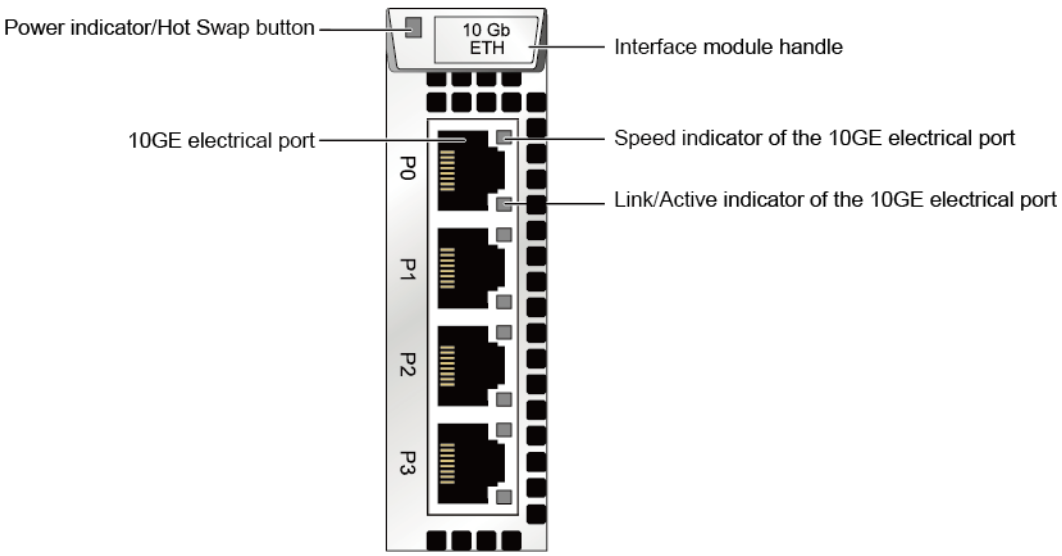
Function

A 10GE electrical interface module has four 10 Gbit/s electrical ports.

Ports

Figure 4-8 shows the appearance of a 10GE electrical interface module. 10GE electrical interface modules of the storage system support GE/10GE autonegotiation.

Figure 4-8 10GE electrical interface module



Indicators

Table 4-4 describes indicators on a 10GE electrical interface module of a powered-on storage system.

Table 4-4 Indicators on a 10GE electrical interface module

Indicator	Status and Description
Power indicator/Hot Swap button	● Steady green: The interface module is working correctly. ● Blinking green: There is a hot swap request to the module. ● Steady red: The module is faulty. ● Off: The module is powered off or hot swappable.
Link/Active indicator of the 10GE electrical port	● Steady green: The link to the application server is normal. ● Blinking green: Data is being transferred. ● Off: The link to the application server is down or no link exists.
Speed indicator of the 10GE electrical port	● Steady orange: The data transfer rate between the storage system and the application server is 10 Gbit/s. ● Off: The data transfer rate between the storage system and the application server is less than 10 Gbit/s.

4.2.2.5 SmartIO Interface Module

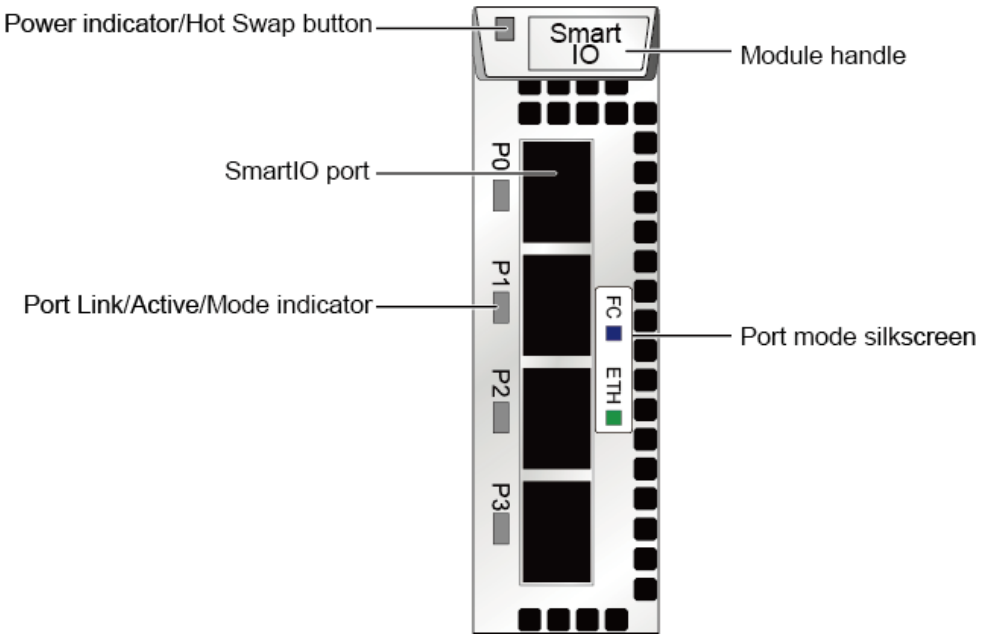
Function

A SmartIO interface module provides 8 Gbit/s, 10 Gbit/s, and 16 Gbit/s optical transceiver.

Interface

Figure 4-9 shows the components of a SmartIO interface module.

Figure 4-9 SmartIO interface module



Indicators

Table 4-5 describes the states of indicators and their meanings on a SmartIO interface module after the storage device is powered on.

Table 4-5 Indicator status description for a SmartIO interface module

Indicator	Status Description
Module Power/Hot Swap button	● Steady green: The interface module is running properly. ● Blinking green: The interface module receives a hot swap request. ● Steady red: The interface module is faulty. ● Off: The interface module is not powered on or can be hot-swappable.

Indicator	Status Description
Port Link/Active/Mode indicator	● Blinking blue slowly (1 Hz): The interface module is working in FC mode, and the port link is down. ● Blinking blue quickly (2 Hz): The interface module is working in FC mode, and data is being transmitted. ● Steady blue: The interface module is working in FC mode, the port link is up, and no data is being transmitted. ● Blinking green slowly (1 Hz): The interface module is working in ETH mode, and the port link is down. ● Blinking green quickly (2 Hz): The interface module is working in ETH mode, and data is being transmitted. ● Steady green: The interface module is working in ETH mode, the port link is up, and no data is being transmitted. ● Steady red: The port is faulty. ● Off: The port is not powered on.

NOTE

- If the mode of the SmartIO port is set to **iSCSI** on the software interface, the port indicator is in ETH mode. The SmartIO port need to be configured with 10 Gbit/s optical modules. 10 Gbit/s optical transceiver does not support GE/10GE autonegotiation.
- If the mode of the SmartIO port is set to **FC** on the software interface, the port indicator is in FC mode. The SmartIO port need to be configured with 8 Gbit/s or 16 Gbit/s optical modules.
- If the mode of the SmartIO port is set to **iSCSI** on the software interface, the MTU value of the SmartIO port must be the same as that of the host.

4.2.2.6 12 Gbit/s SAS Expansion Module

An expansion module provides expansion ports that are used for communication between a controller enclosure and a disk enclosure. The module transfers data between a controller enclosure and a disk enclosure.

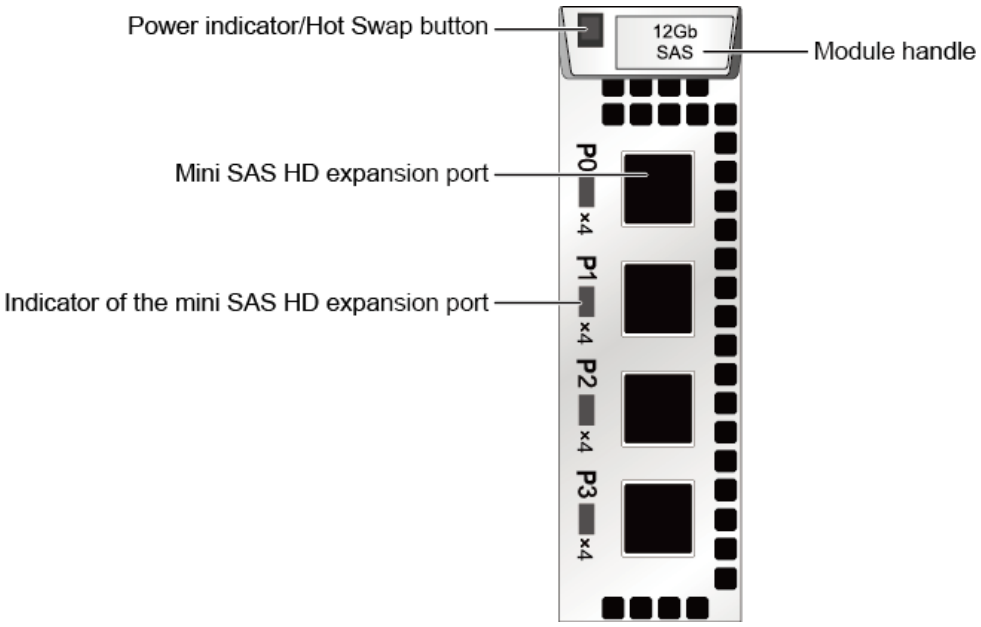
Function

A SAS interface module provides four 4 x 12 Gbit/s mini SAS HD expansion ports that provide connectivity to disk enclosures. The SAS interface module connects to the back-end storage array of the storage system through a mini SAS HD cable. When the transfer rate of the connected device is less than that of the expansion port, the expansion port automatically adjusts the transfer rate to that of the connected device to ensure the connectivity of the data transfer channel.

Ports

Figure 4-10 shows the appearance of a 12 Gbit/s SAS expansion module.

Figure 4-10 12 Gbit/s SAS expansion module



Indicators

Table 4-6 describes indicators on a 12 Gbit/s SAS expansion module of a powered-on storage system.

Table 4-6 Indicators on a 12 Gbit/s SAS expansion module

Indicator	Status and Description
Power indicator/Hot Swap button	● Steady green: The interface module is working correctly. ● Blinking green: There is a hot swap request to the module. ● Steady red: The module is faulty. ● Off: The interface module is powered off or hot swappable.
Indicator of the mini SAS HD expansion port	● Steady blue: Data is transferred to the downstream disk enclosure at the rate of 4 x 12 Gbit/s. ● Steady green: Data is transferred to the downstream disk enclosure at the rate of 4 x 3 Gbit/s or 4 x 6 Gbit/s. ● Steady red: The port is faulty. ● Off: The link to the port is down.

4.2.2.7 Power/Fan-BBU Module

A Power/Fan-BBU module consists of a power module and a BBU. Power modules are supported and they allow the controller enclosure to work correctly in maximum power

consumption mode. BBUs provide enough power to ensure that any data in flight is de-staged to the vault area in the event of a power failure. If a BBU is faulty, it can be isolated without affecting the normal running of the storage system. If a power failure occurs, BBUs ensure that the storage system writes cached data to the built-in disks of the controllers, preventing data loss. After the external power supply resumes, the driver reads data from the built-in disks of the controllers to the cache. In a system using the lithium batteries, the battery capacity is updated and detected by charging and discharging the batteries. In this way, the problems can be detected in advance that the battery capacity attenuates, the batteries fail to meet the power backup requirements of the system, and thus the data backup fails when the batteries are not used for a long time. Then, the reliability of data protection upon the system power failure can be improved.

Appearance

Figure 4-11, and **Figure 4-12** show the front view of an AC Power/Fan-BBU module, and the rear view of a Power/Fan-BBU module respectively.

Figure 4-11 Front view of an AC Power/Fan-BBU module

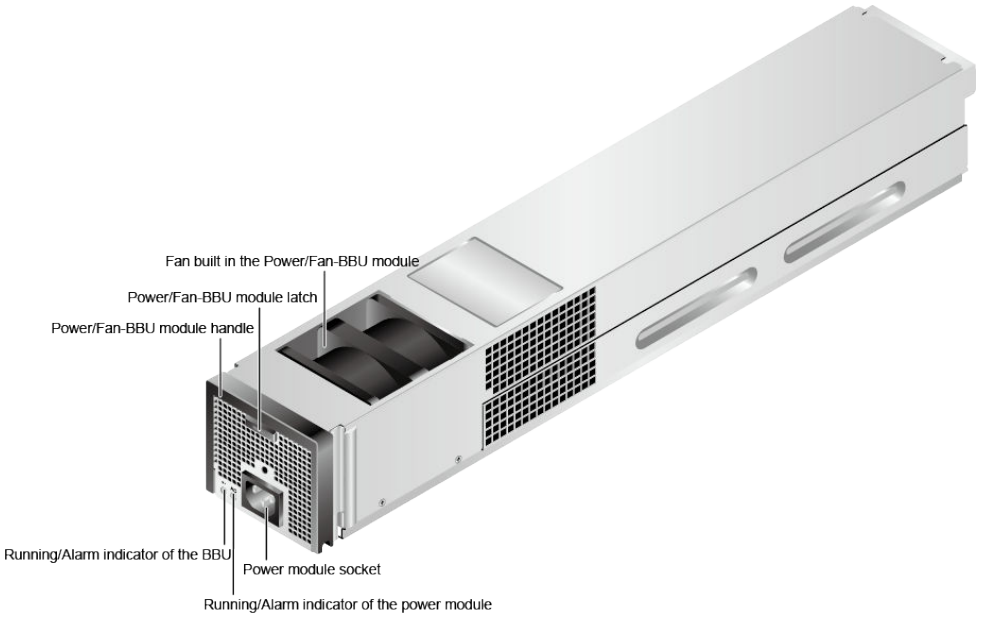
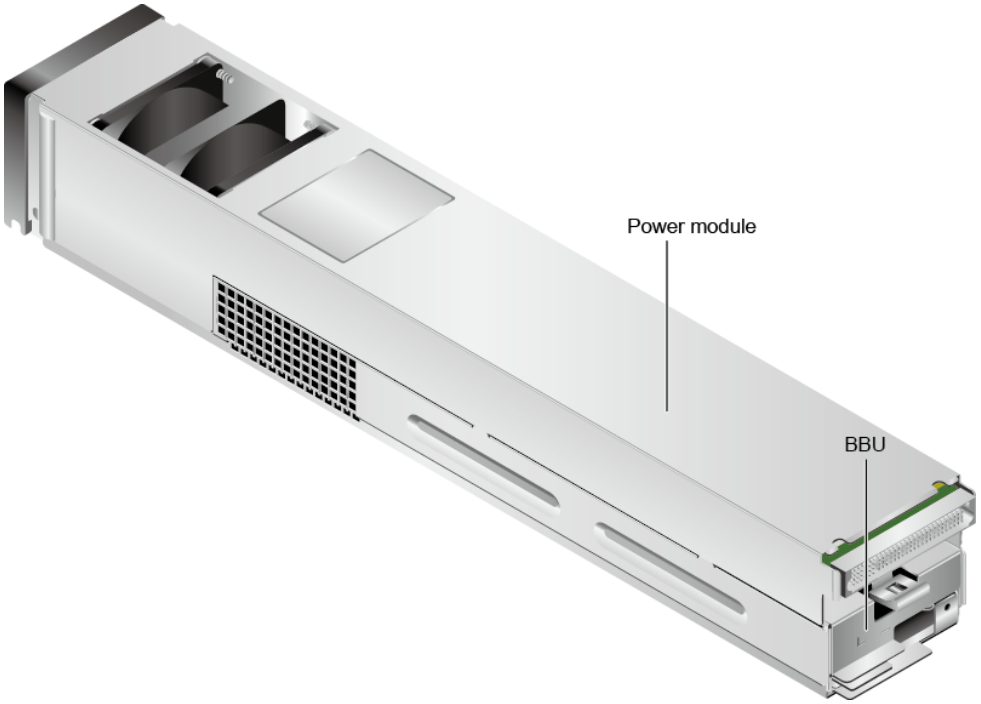


Figure 4-12 Rear view of a Power/Fan-BBU module



Indicators

Table 4-7 describes indicators on a Power/Fan-BBU module of a powered-on storage system.

Table 4-7 Indicators on a Power/Fan-BBU module

Indicator	Status and Description
Running/Alarm indicator of the power module	● Steady green: The power supply is normal. ● Blinking green: The power input is normal but the disk enclosure is powered off. ● Steady red: The power supply is faulty. ● Off: No external power input is found.
Running/Alarm indicator of the BBU	● Steady green: The BBU is fully charged. ● Blinking green (1 Hz): The BBU is being charged. ● Blinking green (4 Hz): The BBU is being discharged. ● Steady red: The BBU is faulty.

