

OceanStor Dorado5000 V3&Dorado6000 V3 Storage System V300R001

Product Description

Issue 01

Date 2017-03-30



Copyright © Huawei Technologies Co., Ltd. 2017. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of Huawei Technologies Co., Ltd.

Trademarks and Permissions

All other trademarks and trade names mentioned in this document are the property of their respective holders.

Notice

The purchased products, services and features are stipulated by the contract made between Huawei and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base

Bantian, Longgang Shenzhen 518129

People's Republic of China

Website: http://e.huawei.com

Product Description About This Document

About This Document

This document describes the orientation, features, architecture, technical specifications, product configuration, environment requirements, standard compliance and granted certifications of the OceanStor storage system.

Intended Audience

This document is intended for: All readers

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.
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.

Product Description About This Document

Change History

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

Issue 01 (2016-11-30)

This issue is the first official release.

Contents

About This Document	ii
1 Product Positioning	1
2 Highlights	
3 Typical Applications	
4 Hardware Architecture	
4.1 Device Composition	
4.2 2 U Controller Enclosure	
4.2.1 Overview	
4.2.2 Component Description	
4.2.2.1 System Enclosure	
4.2.2.2 Controller	
4.2.2.3 56 Gbit/s IB Interface Module	18
4.2.2.4 SmartIO Interface Module	
4.2.2.5 Power-BBU Module	21
4.2.2.6 Disk Module	
4.2.3 Indicator Introduction.	26
4.3 3 U Controller Enclosure	31
4.3.1 Overview	31
4.3.2 Component Description	33
4.3.2.1 System Enclosure.	
4.3.2.2 Controller.	34
4.3.2.3 Fan Module.	36
4.3.2.4 BBU	37
4.3.2.5 56 Gbit/s IB Interface Module	39
4.3.2.6 SmartIO Interface Module	40
4.3.2.7 12 Gbit/s SAS Expansion Module	42
4.3.2.8 Management Module.	44
4.3.2.9 Power Module.	45
4.3.3 Indicator Introduction.	46
4.4 2 U Disk Enclosure (2.5-Inch Disks)	50
4.4.1 Overview	50
4.4.2 Component Description	52

Contents
50
57
60
60
61
61
62
62
63
64
64
66
72
73
77
84
85
85
86
87
89
92
97
100
102
103
103
103
104
105
119

1 Product Positioning

is a brand-new next-generation storage product designed to meet medium- and large-sized enterprises' requirements for mass data storage, high-speed data access, high availability, high utilization, energy saving, and ease-of-use.

Business development leads to a great amount of service data, which poses ever high demands on storage systems. Traditional storage systems fail to meet these demands and encounter the following bottlenecks: inflexible storage performance expansion, complex management of various devices, failure to utilize legacy devices, and increasing maintenance costs occupying a large part of total cost of ownership (TCO). To overcome those bottlenecks, Huawei launches the next-generation all-flash storage product:

With its industry-leading performance and multiple efficiency improving mechanisms, provides customers with comprehensive high-performance storage solutions, maximizing customer ROI and applicable to a variety of services such as online transaction processing/online analytical processing (OLTP/OLAP), high-performance computing (HPC), and virtual desktop infrastructure (VDI).

In addition to providing enterprise users with high-performance and efficient storage services, supports advanced data backup and disaster recovery technologies, ensuring secure and smooth operation of data services. also offers easy-to-use management and convenient local/remote maintenance, greatly decreasing the management and maintenance cost.

2 Highlights

combines a superior hardware structure and an all-flash software architecture with advanced data application and protection technologies, meeting medium- and large-sized enterprises' storage requirements for excellent performance, flexible scalability, proven reliability, and high availability.

High Performance

, an all-flash storage system, provides million-level input/output operations per second (IOPS) capabilities and ensures data consistency, and a stable low latency.

- Superior hardware acceleration
 - is equipped with 64-bit multi-core processors, high-speed and large-capacity caches, various high-speed host interface modules, and back-end disk interface modules. It offers better storage performance than traditional storage systems.
- PCIe 3.0 interconnection controllers are interconnected using PCIe 3.0 to ensure a low latency under a high IOPS.
- HSSDs
 - uses Huawei solid state disks (HSSDs). Its storage operating system is designed based on HSSDs, enabling performance of HSSDs to give into full play and remarkably accelerating the performance of the storage system.
- Full-stripe write
 - uses redirect-on-write (ROW) for full-stripe write to reduce CPU usage and ensure optimal write performance.

Flexible Scalability

supports both Scale-up and Scale-out, achieving flexible scalability while maintaining high performance.

- Scale-up
 - Increases storage capacity and Improves processing capabilities of existing controllers.
- Scale-out

Enables performance to increase linearly as the number of controllers increases.

High Reliability

offers protection measures against component and power failures, and uses advanced technologies to minimize risks of disk failures and data loss.

Component failure protection

Storage system components are in 1+1 redundancy and work in active-active mode. Normally, the two redundant components are working simultaneously and share loads. If one component fails or is offline, the other one takes over all loads without affecting ongoing services.

• RAID 2.0+

The RAID 2.0+ underlying virtualization technology is used 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. RAID 2.0+ supports dynamic RAID and flexible data layout, accelerating SSD reconstruction.

• Power failure protection

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

- Global wear leveling and anti-wear leveling
 - Global wear leveling: The wear degrees vary among SSDs. Some SSDs are damaged ahead of the normal period. As a result