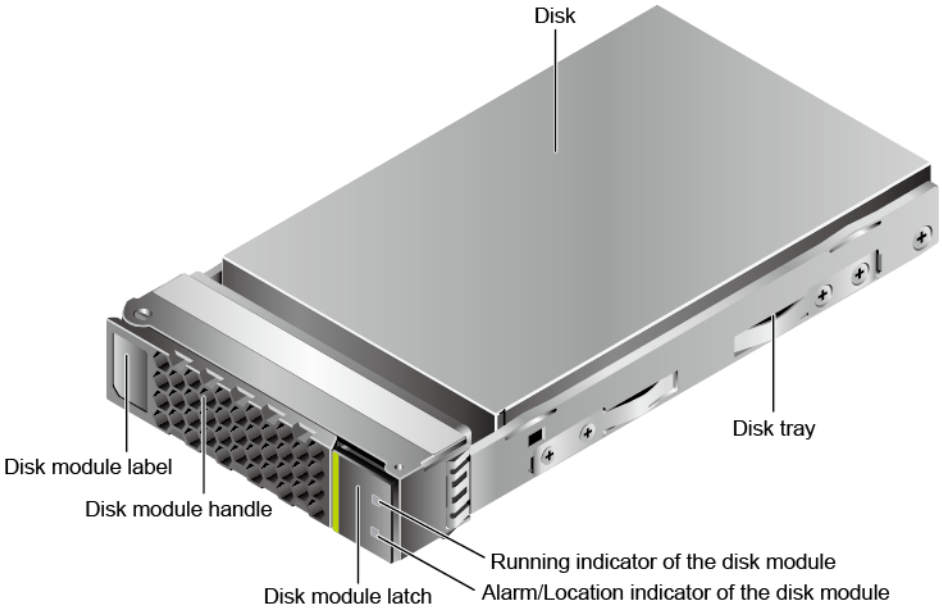
4.2.2.8 Disk Module

Disk modules provide storage capacity for a storage system. Disk modules can function as system coffer disks to save service data, system data, and cache data.

Appearance

Figure 4-13 shows the appearance of a 3.5-inch disk module.

Figure 4-13 Disk module



Indicators

Table 4-8 describes indicators on a disk module of a powered-on storage system.

Table 4-8 Indicators on a disk module

Indicator	Status and Description
Alarm/Location indicator of the disk module	● Steady red: The disk module is faulty. ● Blinking red: The disk module is being located. ● Off: The disk module is working correctly or hot swappable.
Running indicator of the disk module	● Steady green: The disk module is working correctly. ● Blinking green: Data is being read and written on the disk module. ● Off: The disk module is powered off or powered on incorrectly.

4.2.3 Indicator Introduction

After a controller enclosure is powered on, you can check the current operating status of the controller enclosure by viewing its indicators.

Indicators on the Front Panel

Figure 4-14 shows the indicators on the front panel of a 2 U 12-disk controller enclosure.

Figure 4-14 Indicators on the front panel of a 2 U 12-disk controller enclosure

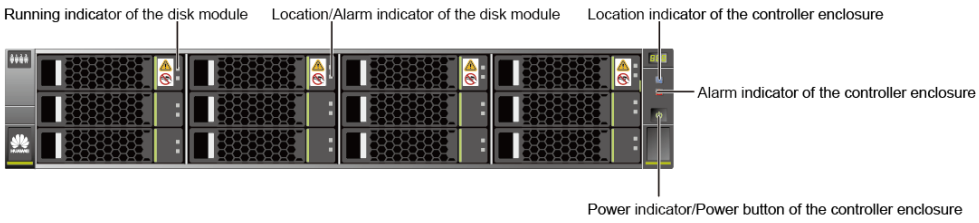


Table 4-9 describes the indicators on the front panel of the controller enclosure.

Table 4-9 Description of the indicators on the front panel of a controller enclosure

Module	Indicator	Status and Description
Disk module	Running indicator of the disk module	● Steady green: The disk module is working correctly. ● Blinking green: Data is being read and written on the disk module. ● Off: The disk module is powered off or powered on incorrectly.
	Alarm/Location indicator of the disk module	● Steady red: The disk module is faulty. ● Blinking red: The disk module is being located. ● Off: The disk module is working correctly or hot swappable.
System enclosure	Location indicator of the controller enclosure	● Blinking blue: The controller enclosure is being located. ● Off: The controller enclosure is not located.
	Alarm indicator of the controller enclosure	● Steady red: The controller enclosure is out of service, or an alarm is generated on it. ● Off: The controller enclosure is working correctly.

Module	Indicator	Status and Description
	Power indicator/Power button of the controller enclosure	● Steady green: The controller enclosure is powered on. ● Blinking green (0.5 Hz): The controller enclosure is being powered on. ● Blinking green (1 Hz): The controller enclosure is in the burn-in test. ● Blinking green (2 Hz): The controller enclosure is in the operating system boot process or in the power-off process. ● Off: The controller enclosure is powered off or powered by the BBUs.

Indicators on the Rear Panel

Figure 4-15 shows the indicators on the rear panel of a controller enclosure.

Figure 4-15 Indicators on the rear panel of a controller enclosure

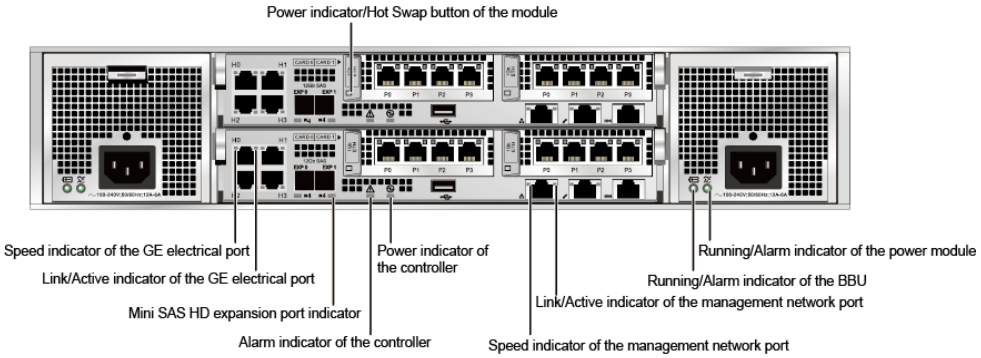


Table 4-10 describes the indicators on the rear panel of the controller enclosure.

Table 4-10 Description of the indicators on the rear panel of a controller enclosure

Module	Indicator	Status and Description
Interface module	Power indicator/Hot Swap button on the interface module	● Steady green: The interface module is working correctly. ● Blinking green: The interface module receives a hot swap request. ● Steady red: The interface module is faulty. ● Off: The interface module is powered off or hot swappable.

Module	Indicator	Status and Description
Power/Fan-BBU module	Running/ Alarm indicator of the power module	● Steady green: The power supply is correct. ● Blinking green: The power input is normal but the disk enclosure is powered off. ● Steady red: The power module is faulty. ● Off: No external power input is found.
	Running/ Alarm indicator of the BBU	● Steady green: The BBU is fully charged. ● Blinking green (1 Hz): The BBU is being charged. ● Blinking green (4 Hz): The BBU is being discharged. ● Steady red: The BBU is faulty.
Controller	Link/Active indicator of the management network port	● Steady green: The port is connected properly. ● Blinking green: Data is being transferred. ● Off: The port is connected abnormally.
	Speed indicator of the management network port	● Steady orange: Data is being transferred at the highest rate. ● Off: The data transfer speed is lower than the highest speed.
	Power indicator of the controller	● Steady green: The controller is powered on. ● The Power indicator blinking green and the Alarm indicator blinking red: The controller is being located. ● Blinking green (0.5 Hz): The controller enclosure is powered on and in the BIOS boot process. ● Blinking green (2 Hz): The controller is in the operating system boot process, or the controller is in the power-off process. ● Off: The controller is absent or powered off.
	Alarm indicator of the controller	● Steady red: An alarm is generated on the controller. ● The Alarm indicator blinking red and the Power indicator blinking green: The controller is being located. ● Off: The controller is working correctly.
	Mini SAS HD expansion port indicator	● Steady blue: Data is transferred to the downstream disk enclosure at the rate of 4 x 12 Gbit/s. ● Steady green: Data is transferred to the downstream disk enclosure at the rate of 4 x 3 Gbit/s or 4 x 6 Gbit/s. ● Steady red: The port is faulty. ● Off: The link to the port is down.

Module	Indicator	Status and Description
	Link/Active indicator of the GE electrical port	● Steady green: The link to the server is normal. ● Blinking green: Data is being transferred. ● Off: The link to the application server is down or no link exists.
	Speed indicator of the GE electrical port	● Steady orange: The data transfer rate between the storage system and the application server is 1 Gbit/s. ● Off: The data transfer rate between the storage system and the application server is less than 1 Gbit/s.

4.3 4 U Disk Enclosure (3.5-Inch Disks)

This section describes a disk enclosure in terms of its hardware structure, component functions, front and rear views, and indicators.

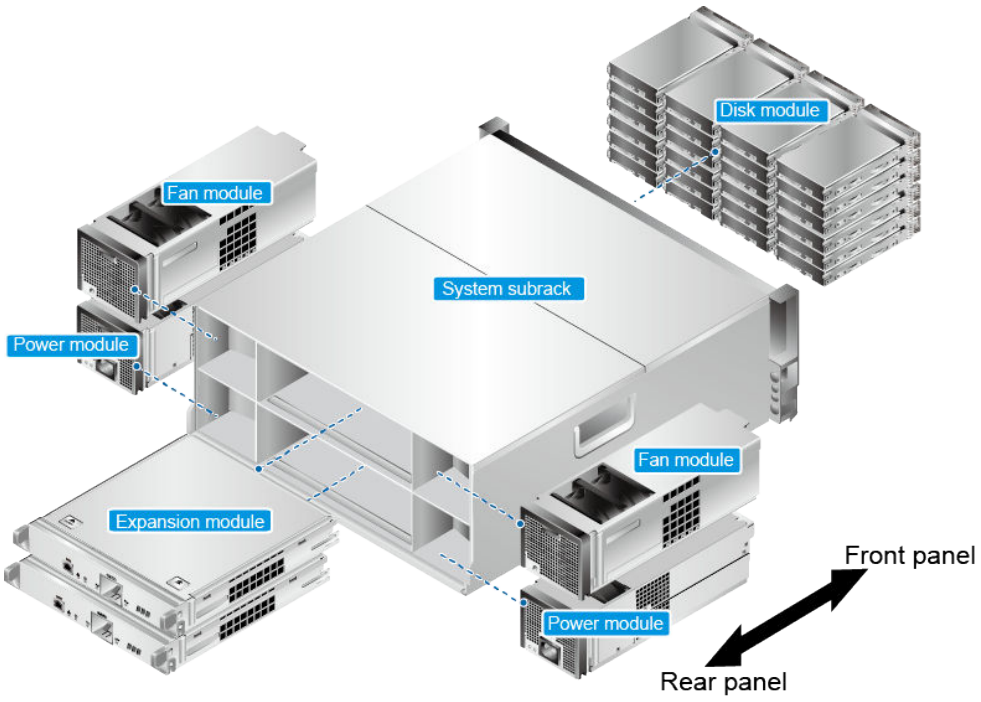
4.3.1 Overview

The disk enclosure consists of a system subrack, expansion modules, power modules, fan modules, and disk modules.

Overall Structure

Figure 4-16 shows the overall structure of a 4 U disk enclosure.

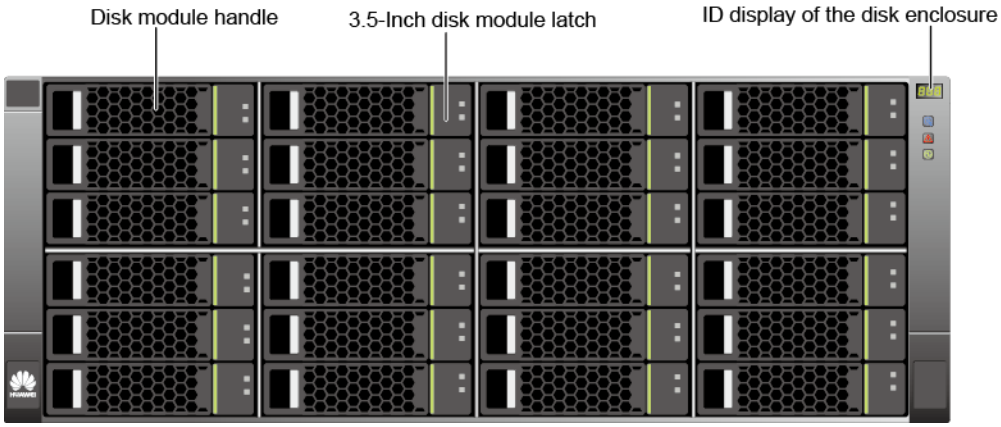
Figure 4-16 Overall structure of a 4 U disk enclosure



Front View

Figure 4-17 shows the front view of a 4 U disk enclosure.

Figure 4-17 Front view of a 4 U disk enclosure



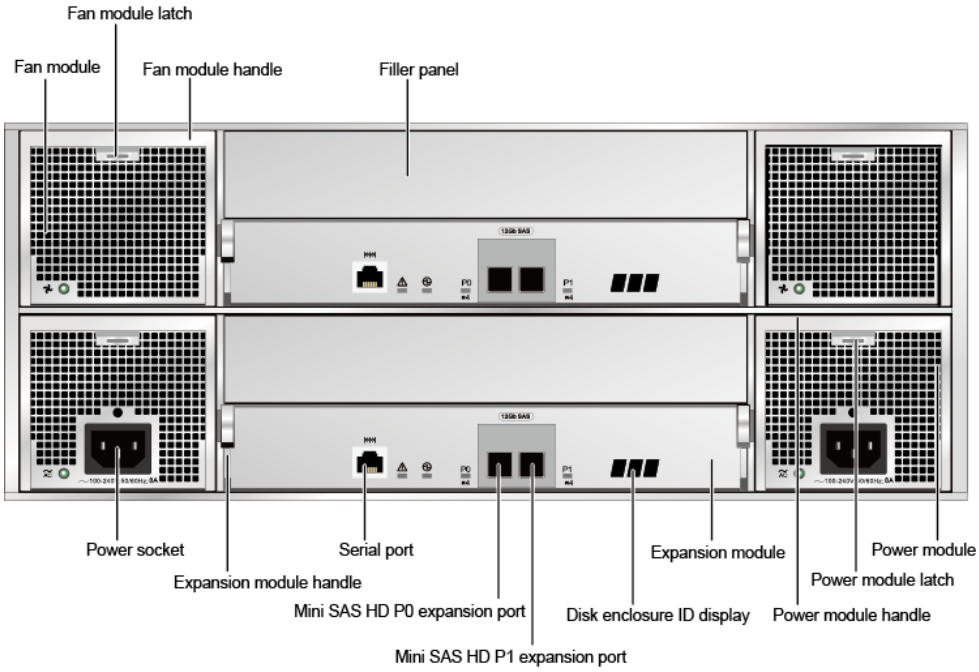
NOTE

The disk slots of a 4 U disk enclosure are numbered 0 to 23 from left to right and from top to bottom.

Rear View

Figure 4-18 shows the rear view of a disk enclosure.

Figure 4-18 Rear view of a disk enclosure



4.3.2 Component Description

This section provides the detailed illustration and description for each component.

4.3.2.1 System Subrack

The system subrack houses a midplane to provide reliable connections for interface modules and to distribute power and signals to inner modules.

Appearance

Figure 4-19 shows the appearance of a system subrack.

Figure 4-19 System subrack

4.3.2.2 Expansion Module

An expansion module connects the disk enclosure and the server through expansion ports. Each expansion module provides a P0 expansion port and a P1 expansion port.

Appearance

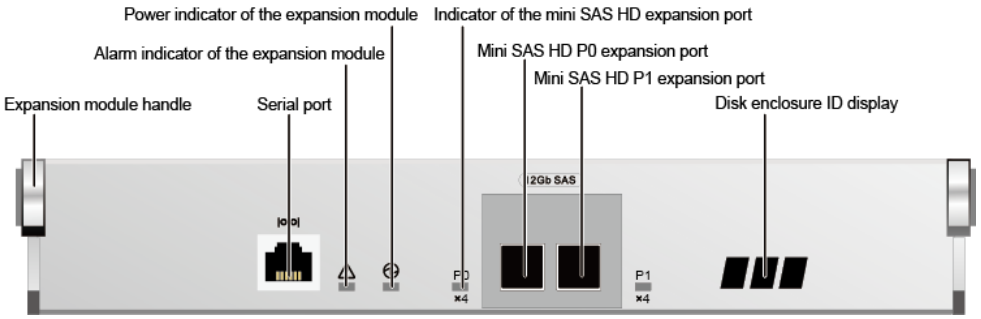
Figure 4-20 shows the appearance of an expansion module.

Figure 4-20 Expansion module

Ports

Figure 4-21 shows the ports of an expansion module.

Figure 4-21 Interfaces of an expansion module



Indicators

Table 4-11 describes indicators on an expansion module of a powered-on storage system.

Table 4-11 Indicators on an expansion module

Indicator	Status and Description
Alarm indicator of the expansion module	● Steady red: An alarm is generated in the expansion module. ● Off: The expansion module is working correctly.
Power indicator of the expansion module	● Steady green: The expansion module is powered on. ● Off: The expansion module is powered off.

Indicator	Status and Description
Indicator of the mini SAS HD expansion port	● Steady blue: Data is transferred to the downstream disk enclosure at the rate of 4 x 12 Gbit/s. ● Steady green: Data is transferred to the downstream disk enclosure at the rate of 4 x 3 Gbit/s or 4 x 6 Gbit/s. ● Steady red: The port is faulty. ● Off: The link to the port is down.

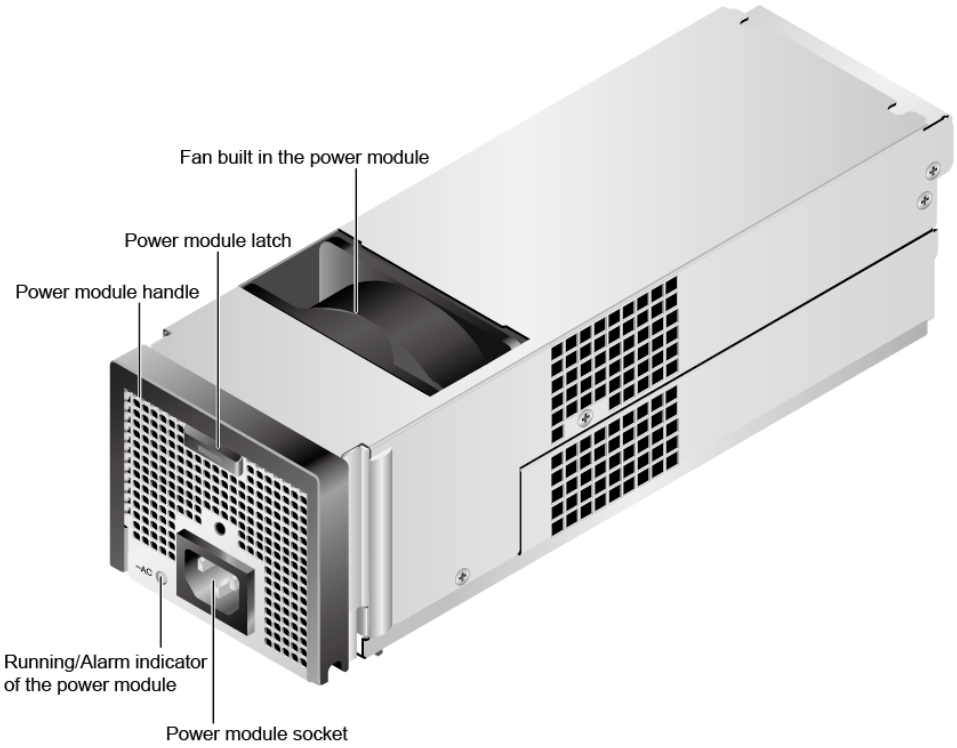
4.3.2.3 Power Module

Power modules can ensure that the disk enclosure works correctly in maximum power consumption mode.

Appearance

Figure 4-22 shows the appearance of an AC power module.

Figure 4-22 AC power module



Indicators

Table 4-12 describes indicators on a power module of a powered-on storage system.

Table 4-12 Indicators on a power module

Indicator	Status and Description
Running/Alarm indicator of the power module	● Steady green: The power supply is correct. ● Blinking green: The power input is normal but the disk enclosure is powered off. ● Steady red: The power module is faulty. ● Off: No external power input is found.

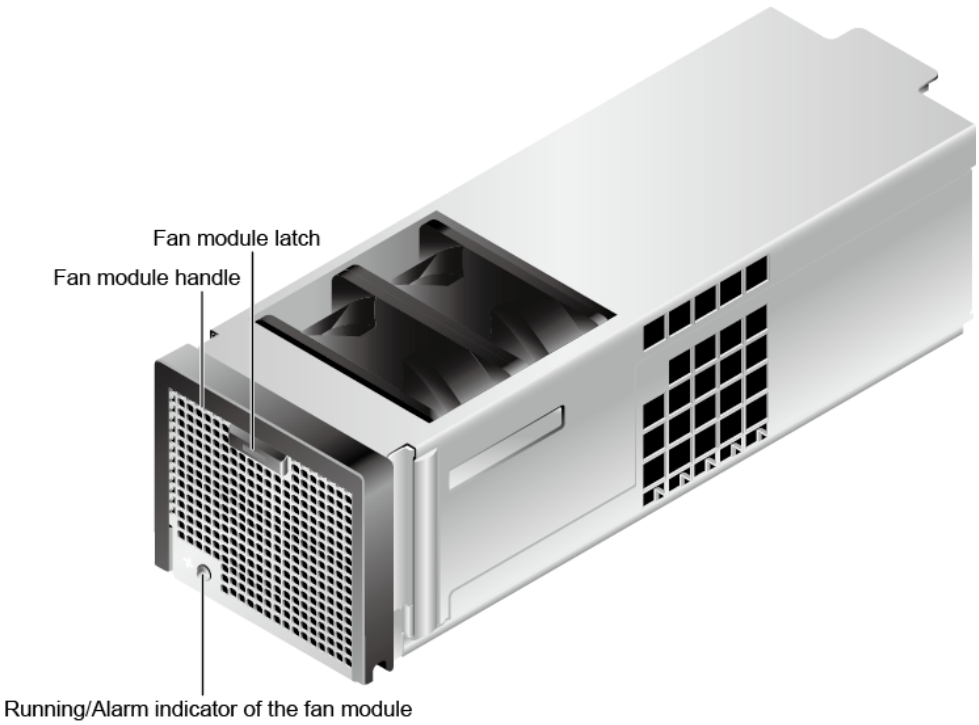
4.3.2.4 Fan Module

A fan module provides heat dissipation and supports the normal running of the disk enclosure in maximum power consumption mode.

Appearance

Figure 4-23 shows the appearance of a fan module.

Figure 4-23 Fan module



Indicators

Table 4-13 describes indicators on a fan module of a powered-on storage system.

Table 4-13 Indicators on a fan module

Indicator	Status and Description
Running/Alarm indicator of the fan module	● Steady green: The fan module is working correctly. ● Steady red: The fan module is faulty. ● Off: The fan module is powered off.

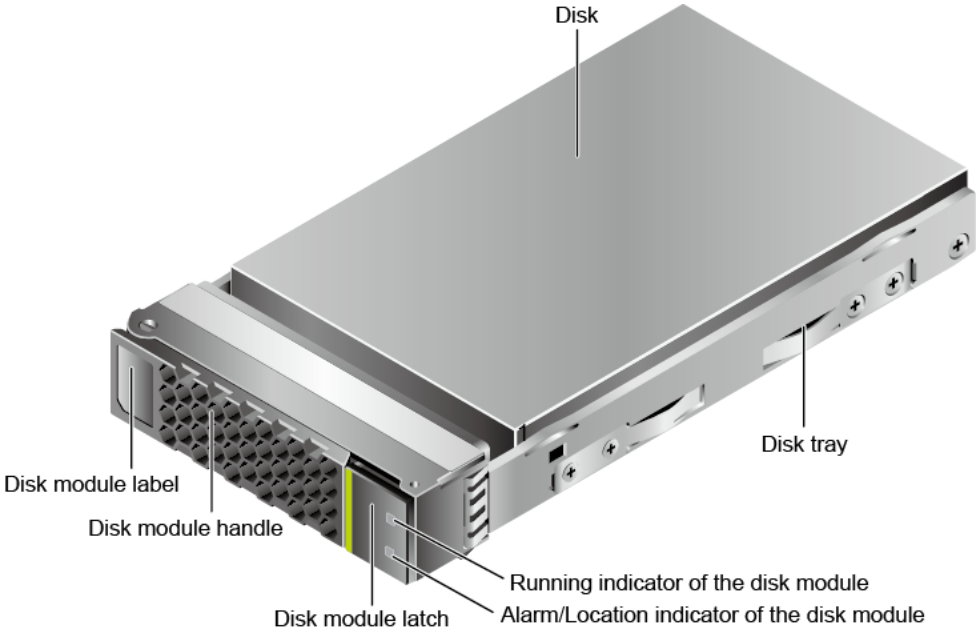
4.3.2.5 Disk Module

Disk modules provide storage capacity for a storage system to store service data.

Appearance

Figure 4-24 shows the appearance of a disk module.

Figure 4-24 Disk module



Indicators

Table 4-14 describes indicators on a disk module of a powered-on storage system.

Table 4-14 Indicators on a disk module

Indicator	Status and Description
Alarm/Location indicator of the disk module	● Steady red: The disk module is faulty. ● Blinking red: The disk module is being located. ● Off: The disk module is working correctly or hot swappable.

Indicator	Status and Description
Running indicator of the disk module	● Steady green: The disk module is working correctly. ● Blinking green: Data is being read and written on the disk module. ● Off: The disk module is powered off or powered on incorrectly.

4.3.3 Indicator Introduction

After a disk enclosure is powered on, you can check the current operating status of the disk enclosure by viewing its indicators.

Indicators on the Front Panel

Figure 4-25 shows the indicators on the front panel of a disk enclosure.

Figure 4-25 Indicators on the front panel of a disk enclosure

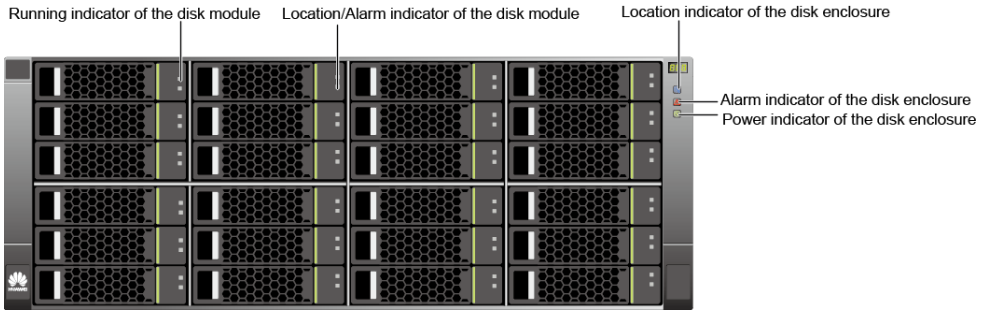


Table 4-15 describes the indicators on the front panel of the disk enclosure.

Table 4-15 Description of the indicators on the front panel of a disk enclosure

Module	Indicator	Status and Description
Disk module	Running indicator of the disk module	● Steady green: The disk module is working correctly. ● Blinking green: Data is being read and written on the disk module. ● Off: The disk module is powered off or powered on incorrectly.
	Alarm/Location indicator of the disk module	● Steady red: The disk module is faulty. ● Blinking red: The disk module is being located. ● Off: The disk module is working correctly or hot swappable.

Module	Indicator	Status and Description
System subrack	Location indicator of the disk enclosure	● Blinking blue: The disk enclosure is being located. ● Off: The disk enclosure is not located.
	Alarm indicator of the disk enclosure	● Steady red: An alarm is generated in the disk enclosure. ● Off: The disk enclosure is working correctly.
	Power indicator of the disk enclosure	● Steady green: The disk enclosure is powered on. ● Off: The disk enclosure is powered off.

Indicators on the Rear Panel

Figure 4-26 shows the indicators on the rear panel of a disk enclosure.

Figure 4-26 Indicators on the rear panel of a disk enclosure

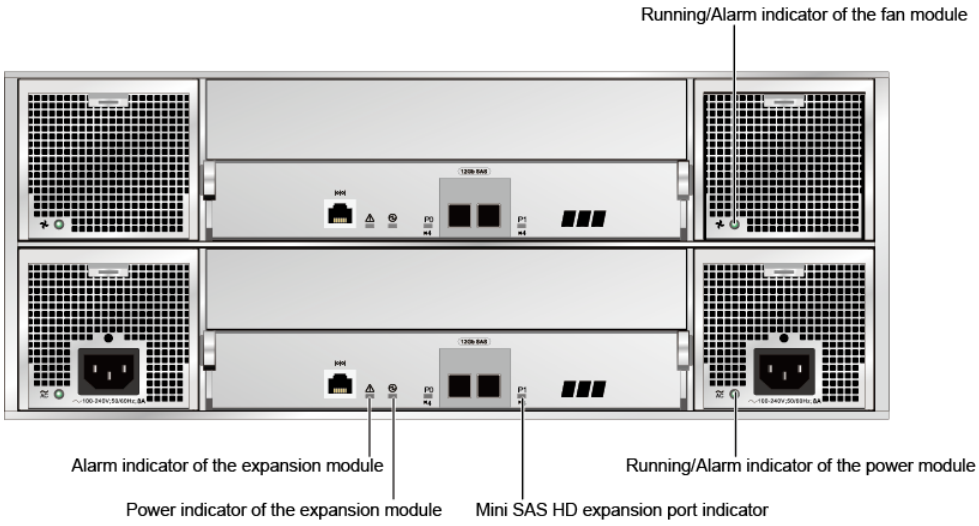


Table 4-16 describes the indicators on the rear panel of the disk enclosure.

Table 4-16 Description of the indicators on the rear panel of a disk enclosure

Module	Indicator	Status and Description
Fan module	Running/ Alarm indicator of the fan module	● Steady green: The fan module is working correctly. ● Steady red: The fan module is faulty. ● Off: The fan module is powered off.

Module	Indicator	Status and Description
Power module	Running/ Alarm indicator of the power module	● Steady green: The power supply is correct. ● Blinking green: The power input is normal but the disk enclosure is powered off. ● Steady red: The power supply is faulty. ● Off: No external power input is found.
Expansion module	Indicator of the mini SAS HD expansion port	● Steady blue: Data is transferred to the downstream disk enclosure at the rate of 4 x 12 Gbit/s. ● Steady green: Data is transferred to the downstream disk enclosure at the rate of 4 x 3 Gbit/s or 4 x 6 Gbit/s. ● Steady red: The port is faulty. ● Off: The link to the port is down.
	Power indicator of the expansion module	● Steady green: The expansion module is powered on. ● Off: The expansion module is powered off.
	Alarm indicator of the expansion module	● Steady red: An alarm is generated on the expansion module. ● Off: The expansion module is working correctly.

4.4 High-Density Disk Enclosure

This chapter describes a high-density disk enclosure in terms of its hardware structure, component functions, front and rear views, and indicators.

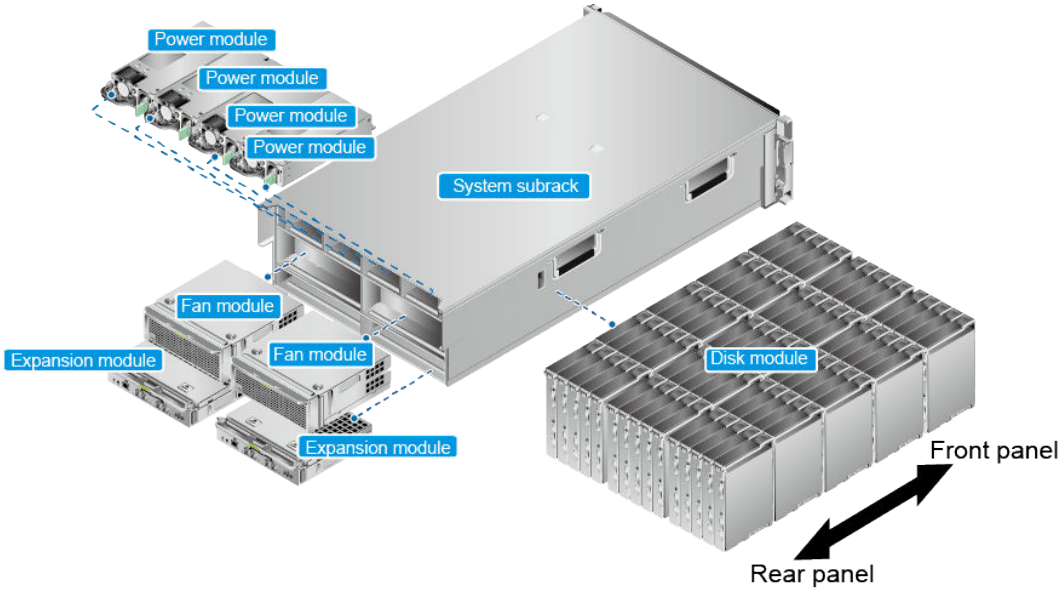
4.4.1 Overview

A high-density disk enclosure employs a modular design and consists of a system subrack, disk modules, fan modules, power modules, and expansion modules.

Overall Structure

Figure 4-27 shows the overall structure of a high-density disk enclosure.

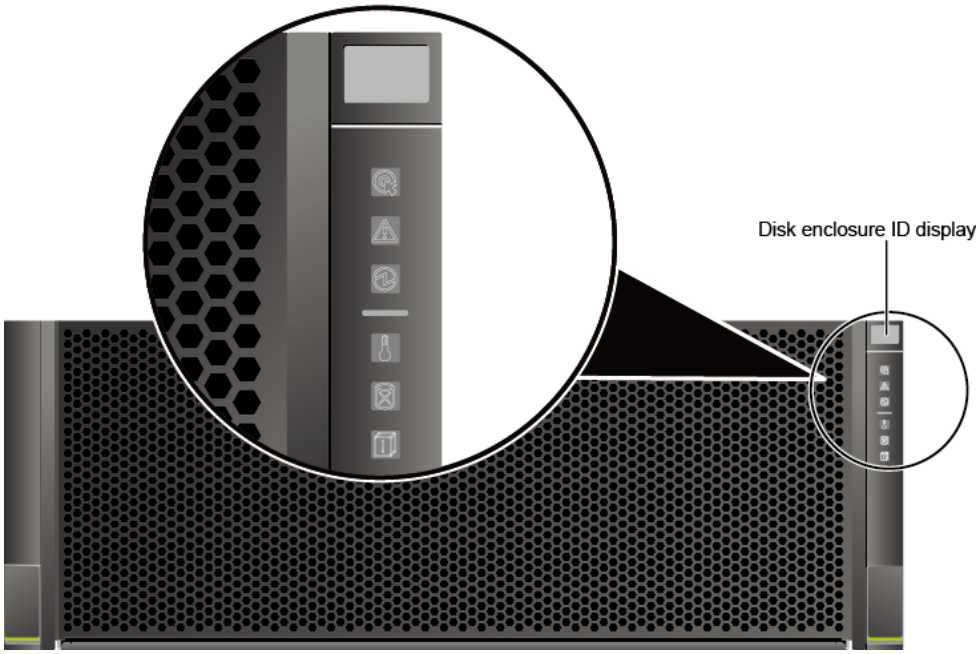
Figure 4-27 Overall structure of a high-density disk enclosure with four 1200 W power modules



Front View

Figure 4-28 shows the front view of a high-density disk enclosure.

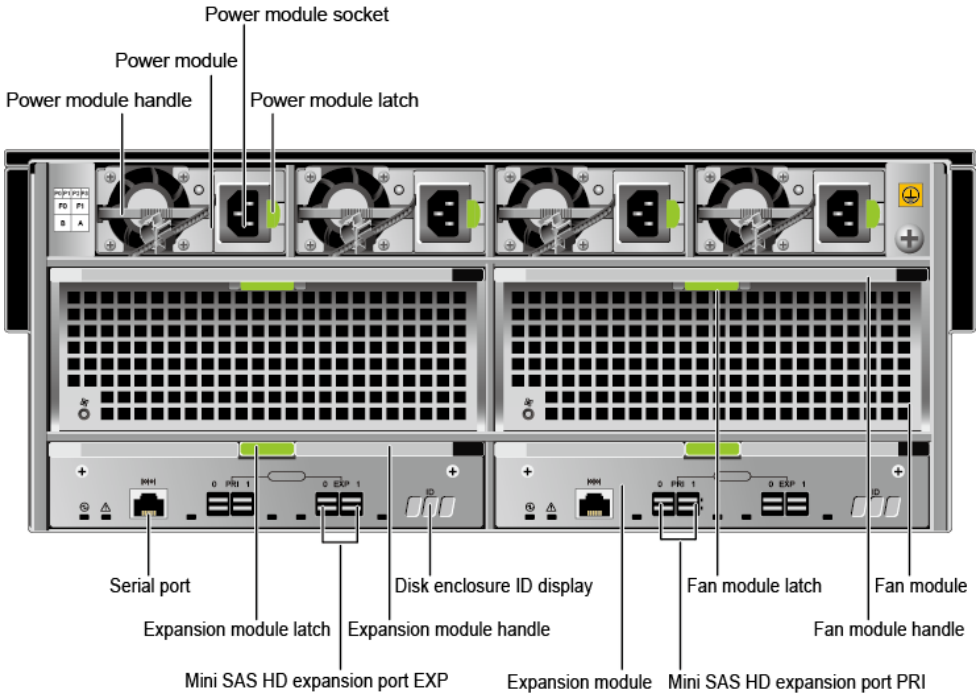
Figure 4-28 Front view of a high-density disk enclosure



Rear View

Figure 4-29 shows the rear view of a high-density disk enclosure.

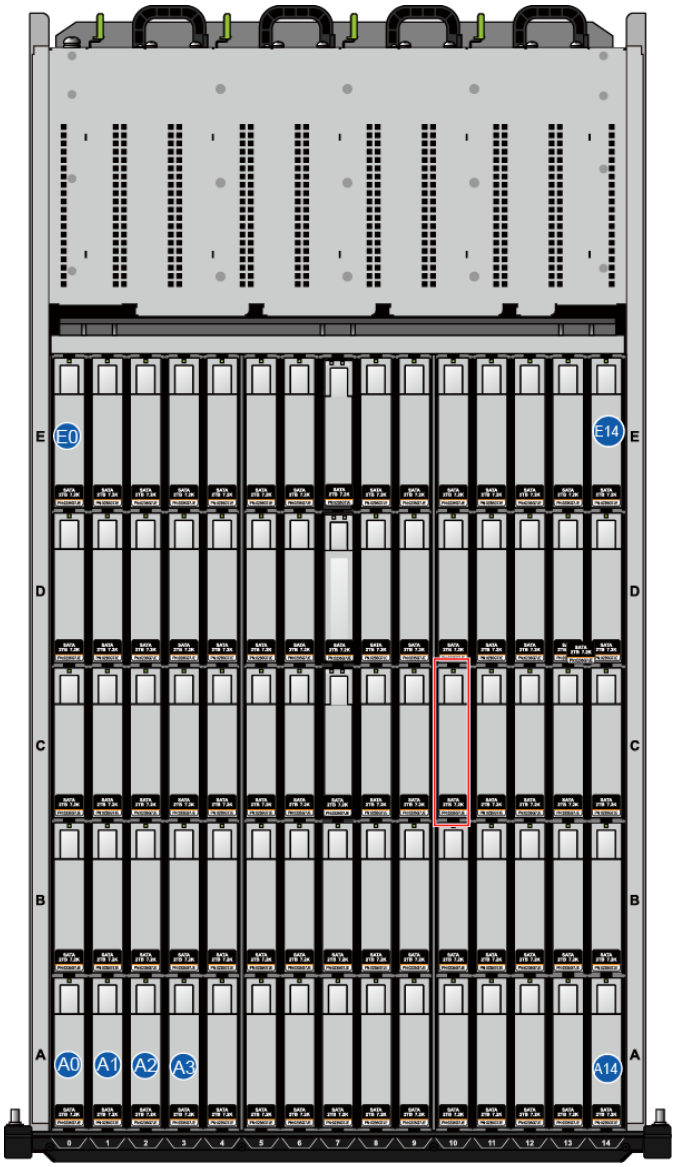
Figure 4-29 Rear view of a high-density disk enclosure



Top View

Figure 4-30 shows the top view of a high-density disk enclosure.

Figure 4-30 Top view of a high-density disk enclosure



The disk number of a high-density disk enclosure displayed on DeviceManager or CLI ranges from 0 to 74. These disks are numbered from left to right (15 columns) and from bottom to top (five rows). The slots of a high-density disk enclosure are numbered 0 to 14 from left to right (15 columns), and A to E from bottom to top (five rows). For example, in the preceding figure, the disk in the red box is numbered 40 in slot C10.

Table 4-17 lists the mappings between disk numbers and slot numbers of high-density disk enclosures.

Table 4-17 Mappings between disk numbers and slot numbers of high-density disk enclosures

Disk Number	Slot Number	Disk Number	Slot Number	Disk Number	Slot Number	Disk Number	Slot Number	Disk Number	Slot Number
0	A0	15	B0	30	C0	45	D0	60	E0

Disk Number	Slot Number	Disk Number	Slot Number	Disk Number	Slot Number	Disk Number	Slot Number	Disk Number	Slot Number
1	A1	16	B1	31	C1	46	D1	61	E1
2	A2	17	B2	32	C2	47	D2	62	E2
3	A3	18	B3	33	C3	48	D3	63	E3
4	A4	19	B4	34	C4	49	D4	64	E4
5	A5	20	B5	35	C5	50	D5	65	E5
6	A6	21	B6	36	C6	51	D6	66	E6
7	A7	22	B7	37	C7	52	D7	67	E7
8	A8	23	B8	38	C8	53	D8	68	E8
9	A9	24	B9	39	C9	54	D9	69	E9
10	A10	25	B10	40	C10	55	D10	70	E10
11	A11	26	B11	41	C11	56	D11	71	E11
12	A12	27	B12	42	C12	57	D12	72	E12
13	A13	28	B13	43	C13	58	D13	73	E13
14	A14	29	B14	44	C14	59	D14	74	E14

4.4.2 Component Description

This section provides the detailed illustration and description for each component.

4.4.2.1 System Subrack

The system subrack houses a midplane to provide reliable connections for interface modules and to distribute power and signals to inner modules.

Appearance

Figure 4-31 shows the appearance of a system subrack.

Figure 4-31 System subrack

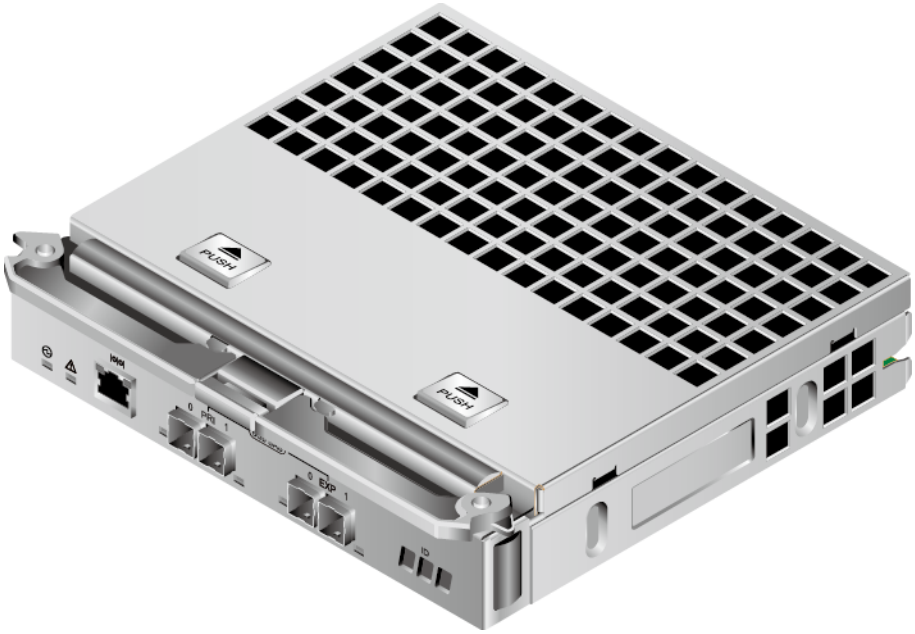
4.4.2.2 Expansion Module

Each expansion module provides two PRI HD expansion ports and two EXP HD expansion ports. Expansion modules enable a high-density disk enclosure to communicate with a controller enclosure or another high-density disk enclosure.

Appearance

Figure 4-32 shows the appearance of an expansion module.

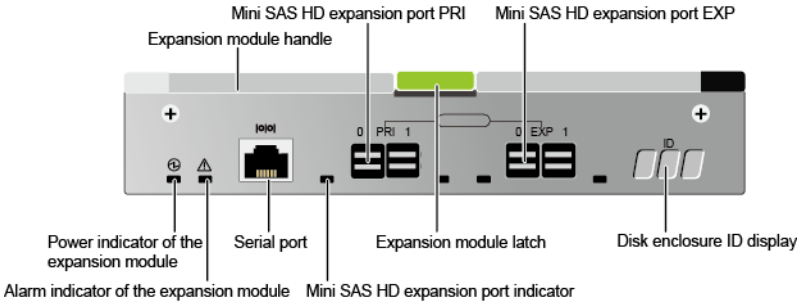
Figure 4-32 Expansion module



Ports

Figure 4-33 shows the ports of an expansion module.

Figure 4-33 Ports on an expansion module



Indicators

Table 4-18 describes the indicators on a disk enclosure expansion module of a storage system that is powered on.

Table 4-18 Indicators on an expansion module in a disk enclosure

Indicator	Status and Description
Power indicator of the expansion module	● Steady green: The expansion module is working correctly. ● Off: The expansion module is powered off.
Alarm indicator of the expansion module	● Steady red: An alarm about the expansion module is generated. ● Off: The expansion module is powered off or working correctly.
Mini SAS HD expansion port indicator	● Steady blue: The link to the expansion port is normal, and the data transfer rate is 4 x 12 Gbit/s. ● Steady green: The link to the expansion port is normal, and the data transfer rate is 4 x 6 Gbit/s. ● Steady red: The port is faulty. ● Off: The link to the expansion port is down.

4.4.2.3 Disk Module

Disk modules provide storage capacity for a storage system to store service data.

Appearance

Figure 4-34 shows the appearance of a disk module.

Figure 4-34 Disk module

Indicator

Table 4-19 describes the indicator on a disk module of a storage system that is powered on.

Table 4-19 Indicator on a disk module

Indicator	Status and Description
Disk module status indicator	● Steady green: The disk module is working correctly. ● Blinking green: Data is being read and written on the disk module. ● Steady red: The disk module is faulty. ● Blinking red: The disk module is located. ● Off: The disk module is powered off or powered on incorrectly.

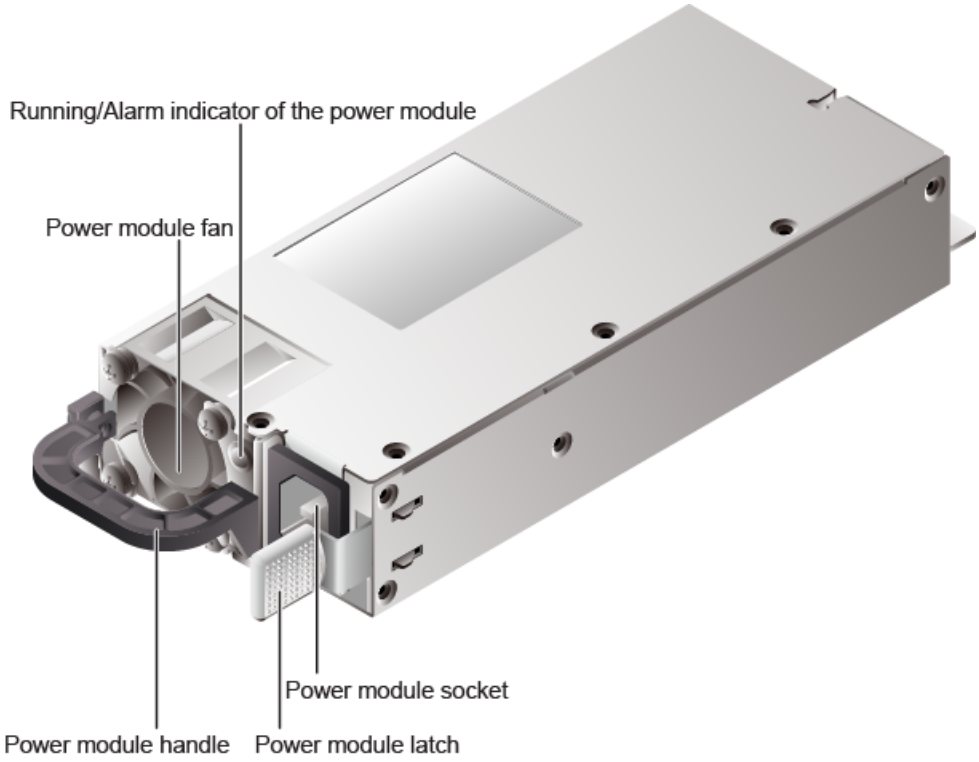
4.4.2.4 Power Module

The storage system supports AC power modules that ensure that a high-density disk enclosure works correctly in maximum power consumption mode.

Appearance

Figure 4-35 shows the appearance of a power module.

Figure 4-35 AC power module



Indicator

Table 4-20 describes the indicator on a power module of a storage system that is powered on.

Table 4-20 Indicator on a power module

Indicator	Status and Description
Running/Alarm indicator of the power module	● Steady green: The power module is working correctly. ● Off: The power module is power off, or undervoltage, overvoltage, overtemperature, or short-circuit occurs.

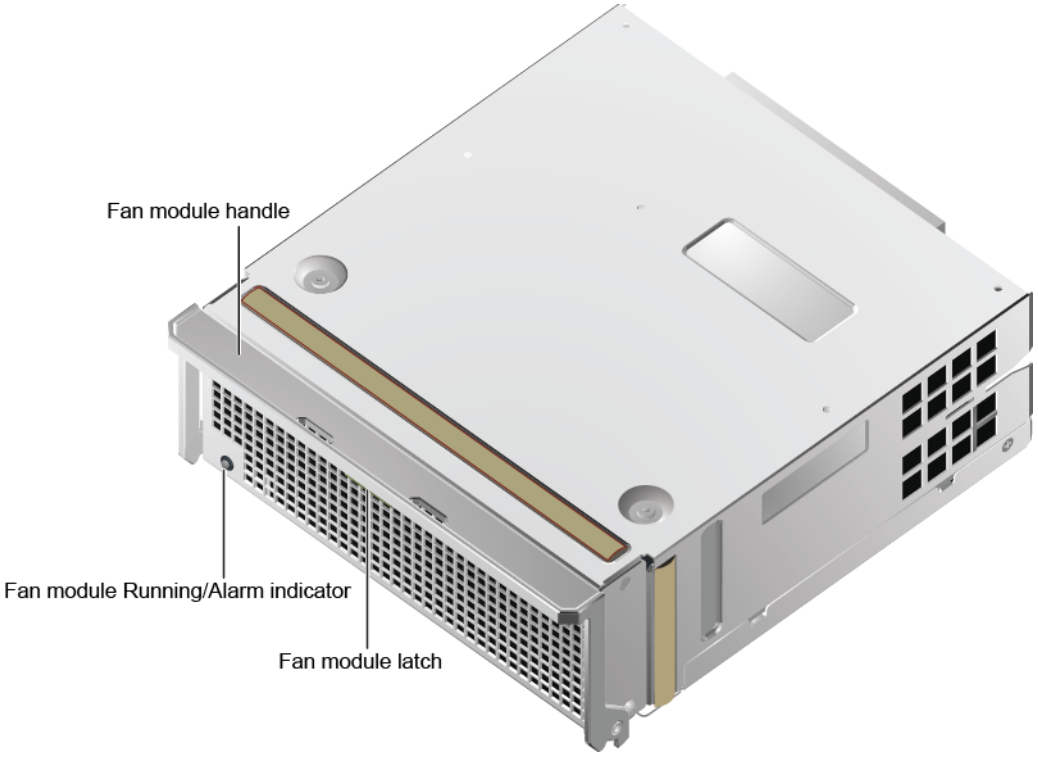
4.4.2.5 Fan Module

A fan module provides heat dissipation and supports the normal running of the disk enclosure in maximum power consumption mode.

Appearance

Figure 4-36 shows the appearance of a fan module.

Figure 4-36 Fan module



Indicator

Table 4-21 describes the indicator on a fan module of a storage system that is powered-on.

Table 4-21 Indicator on a fan module

Indicator	Status and Description
Fan module Running/Alarm indicator	● Steady green: The fan module is working correctly. ● Steady red: The fan module is faulty. ● Off: The fan module is powered off.

4.4.3 Indicator Introduction

After a disk enclosure is powered on, you can check the current operating status of the disk enclosure by viewing its indicators.

Indicators on the Front Panel

Figure 4-37 shows the indicators on the front panel of a high-density disk enclosure.

Figure 4-37 Indicators on the front panel of a high-density disk enclosure

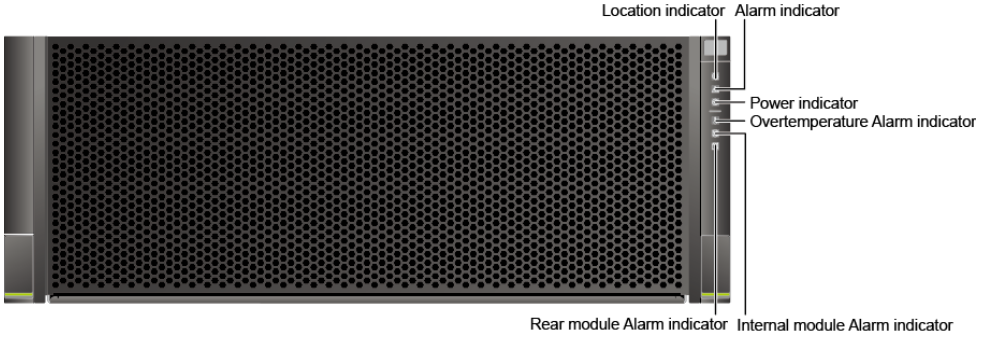


Table 4-22 describes the indicators on the front panel of a high-density disk enclosure.

Table 4-22 Description of the indicators on the front panel of a high-density disk enclosure

Module	Indicator	Status and Description
System subrack	Location indicator	● Blinking blue: The high-density disk enclosure has been located. ● Off: The high-density disk enclosure is not located.
	Alarm indicator	● Steady red: An alarm is generated in the high-density disk enclosure. ● Off: The high-density disk enclosure is running correctly.
	Power indicator	● Steady green: The high-density disk enclosure is powered on. ● Off: The high-density disk enclosure is not powered on.
	Overtemperature Alarm indicator	● Steady red: The temperature of the high-density disk enclosure is too high. ● Off: The temperature of the high-density disk enclosure is within the normal range.
	Internal module Alarm indicator	● Steady red: Internal disk modules of the high-density disk enclosure are faulty. ● Off: Internal disk modules are running correctly.
	Rear module Alarm indicator	● Steady red: The number of rear field replaceable units (FRUs) is fewer than half of that in standard configuration or rear FRUs are faulty. **NOTE** Modules on the rear of the high-density disk enclosure include power modules, fan modules, and expansion modules. ● Off: Rear FRUs are running correctly.

Indicators on the Rear Panel

Figure 4-38 shows the indicators on the rear panel of a high-density disk enclosure.

Figure 4-38 Indicators on the rear panel of a high-density disk enclosure

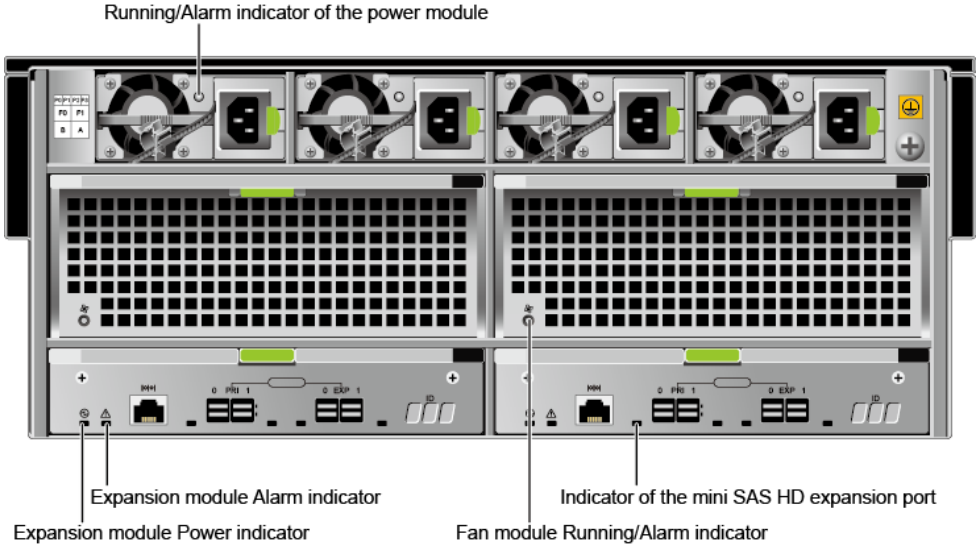


Table 4-23 describes the indicators on the rear panel of a high-density disk enclosure.

Table 4-23 Description of the indicators on the rear panel of a high-density disk enclosure

Module	Indicator	Status and Description
Power module	Running/Alarm indicator of the power module	● Steady green: The power module is working correctly. ● Off: The power module is powered off, or the undervoltage, overvoltage, overtemperature, overcurrent, fan fault, or short-circuit occurs.
Expansion module	Indicator of the mini SAS HD expansion port	● Steady blue: The link is up and the data transfer rate is 4 x 12 Gbit/s. ● Steady green: The link is up and the data transfer rate is 4 x 6 Gbit/s. ● Steady red: The expansion port is faulty. ● Off: The link is down.
Fan module	Fan module Running/Alarm indicator	● Steady green: The fan module is running correctly. ● Steady red: The fan module is faulty. ● Off: The fan module is not powered on.

Module	Indicator	Status and Description
Expansion module	Expansion module Alarm indicator	● Steady red: An alarm is generated on the expansion module. ● Off: The expansion module is running correctly.
	Expansion module Power indicator	● Steady green: The expansion module is running correctly. ● Off: The expansion module is not powered on.

4.5 Coffer Disk

The storage system has two kinds of coffer disks: built-in coffer disk and external coffer disk. Coffer disks are used to store three types of data: cache data requiring power failure protection, OceanStor OS system data, and system configuration information and logs.

Built-in Coffer Disk

Each controller houses one M.2 SATA disk (64 GB) to store system data. The flushing speed of the M.2 SATA disk is 105 MB/s. **Table 4-24** describes capacity partitions of the built-in coffer disks.

Table 4-24 Capacity partitions of built-in coffer disks

Partition Name	Partition Size	Description
Cache dirty data partition	21 GB	Stores the cache dirty data that has not been written into a disk when the storage system is powered off.
OS system partition	8 GB	Stores the OceanStor OS system data.
CCDB partition	2 GB	Stores the user configuration information (such as user configuration data of features).
LogZone partition	2 GB	Stores system logs and run logs when the storage system is powered off and write through is enabled.
DB partition	1 GB	Stores the user configuration information (such as information about the LUN capacity, ID, WWN, Fibre Channel ports, and iSCSI ports).

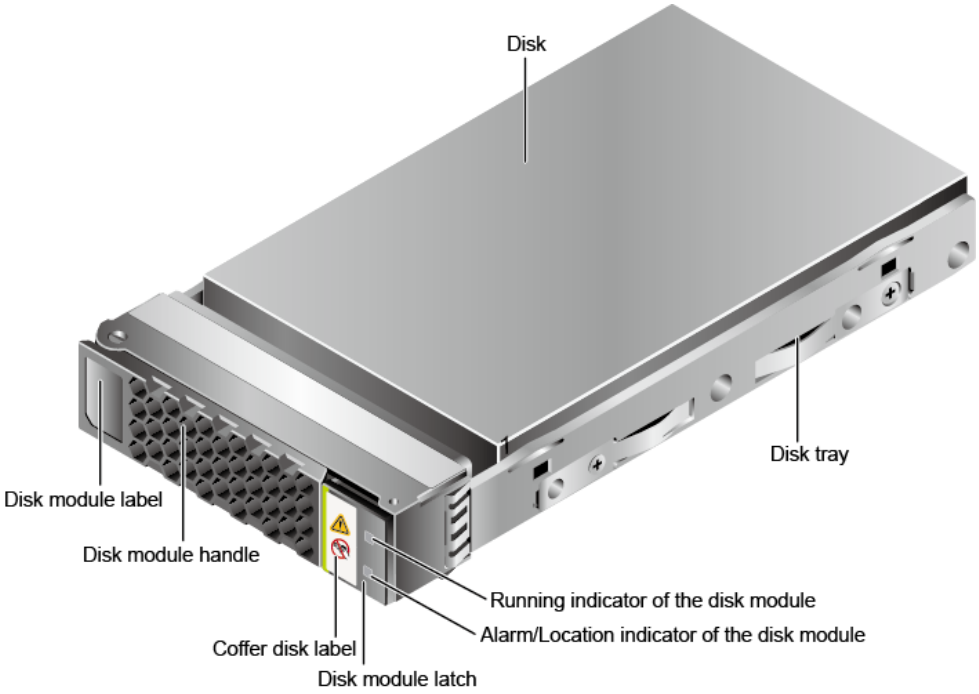
External Coffer Disk

The first four disks in the storage system are configured as coffer disks. SAS disks can be used as coffer disks. The type of the four coffer disks must be the same.

Appearance

Figure 4-39 shows the appearance of a coffer disk.

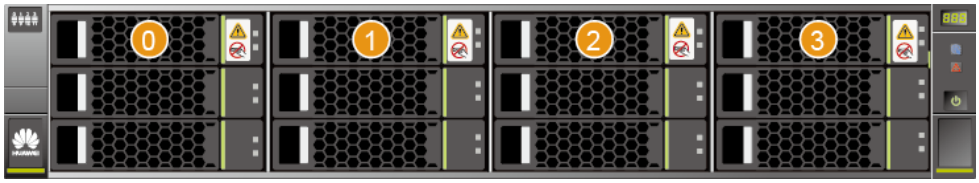
Figure 4-39 3.5-inch coffer disk



Positions

Figure 4-40 shows the positions of the first four disks in the storage system.

Figure 4-40 Positions of external coffer disks



Capacity partitions: For the four disks, each spares 5 GB of space to form a RAID 1 group. The rest of the coffer disk space can be used to store service data. Table 4-25 describes capacity partitions of external coffer disks.

Table 4-25 Capacity partitions of external coffer disks

Partition Name	Partition Size	Description
CCDB partition	2 GB	Stores the user configuration information (such as user configuration data of features). The four coffer disks are mirrors of each other for redundancy.

Partition Name	Partition Size	Description
LogZone partition	2 GB	Stores system logs and run logs when the storage system is powered off and write through is enabled. The four coffer disks are mirrors of each other for redundancy.
DB partition	1 GB	Stores the user configuration information (such as information about the LUN capacity, ID, WWN, Fibre Channel ports, and iSCSI ports). The four coffer disks are mirrors of each other for redundancy.

4.6 Device Cables

Device cables used in the storage system include power cables, ground cables, and signal cables. This section displays their appearances and describes the functions and specifications of various cables.

4.6.1 Power Cables

Power cables are classified into AC power cables, and PDU power cables. Power cables supply power to devices in a cabinet. One end of a power cable is connected to the power socket of the storage system, and the other end to an external power supply.

AC Power

- Each AC power module is equipped with one AC power cable. **Figure 4-41** shows the appearance of an AC power cable.

  Figure 4-41 AC power cable

- If a cabinet is equipped with power distribution units (PDUs), use PDU power cables to supply power to devices in the cabinet. **Figure 4-42** shows the appearance of a PDU power cable.

Figure 4-42 PDU power cable

4.6.2 Ground Cables

Ground cables are used for device grounding to improve the security when you perform operations on a storage device.

Appearance

Figure 4-43 shows the appearance of a ground cable.

Figure 4-43 Ground cable

4.6.3 Network Cables

The storage system uses network cables for its management network ports, service network ports, and other ports to connect to other devices or application servers for communication.

Appearance

The storage system communicates with the external network using network cables. One end of the network cable connects to the management network port, service network port, or other maintenance network port of the storage system, and the other end connects to the network switch, application server, or other devices.

Figure 4-44 shows the appearance of a network cable.

NOTE

GE electrical ports employ CAT5 network cables or CAT6A shielded network cables. 10GE electrical ports employ 1 m to 3 m CAT6A shielded network cables.

Figure 4-44 Network cable

4.6.4 Serial Cables

Serial cables are used to connect the serial ports of the storage system to other devices.

Appearance

A serial cable connects the serial port of the storage system to the port of the maintenance terminal.

One end of a serial cable is the RJ-45 port used to connect to the serial port of a storage system. The other end is a DB-9 port used to connect to the port of the maintenance terminal.

Figure 4-45 shows the appearance of a serial cable.

Figure 4-45 Serial cable

4.6.5 Mini SAS HD Electrical Cables

Mini SAS HD electrical cables are used to connect a controller enclosure to a disk enclosure or connect two disk enclosures.

Figure 4-46 shows the appearance of a mini SAS HD electrical cable.

Figure 4-46 Mini SAS HD electrical cable

4.6.6 Optical Fibers

The storage system communicates with Fibre Channel switches through optical fibers. One end of the optical fiber connects to the Fibre Channel host bus adapter (HBA), and the other end connects to the Fibre Channel switch or the application server. The two ends of the optical fiber are LC connectors.

Figure 4-47 shows the appearance of an optical fiber.

NOTE

When connecting cables, select proper cables according to site requirements and label information.

Figure 4-47 Optical Fiber

5 Software Architecture

Storage system software manages the storage system and storage system data, and assists application servers in data operations.

Figure 5-1 shows the storage system software architecture.

Figure 5-1 Storage system software architecture

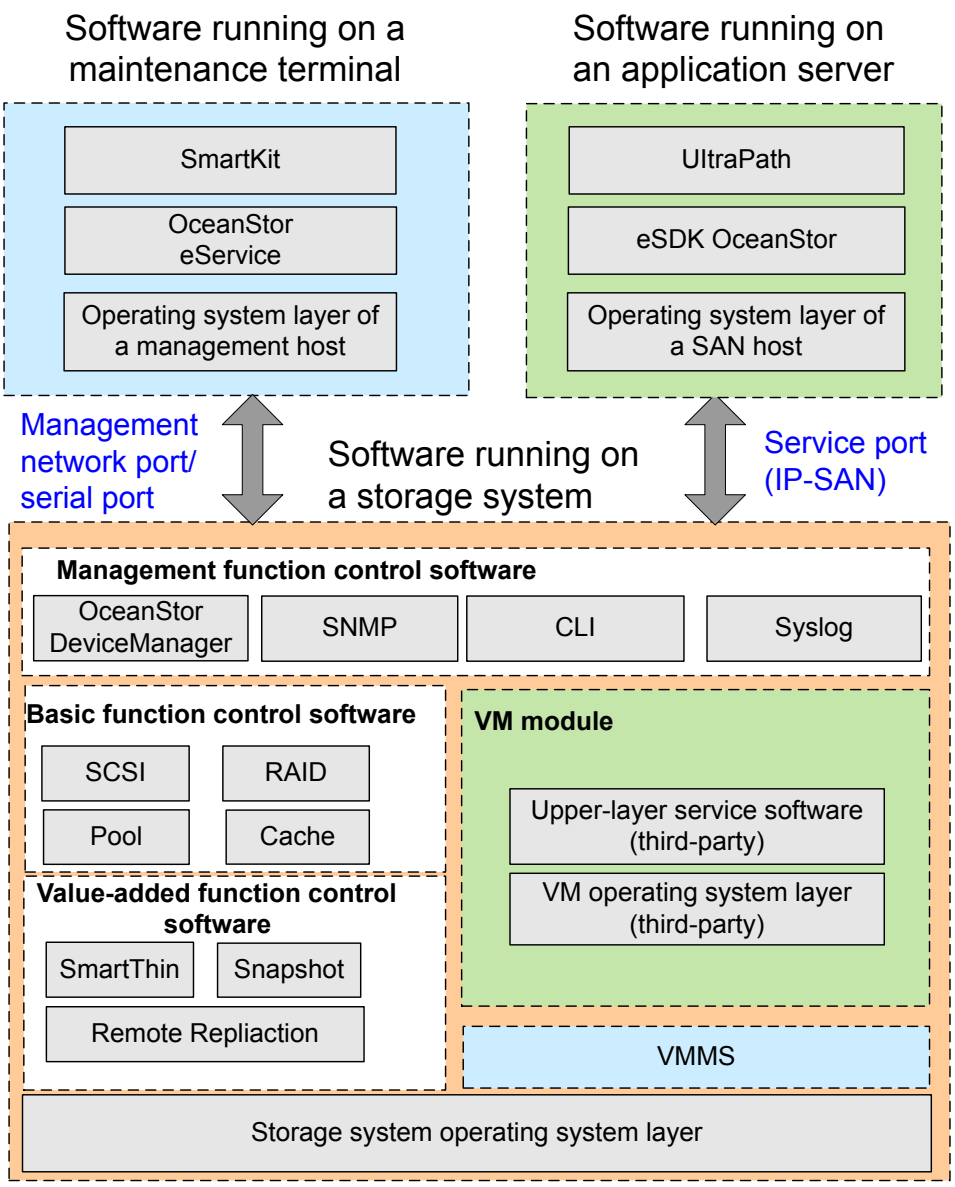


Table 5-1 describes the components of storage system software.

Table 5-1 Storage system software components

Component	Function
Software on the storage system	The storage system uses dedicated operating system to manage hardware and support the operation of storage service software. Basic function control software is used to provide basic data storage and access functions. The imbedded VM management system is used to create VM running environments.
Software on a maintenance terminal	Manages and maintains the storage system. The software includes SmartKit and OceanStor eService.
Software running on an application server	Enables the communication and interoperation between the storage system and the application server. This software category includes UltraPath, and eSDK OceanStor.

Table 5-2 describes software running on the storage system.

Table 5-2 Software on the storage system

Category	Software	Function
Storage operating system	-	Manages storage system hardware and supports storage service software.
Management function control software	OceanStor DeviceManager	The OceanStor DeviceManager is an integrated storage management platform developed by Huawei. The DeviceManager provides easy configuration, management, and maintenance of storage devices.
	SNMP[ab]	The storage system supports SNMP-based management and configuration. Users can manage and configure the storage system through third-party software that supports SNMP. A variety of network management software supports SNMP. Users can choose the software based on their requirements.
	CLI[c]	All configuration and maintenance operations of the storage system are recommended to perform on the CLI. Users can use a third-party terminal software to log in to the storage system through its serial port or management network port (over SSH), and manage the storage system on the CLI.

Category	Software	Function
	Syslog	The storage system can send alarm information to a third party. Syslog software is used to receive and save the information. There are a variety of third-party Syslog software, and users can choose one based on site requirements.
Basic function control software	SCSI software module	Processes transport layer protocols of host interface protocols, manages SCSI command status, and dispatches, resolves and processes SCSI commands.
	Cache software module	Uses high-speed and small-capacity memory as a buffer, allowing low-speed and large-capacity disks to implement tiered storage and improve system performance. Major functions include data caching, delayed writes, and prefetch.
	SRAID software module	Uses data stripping and redundancy to provide high-performance, large-capacity, and high-reliability data storage. A wide range of RAID levels are supported to improve data reliability and access performance.
	SPool software module	Logically combines disks from different disk enclosures into a storage pool to provide services.
	File protocol module	Provides file system sharing and backup functions. It supports CIFS, NFS, HTTP, and FTP file sharing protocols and NDMP backup protocol.
	Quota management module	Provides quota management for file system sharing. A shared file system allows you to specify the maximum storage capacity available to a specific directory.
	Volume management module of file system	Implements virtualized management based on volumes.
VM module	Upper-layer service software	Third-party software that provides specific services. You can purchase and install such software based on service requirements.
	VM operating system	Operating system where service software runs. You can purchase and install a VM operating system based on service requirements.
	VM management system (VMMS)	Manages VM operations.

Category	Software	Function
Value-added function control software	SmartThin software module	Provides the SmartThin function. SmartThin achieves the on-demand space allocation. It allocates free storage space in quota to application servers only as needed, increasing the storage space usage.
	Snapshot software module	Provides the snapshot function. Snapshot does not provide a complete physical duplicate but only an image of the source data, and locates the image through a mapping table.
	Remote replication software module	Provides the remote replication function. Remote replication creates an available data duplicate almost in real time on a storage system that resides in a different region from the local storage system. The duplicate can be used immediately without data recovery, protecting service continuity and data availability to the maximum.
a: Simple Network Management Protocol b: The supported character encoding is UTF-8. c: Command Line Interface		

Table 5-3 describes software on a maintenance terminal.

Table 5-3 Description of software running on a maintenance terminal

Software	Function
SmartKit	SmartKit helps service engineers and O&M engineers deploy, maintain, and upgrade devices.
OceanStor eService	OceanStor eService is a piece of remote maintenance and management software used for device monitoring, alarm reporting, and device inspection.

Table 5-4 describes the software running on an application server.

Table 5-4 Description of software running on an application server

Software	Function
UltraPath	A storage system driver program installed on application servers. When multiple data channels are set up between an application server and a storage system, the UltraPath selects an optimal channel for the application server to access the storage system. Therefore, UltraPath is an easy and efficient path management solution for proven data transmission reliability and high path security.
eSDK OceanStor	eSDK OceanStor is a Huawei-developed integration platform for storage devices. It has open capabilities and provides standard interfaces and preinstalled plug-ins. The plug-ins and providers of eSDK OceanStor enable the storage system to interconnect with vCenter and System Center so that customers can use their existing network management systems to manage Huawei's storage devices.

6 Product Specifications

About This Chapter

This chapter describes the hardware specifications and software specifications of the storage system.

6.1 Hardware Specifications
Hardware specifications include hardware configurations, port specifications, disk specifications, dimensions, weight, electrical specifications, and reliability specifications.

6.2 Software Specifications
Storage system software specifications include basic specifications and supported operating systems.

6.1 Hardware Specifications

Hardware specifications include hardware configurations, port specifications, disk specifications, dimensions, weight, electrical specifications, and reliability specifications.

Table 6-1 describes categories of hardware specifications. You can quickly find desired specifications based on their categories.

Table 6-1 Categories of hardware specifications

Category	Description
Hardware configuration	Describes the configurations of major hardware components, such as processors, memory, disks, and ports.
Port specifications	Describes port specifications, such as the maximum number of ports supported by each interface module and the maximum number of interface modules supported by each controller.
Disk specifications	Describes the size, rotational speed, capacity, and weight of each disk type.

Category	Description
Dimensions and weight	Describes the dimensions and weight of controller enclosures and disk enclosures.
Electrical specifications	Describes the electrical specifications of controller enclosures and disk enclosures.
Reliability specifications	Describes the reliability specifications of the storage system.

Hardware Configurations

Item	Value
Processors per controller	1 x 8-core processor
Cache size per controller	● 32 GB ● 48 GB ● 64 GB **NOTE** SmartContainer is not supported when each controller has 32 GB cache. SmartContainer and the NAS service cannot be configured both.
Max. number of controllers	2
Maximum number of disks	750
Controller enclosure	2 U controller enclosure with 12 x 3.5-inch disks
Type of supported disk enclosures	● 4 U SAS disk enclosure with 24 x 3.5-inch disks ● 4 U SAS high-density disk enclosure with 75 x 3.5-inch disks
Maximum number of disk enclosures	● 4 U SAS disk enclosure: 30 ● 4 U SAS high-density disk enclosure: 10
Maximum number of disk enclosures connected to back-end channels (ports)	● A maximum of eight SAS disk enclosures can be connected to a pair of SAS ports. Three is recommended. ● A maximum of eight high-density disk enclosures can be connected to every two pairs of SAS ports (a pair consists of two adjacent ports on the same card). One is recommended. ● Common disk enclosures and high-density disk enclosures cannot be connected in a mixed manner in the same back-end loop of a SAS interface module.

Item	Value
Supported disk types	● SAS (used as data coffer disks, located in slot 0 to 3 of a controller enclosure) ● NL-SAS (used as data disks, located in the other slots of controller enclosure, 4 U SAS disk enclosure, and 4 U SAS high-density disk enclosure) ● SATA (used as data disks, located in all slots of 4 U SAS disk enclosures)
Supported hot-swappable interface module types	● GE ● 10GE (electrical) ● SmartIO (Used as front-end ports. Each module has four optical ports. iWARP is not supported.)
Supported hot-swappable expansion module type	12Gbit/s SAS
Maximum number of hot-swappable I/O interface modules per controller	2
Length of expansion SAS cables	Common disk enclosure ● Electrical cables: 1 m, 3 m, and 5 m ● Optical cables: 15 m High-density disk enclosure ● Electrical cables: 5 m.
Redundancy degree of main components	● BBU: 1+1 ● Power modules: 1+1 ● Fan: 1+1

Port Specifications

Port Specification		Value
GE electrical interface module	Number of ports per interface module	Four ports for each front-end module
	Max. number of ports per controller	12

Port Specification		Value
SmartIO interface module	Number of ports per interface module	Four ports for each front-end module
10GE electrical interface module	Number of ports per interface module	Four ports for each front-end module
	Max. number of ports per controller	8
12 Gbit/s SAS expansion module	Number of ports per interface module	Four ports for each back-end module
	Max. number of ports per controller	6

Disk Specifications

Disk Type[a]	Dimensions	Rotational Speed	Weight	Capacity
SAS	3.5-inch	10,000 rpm	0.35 kg (0.77 lb)	600 GB[b]
NL-SAS		7200 rpm	0.725 kg (1.60 lb)	4 TB
SATA		7200 rpm	0.725 kg (1.60 lb)	● 4 TB ● 6 TB ● 8 TB ● 10 TB
SSD[c]		-	0.35 kg (0.77 lb)	● 1.92 TB[b] ● 3.84 TB[b]

Disk Type[a]	Dimensions	Rotational Speed	Weight	Capacity
a: Hard disk drives (HDDs for short) cannot be preserved long after being powered off. Packed HDDs can be preserved for a maximum of six months. Unpacked HDDs that are powered off can be preserved for a maximum of six months. If the maximum preservation time is exceeded, data loss or disk failure may occur. The maximum preservation time is determined based on the disk preservation specifications provided by the HDD vendor. For details, see the manual provided by the vendor. b: Configurable only in IP SAN mode. c: Applicable to V300R006C20 and later versions.				

Dimensions and Weight (unpackaged)

Module	Parameter	Value
Controller enclosure	Dimensions	● D: 748 mm (29.45 in.) ● W: 447 mm (17.60 in.) ● H: 86.1 mm (3.39 in.)
	Weight	31.8 kg (70.12 lb), when no disks are installed
4 U SAS disk enclosure	Dimensions	● D: 488 mm (19.21 in.) ● W: 447 mm (17.60 in.) ● H: 175 mm (6.89 in.)
	Weight	26.5 kg (58.43 lb), when no disks are installed
4 U high-density disk enclosure	Dimensions	Cable managers not included: ● D: 790 mm (31.1 in.) ● W: 446 mm (17.56 in.) ● H: 176.5 mm (6.95 in.) Cable managers included: ● D: 974 mm (38.35 in.) ● W: 446 mm (17.56 in.) ● H: 176.5 mm (6.95 in.)
	Weight	50.5 kg (111.35 lb), when no disks are installed

Electrical Specifications

Item		Value
Power consumption	Controller enclosure	● Max power consumption: 690 W Dual controllers, 48 GB memory for each controller, 12 x 3.5-inch disks (4 x 600 GB SAS disks + 8 x 4 TB NL-SAS disks), AC power, and 4 x SmartIO interface modules ● Typical power consumption: 506 W ● Min power consumption: 380 W
	4 U SAS disk enclosure	● Max power consumption: 520 W ● Typical power consumption: 348 W ● Min power consumption: 243 W
	4 U high-density disk enclosure	● Max power consumption: 1250 W ● Typical power consumption: 995 W ● Min power consumption: 735 W
Power voltage and rated currency	Controller enclosure	AC: ● 100 V to 240 V, AC±10%, 12 A to 6 A, single-phase, 50/60 Hz ● Supports dual-live-line input (2 W+PE), 200 V to 240 V, AC ±10%
	Disk enclosure	AC: 100 V to 240 V, AC±10%, 10 A
	High-density disk enclosure	AC: ● 100 V to 127 V, AC±10%, 10 A ● 200 V to 240 V, AC±10%, 5 A
BBU Power		16 Wh

Reliability Specifications

Item	Value
Solution reliability	99.9999%

Item	Value
Mean Time Between Failures (MTBF)	1,000,000 hours
Mean Time To Repair (MTTR)	2 hours

6.2 Software Specifications

Storage system software specifications include basic specifications and supported operating systems.

Table 6-2 describes categories of software specifications. You can quickly find desired specifications based on their categories.

Table 6-2 Categories of software specifications

Category	Description
Basic specifications	Describes basic software specifications of the storage system, including the supported RAID levels, max. number of LUNs, and max. number of mappings.
Feature specifications	Describes the feature specifications of the storage unit.
Supported operating systems	Describes operating systems supported by the VM.
License Control	Describes whether software features of the storage unit are controlled by licenses.

Basic Specifications

Item	Value
General specifications	
Maximum number of connected application servers	iSCSI ports: 1024
Maximum number of hosts per host group	64
RAID level	0, 1, 3, 5, 6, 10, 50

Item	Value
Maximum number of LUNs	4096
Maximum number of LUN groups	4096
Maximum number of LUNs that can be mapped to a host	511
Maximum number of mapping views	4095
Maximum number of iSCSI initiators	1024
Maximum number of iSCSI connections	2048
Maximum number of disk domains	64
Maximum number of disks in a disk domain	750
Minimum number of disks in a disk domain	4
Maximum number of storage pools	64
Maximum number of LUNs in a storage pool	4096
Maximum capacity of a LUN	256 TB
Maximum number of file systems	1024 The maximum number of file systems, LUNs, and LUN writable snapshots cannot exceed 4096.
Minimum capacity of a file system	1 GB
Maximum capacity of a file system	16 PB
Maximum number of files per file system	2 billion

Item	Value
Maximum capacity of a file	256 TB
Maximum number of sub-directories per directory	30 million
Maximum number of SMB shares	12,000
Maximum number of NFS shares	10,000
Maximum number of CIFS and NFS connections per controller	11,000
Maximum number of FTP connections per controller	32
Maximum number of HTTP connections per controller	32
Maximum NDMP flows per controller	8
Maximum number of local users	1000
Maximum number of local user groups	20,000
Maximum number of users in a user group	80,000
Maximum file path length	4096 bytes
Maximum length of a single file name or directory name	256 bytes
Maximum directory depth of a file system	256
Maximum number of files that can be opened at a time on a controller	100,000

Item	Value
Maximum number of logical ports per controller	128
Maximum VLANs per controller	128
VM parameters	
Maximum number of VMs per controller	3
Maximum number of data disks per VM	16
VM memory (each VM)	● 48 GB per controller: 128 MB ≤ VM memory (each VM) ≤ Reserved remaining memory per VM (max. : approximately 19 GB) ● 64 GB per controller: 128 MB ≤ VM memory (each VM) ≤ Reserved remaining memory per VM (max. : approximately 32 GB)
Number of CPU cores per VM	1 to 32
System disk capacity of a VM (GB)	≥ 1 GB
Number of network ports per VM	1 (at least one management network port is required) ≤ Number of network ports per VM ≤ Max. number of physical network ports

Feature Specifications

Feature	Parameter	2800 V5
HyperSnap	Maximum number of source LUNs	1024
	Maximum number of snapshots for a source LUN	256
	Maximum number of LUN snapshots	2048
	Maximum number of LUNs that can be batch activated	64

Feature	Parameter	2800 V5
HyperReplication	Maximum number of pairs in a remote replication	256 (synchronous + asynchronous)
	Maximum number of secondary LUNs in a pair	● Synchronous: 1:1 ● Asynchronous: 1:2
	Maximum number of connected remote storage devices	64
	Maximum number of remote replication consistency groups	64 (synchronous + asynchronous)
	Maximum number of pairs in a remote replication consistency group	64
SmartThin	Maximum number of thin LUNs	4096
	Maximum capacity of a thin LUN	256 TB
	Granularity of a thin LUN	64 KB

Supported VM Operating Systems

The following table only lists common operating systems supported by the storage system. You can contact Huawei technical support for a more complete list of supported operating systems.

Operating System	Bit Width	Kernel Version
CentOS 5.7	32/64	2.6.18-274.el5
CentOS 5.8	32/64	2.6.18-308.el5
CentOS 6.2	32	2.6.32-220.el6.i686
	64	2.6.32-220.el6.x86_64
CentOS 6.3	32	2.6.32-279.el6.i686
	64	2.6.32-279.el6.x86_64
CentOS 6.4	32	2.6.32-358.el6.i686
	64	2.6.32-358.el6.x86_64
CentOS 6.5	32	2.6.32-431.el6.i686

Operating System	Bit Width	Kernel Version
	64	2.6.32-431.el6.x86_64
CentOS 6.6	32	2.6.32-504.el6.i686
	64	2.6.32-504.el6.x86_64
Novell SuSE Linux Enterprise Server 10 SP1	32/64	2.6.16.46-0.12
Novell SuSE Linux Enterprise Server 10 SP2	32/64	2.6.16.60-0.21
Novell SuSE Linux Enterprise Server 10 SP3	32/64	2.6.16.60-0.54.5
Novell SuSE Linux Enterprise Server 10 SP4	32/64	2.6.16.60-0.85.1
Novell SuSE Linux Enterprise Server 11 SP1	32/64	2.6.32.12-0.7-default 2.6.32.59-0.7-default
Novell SuSE Linux Enterprise Server 11 SP2	32/64	3.0.13-0.27-default
Novell SuSE Linux Enterprise Server 11 SP3	32/64	3.0.76-0.11-default
Red Hat Enterprise Linux 5.5	32/64	2.6.18-194.el5
Red Hat Enterprise Linux 5.6	32/64	2.6.18-238.el5
Red Hat Enterprise Linux 5.7	32/64	2.6.18-274.el5
Red Hat Enterprise Linux 5.8	32/64	2.6.18-308.el5
Red Hat Enterprise Linux 5.9	32/64	2.6.18-348.el5
Red Hat Enterprise Linux 6.0	32	2.6.32-71.el6.i686
	64	2.6.32-71.el6.x86_64
Red Hat Enterprise Linux 6.1	32	2.6.32-131.0.15.el6.i686
	64	2.6.32-131.0.15.el6.x86_64
Red Hat Enterprise Linux 6.2	32	2.6.32-220.el6.i686
	64	2.6.32-220.el6.x86_64
Red Hat Enterprise Linux 6.3	32	2.6.32-279.el6.i686
	64	2.6.32-279.el6.x86_64
Red Hat Enterprise Linux 6.4	32	2.6.32-358.el6.i686
	64	2.6.32-358.el6.x86_64
Red Hat Enterprise Linux 6.5	32	2.6.32-431.el6.i686

Operating System	Bit Width	Kernel Version
	64	2.6.32-431.el6.x86_64
Red Hat Enterprise Linux 7.0	64	3.10.0-123.el7.x86_64
Windows Server 2008 DataCenter R2 SP1	64	-
Windows Server 2008 Enterprise R2 SP1	64	-
Windows Server 2008 Enterprise R2	64	-
Windows Server 2012 DataCenter/ Standard	64	-
Windows Server 2012 R2 DataCenter/Essentials/Standard	64	-
Windows Server 2003 DataCenter SP2[a]	32	-
Windows Server 2003 Enterprise SP2[a]	32	-
Windows Server 2003 Standard SP2[a]	32/64	-
Windows 7	64	-
Windows 7 SP1	32	-
	64	-
a: Limited support (These systems can run, but are not provided with commercial quality assurance and support services.)		

License Control

Obtain LicensePurchase License

Function	Requiring License Control or Not
HyperSnap (Snapshot)	Yes
HyperReplication (Remote replication)	Yes
SmartThin	Yes
CIFS	Yes
NFS	Yes

7 Environmental Requirements

About This Chapter

Environmental requirements cover the following aspects: temperature, humidity, particle contaminants, corrosive airborne contaminants, heat dissipation, and noise.

7.1 Temperature, Humidity, and Altitude
Temperature, humidity, and altitude requirements must be met so that storage systems can correctly work or be properly preserved.

7.2 Vibration and Shock
Vibration and shock requirements must be met so that storage systems can correctly work or be properly preserved.

7.3 Particle Contaminants
Particle contaminants and other negative environmental factors (such as abnormal temperature and humidity) may expose IT equipment to a higher risk of corrosive failure. This section specifies the limitation on particle contaminants with the aim at avoiding such risks.

7.4 Corrosive Airborne Contaminants
Corrosive airborne contaminants and other negative environmental factors (such as abnormal temperature and humidity) may expose IT equipment to higher risks of corrosive failure. This article specifies the limitation on corrosive airborne contaminants with an aim at avoiding such risks.

7.5 Heat Dissipation and Noise
A storage system can run steadily using the heat dissipation system carried in its own fan modules. An external device is necessary to remove the hot air discharged from a storage system into the equipment room to ensure proper air circulation.

7.1 Temperature, Humidity, and Altitude

Temperature, humidity, and altitude requirements must be met so that storage systems can correctly work or be properly preserved.

Table 7-1 lists the temperature, humidity, and altitude requirements of the storage systems.

Table 7-1 Requirements on ambient temperature and humidity

Parameter	Condition	Requirement
Temperature	Operating temperature	● 5°C to 40°C (41°F to 104°F) when the altitude is between -60 m and +1800 m (-196.85 ft. and +5905.51 ft.) ● At altitudes between 1800 m and 3000 m (5905.51 ft. and 9842.52 ft.), the temperature drops by 1°C (1.8°F) for 220 m (721.78 ft.) of altitude increase.
	Temperature variation in the operating environment	● Operating: 20°C/h ● Storage and transportation: 30°C/h
	Non-operating temperature	-40°C to 70°C (-40°F to 158°F)
	Storage temperature (during transportation and storage with packages)	-40°C to 70°C (-40°F to 158°F)
Humidity	Humidity	10% RH[a] to 90% RH
	Storage humidity	5% RH to 95% RH
	Non-operating humidity	5% RH to 95% RH
	Maximum humidity variation	10%/h
Altitude	Operating altitude of disks	-304.8 m to +3048 m (-1000 ft. to +10000 ft.)
	Non-operating altitude of disks	-305 m to +12192 m (-1000.66 ft. to +40000 ft.)
a: relative humidity (RH)		

7.2 Vibration and Shock

Vibration and shock requirements must be met so that storage systems can correctly work or be properly preserved.

Table 7-2 shows the vibration and shock requirements of storage systems.

Table 7-2 Vibration and shock requirements of storage systems

Parameter	Requirement
Operating vibration	5 to 350 Hz, PSD: 0.0002 g^2/Hz, 350 to 500 Hz, -3 dB, 0.3 Grms, 3 axes, 15min/axis
Non-operating vibration	10 to 500 Hz, 1.49 Grms, 3 axes, 15 min/axis PSD: ● 10 HZ@0.1g^2/HZ ● 20 HZ@0.1g^2/HZ ● 50 HZ@0.004g^2/HZ ● 100 HZ@0.001g^2/HZ ● 500 HZ@0.001g^2/HZ
Non-operating shock	Half sine, 70 Gs/2 ms, 1 shock/face, total 6 faces

7.3 Particle Contaminants

Particle contaminants and other negative environmental factors (such as abnormal temperature and humidity) may expose IT equipment to a higher risk of corrosive failure. This section specifies the limitation on particle contaminants with the aim at avoiding such risks.

The concentration level of particle contaminants in a data center should meet the requirements listed in the white paper entitled *Gaseous and Particulate Contamination Guidelines for Data Centers published in 2011* by the American Society of Heating Refrigerating and Air-conditioning Engineers (ASHRAE) Technical Committee (TC) 9.9.

ASHRAE, affiliated to International Organization for Standardization (ISO), is an international organization operated for the exclusive purpose of advancing the arts and sciences of heating, ventilation, air-conditioning, and refrigeration (HVAC & R). The *Gaseous and Particulate Contamination Guidelines for Data Centers* is widely accepted, which is prepared by the members of ASHRAE TC 9.9, AMD, Cisco, Cray, Dell, EMC, Hitachi, HP, IBM, Intel, Seagate, SGI, and Sun.

According to the Guidelines, particle contaminants in a data center shall reach the cleanliness of ISO 14664-1 Class 8:

- Each cubic meter contains not more than 3,520,000 particles that are greater than or equal to 0.5 μm.
- Each cubic meter contains not more than 832,000 particles that are greater than or equal to 1 μm.
- Each cubic meter contains not more than 29,300 particles that are greater than or equal to 5 μm.

It is recommended that you use an effective filter to process air flowing into the data center as well as a filtering system to periodically clean the air already in the data center.

ISO 14644-1, Cleanrooms and Associated Controlled Environments - Part 1: Classification of Air Cleanliness, is the primary global standard on air cleanliness classification. **Table 7-3** gives the air cleanliness classification by particle concentration.

Table 7-3 Air cleanliness classification by particle concentration of ISO 14664-1

ISO Class	Maximum allowable concentrations (particles/m^3) for particles equal to and greater than the considered sizes shown below					
	≥ 0.1 µm	≥ 0.2 µm	≥ 0.3 µm	≥ 0.5 µm	≥ 1 µm	≥ 5 µm
Class 1	10	2	-	-	-	-
Class 2	100	24	10	4	-	-
Class 3	1000	237	102	35	8	-
Class 4	10,000	2370	1020	352	83	-
Class 5	100,000	23,700	10,200	3520	832	29
Class 6	1,000,000	237,000	102,000	35,200	8320	293
Class 7	-	-	-	352,000	83,200	2930
Class 8	-	-	-	3,520,000	832,000	29,300
Class 9	-	-	-	-	8,320,000	293,000

7.4 Corrosive Airborne Contaminants

Corrosive airborne contaminants and other negative environmental factors (such as abnormal temperature and humidity) may expose IT equipment to higher risks of corrosive failure. This article specifies the limitation on corrosive airborne contaminants with an aim at avoiding such risks.

Table 7-4 lists common corrosive airborne contaminants and their sources.

Table 7-4 Common corrosive airborne contaminants and their sources

Symbol	Sources
H_2S	Geothermal emissions, microbiological activities, fossil fuel processing, wood rot, sewage treatment
SO_2, SO_3	Coal combustion, petroleum products, automobile emissions, ore smelting, sulfuric acid manufacture
S	Foundries, sulfur manufacture, volcanoes
HF	Fertilizer manufacture, aluminum manufacture, ceramics manufacture, steel manufacture, electronics device manufacture
NO_X	Automobile emissions, fossil fuel combustion, chemical industry
NH_3	Microbiological activities, sewage, fertilizer manufacture, geothermal emissions, refrigeration equipment

Symbol	Sources
C	Incomplete combustion (aerosol constituent), foundry
CO	Combustion, automobile emissions, microbiological activities, tree rot
Cl_2, ClO_2	Chlorine manufacture, aluminum manufacture, zinc manufacture, refuse decomposition
HCl	Automobile emissions, combustion, forest fire, oceanic processes, polymer combustion
HBr, HI	Automobile emissions
O_3	Atmospheric photochemical processes mainly involving nitrogen oxides and oxygenated hydrocarbons
C_NH_N	Automobile emissions, animal waste, sewage, tree rot

The concentration level of corrosive airborne contaminants in a data center should meet the requirements listed in the white paper entitled *Gaseous and Particulate Contamination Guidelines for Data Centers published in 2011* by the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) Technical Committee (TC) 9.9.

According to the Guidelines, corrosive airborne contaminants in a data center should meet the following requirements:

- Copper corrosion rate

  Less than 300 Å/month per ANSI/ISA-71.04-1985 severity level G1.
- Silver corrosion rate

  Less than 200 Å/month.

NOTE

Å, or angstrom, is a unit of length. One Å is equal to 1/10,000,000,000 meter.

According to ANSI/ISA-71.04-1985 Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants, the gaseous corrosivity levels are G1 (mild), G2 (moderate), G3 (harsh), and GX (severe), as described in **Table 7-5**.

Table 7-5 Gaseous corrosivity levels per ANSI/ISA-71.04-1985

Severity Level	Copper Reactivity Level	Description
G1 (mild)	300 Å/month	An environment sufficiently well-controlled such that corrosion is not a factor in determining equipment reliability.
G2 (moderate)	300 Å/month to 1000 Å/month	An environment in which the effects of corrosion are measurable and may be a factor in determining equipment reliability.

Severity Level	Copper Reactivity Level	Description
G3 (harsh)	1000 Å/month to 2000 Å/month	An environment in which there is high probability that corrosion will occur.
GX (severe)	> 2000 Å/month	An environment in which only specially designed and packaged equipment would be expected to survive.

See **Table 7-6** for the copper and silver corrosion rate requirements.

Table 7-6 Concentration limitation of corrosive airborne contaminants in a data center

Group	Gas	Unit	Concentration
Group A	H_2S	ppb[a]	< 3
	SO_2	ppb	< 10
	Cl_2	ppb	< 1
	NO_2	ppb	< 50
Group B	HF	ppb	< 1
	NH_3	ppb	< 500
	O_3	ppb	< 2
a: Part per billion (ppb) is the number of units of mass of a contaminant per billion units of total mass.			

Group A and group B are common gas groups in a data center. The concentration limits of Group A or group B that correspond to copper reactivity level G1 are calculated based on the premise that relative humidity in the data center is lower than 50% and that the gases in the group interact with each other. A 10% of increase in the relative humidity will heighten the gaseous corrosivity level by 1.

Corrosion is not determined by a single factor, but by comprehensive environmental factors such as temperature, relative humidity, corrosive airborne contaminants, and ventilation. Any of the environmental factors may affect the gaseous corrosivity level. Therefore, the concentration limitation values specified in the previous table are for reference only.

7.5 Heat Dissipation and Noise

A storage system can run steadily using the heat dissipation system carried in its own fan modules. An external device is necessary to remove the hot air discharged from a storage system into the equipment room to ensure proper air circulation.

Heat Dissipation

Traditional heat dissipation modes are as follows:

- Air goes into a controller enclosure from the front end and out of its back end.

  Cooling air enters through small holes on the interface modules. After dissipating the heat of interface modules, controllers, and power modules, the air is discharged by fans. The controller enclosure dynamically adjusts rotational speed of the fans based on the operational temperature of the storage system.
- Air goes into a disk enclosure from the front end and out of its back end.

  Cooling air enters through the space between disks, passing the midplane, into the power modules and expansion modules. After dissipating the heat, the air is discharged by fans. The disk enclosure dynamically adjusts rotational speed of the fans based on the operational temperature of the storage system.

For better maintenance, ventilation, and heat dissipation, pay attention to the following when installing the storage system in the cabinet:

- To ensure smooth ventilation, the cabinet should be at least 100 cm (39.4 inches) away from the equipment room walls and at least 120 cm (47.24 inches) away from other cabinets (that are in front of or behind).
- To keep air convection between the cabinet and the equipment room, no enclosed space is allowed in the cabinet. 1 U (44.45 mm, 1.75 inches) space should be left above and below each device.

The airflow parameters of the storage system are shown in **Table 7-7**.

Table 7-7 Airflow parameters of storage systems

System Airflow	Value
Controller enclosure	● 183 CFM[a] (maximum fan speed) ● 83 CFM (25°C)
4 U disk enclosure	● 151 CFM (maximum fan speed) ● 52 CFM (25°C)
4 U high-density disk enclosure	● 210 CFM (maximum fan speed) ● 116 CFM (25°C)
a: cubic feet per minute (CFM)	

The heat dissipation parameters of the storage system are shown in **Table 7-8**.

Table 7-8 Heat dissipation parameters of the storage system

Maximum heat dissipation	2800 V5
Controller enclosure	2339 BTU[a]/h

Maximum heat dissipation	2800 V5
4U Disk enclosure	1773 BTU/h
4U high-density disk enclosure	4262 BTU/h
a: BTU, British Thermal Unit.	

Noise

The disks and fans make noise when in operation, with fans being the major noise source. The intensity of fan rotation is associated with the temperature. A higher temperature leads to greater rotational speed by the fans, which in return creates greater noise. Therefore, there is a direct correlation between the noise made by a storage system and the ambient temperature in the equipment room.

When the temperature is 25°C, the parameters of the noise generated by the storage system are shown in **Table 7-9**.

Table 7-9 Noise parameters of storage systems

Device	Sound Power
2 U controller enclosure	63.1 dB
4 U disk enclosure	66.3 dB
4 U high-density disk enclosure	75.4 dB

8 Standard Compliance

The chapter describes the protocol standards, the safety specifications and electromagnetic compatibility (EMC) standards, the industry standards that the storage system complies with.

Protocol Standards

Table 8-1 lists the protocol standards that the storage system complies with.

Table 8-1 Protocol standards

Name	Standard No.
SCSI system	FC-PH: ANSI X3.230
	FC-PH2: ANSI X3.297
	SCSI-FCP: ANSI X.269
	FC-AL: ANSI X.272
	FC-AL-2: ANSI NCITS 332-1999
	FC-SW: ANSI NCITS 321
	FC-SW-2: ANSI NCITS 355-2001
	FC-GS: ANSI X.288 (for FC switch)
	FC-GS2: ANSI NCITS 288 (for FC switch)
	SAS Serial Attached SCSI-1.1 (SAS-1.1)
	SAS Serial Attached SCSI-2.0 (SAS-2.0)
	SAS Serial Attached SCSI-3.0 (SAS-3.0)
	T10/1562D Rev.05 Serial Attached SCSI (SAS)
	T10/1601D Rev.07 Serial Attached SCSI Model-1.1 (SAS-1.1)

Name	Standard No.
	T10/1601D Rev.07 Serial Attached SCSI Model-1.1 (SAS-2.0)
	T10/1601D Rev.07 Serial Attached SCSI Model-1.1 (SAS-3.0)
	SFF 8301 form factor of 3.5' disk drive
	SFF 8323 3.5' disk drive form factor with serial connector
	SFF 8482 SAS plug connector
	SCSI 3 SAM-2: ANSI INCITS 366-2003
	SPC-2: ANSI INCITS 351-2001
	SBC: ANSI INCITS 306-1998
	PICMG3.0 Advanced Telecommunications Computing Architecture
	PICMG3.1 Ethernet/fiber Channel Over PICMG3.0
TCP/IP system	SNMP v1
	SNMP v2c
	SNMP v3
PCIe system	PCI Express Base Specification R1.1
	PCI Express to PCI or PCI-X Bridge Specification v1.0
	PCI Express Base Specification v2.0

Interface Standards

Table 8-2 describes the interface standards that the storage systems comply with.

Table 8-2 Interface standards that the storage systems comply with

Name	Description
VAAI	An application programming interface (API) framework from VMware. It enables some storage-related tasks (such as thin provisioning) to be offloaded from a VMware server to a storage array.
SRA	An interface between VMware Site Recovery Manager (SRM) and a storage system. It enables SRM to perform the following operations: discovery of storage systems, non-disruptive failover test, emergency or planned failover, reverse replication, backup, and restoration.

Name	Description
SMI-S	A storage standard developed and maintained by the Storage Networking Industry Association (SNIA). It aims to simplify the management of a storage area network (SAN) that contains devices from various manufacturers. It provides a universal management interface for all types of network elements and simplifies the management of a heterogeneous SAN environment. **NOTE** Log in to **http://enterprise.huawei.com**, choose **Support** > **Product Support** > **Vertical Industries Solutions** > **eSDK Solution** > **eSDK Storage**, and download the latest documents to get more information.

Safety Specifications and EMC Standards

Table 8-3 lists the safety specifications and EMC standards that the storage system complies with.

Table 8-3 Safety specifications and EMC standards

Name	Standard No.
China safety standard	GB 4943
North America safety standard	UL 60950-1
European safety directive	2014/35/EU
European safety standard	EN 60950-1
China EMC standard	GB9254-2008
	GB17625.1-2012
Canada EMC standard	ICES-003
	CAN/CSA-CEI/IEC CISPR 22:02
North America EMC standard	FCC, CFR 47 Part 15, Subpart B
European EMC directive	EMC Directive 2004/108/EC
European EMC standard	EN 55032
	EN 55024

Industry Standards

Table 8-4 lists the industry standards that the storage system complies with.

Table 8-4 Industry standards

Name	Standard No.
Ethernet	IEEE 802.3
Fast Ethernet	IEEE 802.3u
Gigabit Ethernet	IEEE 802.3z
	IEEE 802.3ab
10-Gigabit Ethernet	IEEE 802.3ae
IEEE standard test access port and boundary-scan architecture	IEEE 1149.1-2001
Procedure for failure modes and effects analysis (FMEA)	IEC 812
Presentation of reliability, maintainability and availability predictions	IEC 863
ETSI standard (environment)	ETS 300 019
ETSI standard (power)	ETS 300 132
ETSI standard (noise)	ETS 300 753
ETSI standard (environment)	ETS 300 119
ETSI standard (grounding)	ETS 300 253
ITUT standard (grounding)	ITUT K.27
Environmental protection	ECMA TR/70
Reliability	GR-929, Telcordia SR-332
Clean room and related controlled environments	ISO 14664-1 Class8
Airborne contaminants and environment standards	ANSI/ISA-71.04-1985 severity level G1

9 Certifications

The chapter describes the certifications of the storage system.

Table 9-1 lists the certifications that the storage system obtains.

Table 9-1 Certifications

Name	Description
CB	The IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE) is based on the use of specific IEC standards for electrical equipment. The Certification Bodies (CB) Scheme is applicable to electrical equipment within the scope of IEC standards for safety, accepted for use in the IECEE. The Scheme becomes operative for such standards as soon as at least one National Certification Body has declared their recognition of CB Test Certificates. The CB scheme is designed for eliminating the international commerce barriers resulted from the compliance with certifications and approval guidelines of different countries. The IEC System for Conformity Testing to Standards for Safety of Electrical Equipment (referred to as the IECEE) is based on the use of specific IEC standards for electrical equipment. The CB Scheme is applicable to electrical equipment within the scope of IEC standards for safety, accepted for use in the IECEE. The Scheme becomes operative for such standards as soon as at least one National Certification Body has declared their recognition of CB Test Certificates.
CCC	China Compulsory Certification (CCC) is a three-in-one authoritative certification incorporating the Conformity Certification of Electrical Equipment (CCEE), the certificate for the safe license of import granted by China Commodity Inspection Bureau (CCIB), and Safety and Electro Magnetic Compatibility (EMC). The China Compulsory Certificate (CCC) mainly involves the products related to human health and security, animal and plant life and health, environmental protection, and public security.

Name	Description
FCC	Federal Communications Commission (FCC) authorizes and manages all RF transmission facilities and devices except for those used by the federal government. It is also responsible for the environmental damages generated by the facilities and devices it approves.
IC	Industry Canada (IC) sets up the test standards for analog and digital terminal devices and specifies corresponding EMC certificates that all import electronic products must obtain.
UL	Underwriters Laboratories Inc. (UL): The UL is a non-profit agency engaged in product safety testing. UL has its own certification system for the entire system, components, and materials. All electric products that are exported to the USA must pass the UL certification. The UL safety certification is classified into the following three methods: ● Labeling The UL labeling service is the best known service of the UL safety certification. The UL label on the product indicates that UL has tested the sample of the product according to the safety standards approved by the USA. The sample does not cause fire, creepage, or other dangers if predictable. ● Classification UL tests the product according to different features, in the specified danger range, or under specific cases. In general, the classified products are mostly construction materials or industrial instruments. The classified products include industrial or commercial products. Some specified features must be tested, such as inflammability, hazardous performance, or specifications specified by the government. ● Approval UL tests parts of the product or unfinished product. These parts will be used in the UL labeled product list. This service covers millions of plastics, wires, circuit boards, various finished products, and even some large components, such as motorcycles or power supplies.
CE	Conformite Europeenne (CE): Products marked with CE conform to EMC (2014/30/EU) and low-voltage (2014/35/EU) specifications published by EU. If this product has telecommunication functionality, the R_TTE Directive (1999/5/EC) that complies with the directives mentioned previously implies conformity to the following European norms (in parentheses are the equivalent international standards and regulations): ● EN 55032 (CISPR 32)-Electro Magnetic Interference ● EN 55024 (IEC61000-4-2, 3, 4, 5, 6, 8, 11)-Electro Magnetic Immunity ● EN 60950 (IEC 60950)-Product Safety
REACH	REACH is a set of comprehensive regulations that require all chemical products that are both imported and produced in Europe must be registered, assessed, authorized, and restricted. In this way, customers can easily recognize the chemical elements. As a result, both humans and environment are protected.

Name	Description
RoHS	The restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) is the directive that restricts the use of certain hazardous substances in the electrical, electronic equipment. RoHS is the European Union (EU) compulsory standard that is designed to regulate the materials and the technical standard of the electrical and electronic products. In this way, it does good to human health and environment protection. That is, the six hazardous substances of lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (Cr6+), polybrominated biphenyl (PBB), polybrominated diphenyl ethers (PBDE) cannot exceed the specified limits.
WEEE	The EU Directive on Waste of Electric and Electronic Equipment. Electrical and electronic products sold in the EU market must comply with this directive and have the mark of cross out wheeled bin.
CU-TR	Russia, Kazakhstan, and Belarus have integrated their own certification technology requirements and formulated a unified Customs Union (CU) certification. The products within the scope of control are subject to mandatory certification of customs union technical regulations (CU-TR), unified technical regulations and evaluation modes, product qualification directories, certificate forms, and technical supervision and registration.
RCM	The Australian & New Zealand Regulatory Compliance Mark (RCM) is the mandatory compliance for selling electrical equipment products in the market.
SONCAP	A certification issued by Standards Organization of Nigeria. The products in the certification item list must acquire SONCAP for the entrance to Nigeria market.

Security Symbol (CCC)

The product is a Class A device based on the CCC. Use of it in a residential area is likely to cause radio interference. Users may be required to prevent the interference by taking protective measures.

10 Operation and Maintenance

The storage systems can be operated and maintained by using the command line interface (CLI) and the DeviceManager, adapting to different environments and user habits.

Introduction to the CLI

The CLI enables users to manage and maintain the 2800 V5 storage system using command lines.

Users need to log in to the CLI by using terminal software, such as PuTTY.

There are two ways to log in to the CLI.

- Log in through a serial port of a storage system. To connect to a serial port, the maintenance terminal must be located next to the storage system. Therefore, this login mode is applicable to the scenario where a user does not know the management IP address of a storage system or a storage system is faulty.
- Log in through a management network port of a storage system. When there are reachable routes, a user can log in to the CLI by entering the IP address of the management network port of a storage system in the terminal software. IP networks are easily accessible. Therefore, a user can log in to a storage system remotely, and this login mode is more popular.

Introduction to the DeviceManager

Figure 10-1 shows the DeviceManager main window.

Figure 10-1 DeviceManager main window

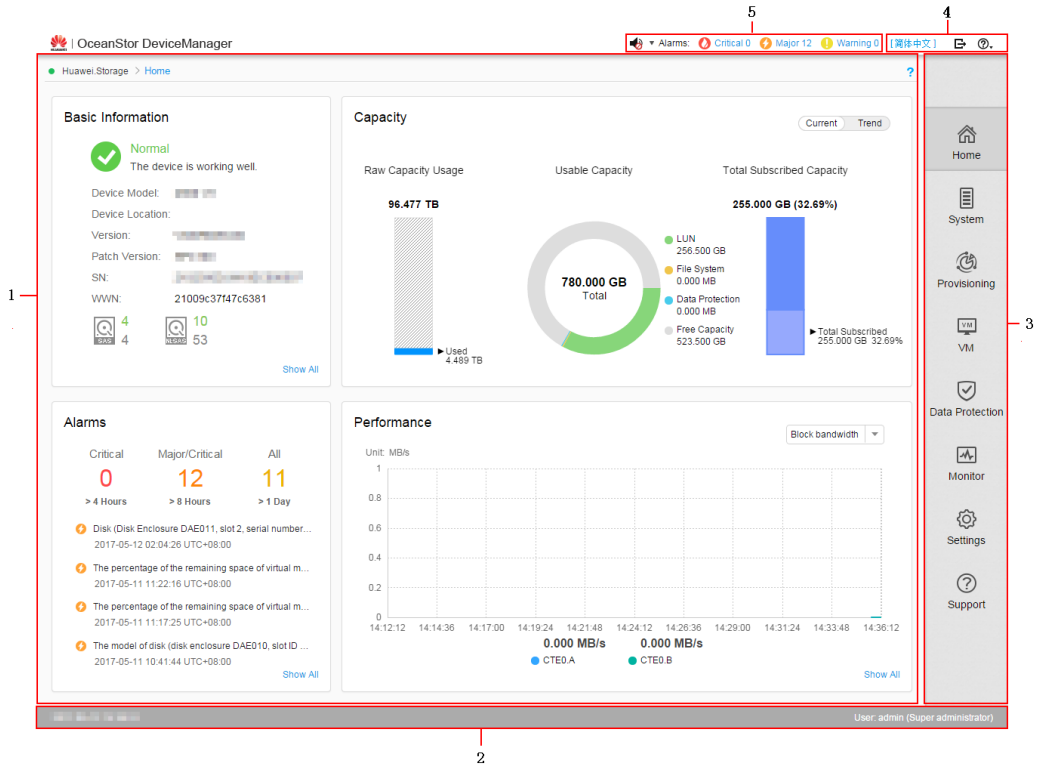


Table 10-1 describes the components of the DeviceManager main window.

Table 10-1 Components of the DeviceManager main window

No.	Name	Description
1	Function pane	The function pane shows a page associated with the current operation.
2	Status bar	The status bar shows information such as the user name currently logged in and the login time.
3	Navigation bar	The navigation bar shows the function modules of a storage system. Users can click a function module to configure the corresponding functions.
4	Exit, help, and language selection area	The exit and help area shows exit button and help button.
5	Fault statistics area	The fault statistics area shows the number of each level of system faults, helping users learn about the running status of a storage system.

Users can log in to the DeviceManager by using a common browser.

11 Privacy Statement on Personal Data Collection

Service Type (System/ Application Name/ Function/ Product)	Personal Data Collection Item	Data Meaning (Data Description)	Mandatory or Optional (Forced or Not/ Provided by Users by Default)	Personal Data Collection Source, Method, and Basis	Personal Data Collection Purpose and Application Scenario	Transfer Mode	Storage Mode	Storage Period
System alarm	Mobile phone number	Mobile phone number set by the system administrator for receiving alarm notification	Optional	Configured by the system administrator	To notify users of the system alarm	Transferred to the server through HTTPS/SSH	Plaintext	Determined by cus

Service Type (System/ Application Name/ Function/ Product)	Personal Data Collection Item	Data Meaning (Data Description)	Mandatory or Optional (Forced or Not/ Provided by Users by Default)	Personal Data Collection Source, Method, and Basis	Personal Data Collection Purpose and Application Scenario	Transfer Mode	Storage Mode	Storage Period
								tomers
System alarm	Email address and account	Email address and account set by the system administrator for receiving alarm notification	Optional	Configured by the system administrator	To notify users of the system alarm	Transferred to the server through HTTPS/SSH	Plaintext	Determinedbycustomers

Service Type (System/ Application Name/ Function/ Product)	Personal Data Collection Item	Data Meaning (Data Description)	Mandatory or Optional (Forced or Not/ Provided by Users by Default)	Personal Data Collection Source, Method, and Basis	Personal Data Collection Purpose and Application Scenario	Transfer Mode	Storage Mode	Storage Period
System management	LDAP username and LDAP user group name	● LDAP user name: user name registered by an enterprise or user for device management ● LDAP user group name: user group allocated for an enterprise or user during the registration	Optional	Configured by the system administrator	To manage and maintain the system	Transferred to the server through HTTPS/SSH	Plaintext	Determined by customers

A How to Obtain Help

If a tough or critical problem persists in routine maintenance or troubleshooting, contact Huawei for technical support.

A.1 Preparations for Contacting Huawei
To better solve the problem, you need to collect troubleshooting information and make debugging preparations before contacting Huawei.

A.2 How to Use the Document
Huawei provides guide documents shipped with the device. The guide documents can be used to handle the common problems occurring in daily maintenance or troubleshooting.

A.3 How to Obtain Help from Website
Huawei provides users with timely and efficient technical support through the regional offices, secondary technical support system, telephone technical support, remote technical support, and onsite technical support.

A.4 Ways to Contact Huawei
Huawei Technologies Co., Ltd. provides customers with comprehensive technical support and service. For any assistance, contact our local office or company headquarters.

A.1 Preparations for Contacting Huawei

To better solve the problem, you need to collect troubleshooting information and make debugging preparations before contacting Huawei.

A.1.1 Collecting Troubleshooting Information

You need to collect troubleshooting information before troubleshooting.

You need to collect the following information:

- Name and address of the customer
- Contact person and telephone number
- Time when the fault occurred
- Description of the fault phenomena
- Device type and software version

- Measures taken after the fault occurs and the related results
- Troubleshooting level and required solution deadline

A.1.2 Making Debugging Preparations

When you contact Huawei for help, the technical support engineer of Huawei might assist you to do certain operations to collect information about the fault or rectify the fault directly.

Before contacting Huawei for help, you need to prepare the boards, port modules, screwdrivers, screws, cables for serial ports, network cables, and other required materials.

A.2 How to Use the Document

Huawei provides guide documents shipped with the device. The guide documents can be used to handle the common problems occurring in daily maintenance or troubleshooting.

To better solve the problems, use the documents before you contact Huawei for technical support.

A.3 How to Obtain Help from Website

Huawei provides users with timely and efficient technical support through the regional offices, secondary technical support system, telephone technical support, remote technical support, and onsite technical support.

Contents of the Huawei technical support system are as follows:

- Huawei headquarters technical support department
- Regional office technical support center
- Customer service center
- Technical support website: **http://support.huawei.com/enterprise/**

You can query how to contact the regional offices at **http://support.huawei.com/enterprise/**.

A.4 Ways to Contact Huawei

Huawei Technologies Co., Ltd. provides customers with comprehensive technical support and service. For any assistance, contact our local office or company headquarters.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base Bantian, Longgang Shenzhen 518129 People's Republic of China

Website: **http://enterprise.huawei.com/**

B Glossary

If you want to obtain information about glossaries, visit **http://support.huawei.com/enterprise/**. In the search field, enter a product model, and select a path from the paths that are automatically displayed to go to the document page of the product. Browse or download the *OceanStor V5 Series V500R007 Glossary*.

C Acronyms and Abbreviations

A

ANSI	American National Standards Institute

C

CLI	Command Line Interface

I

IP	Internet Protocol
ISA	Instrument Society of America
iSCSI	Internet Small Computer Systems Interface
ISO	International Organization for Standardization

L

LUN	Logical Unit Number

M

MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair

R

RAID	Redundant Array of Independent Disks

S

SAN	Storage Area Network
SCSI	Small Computer System Interface

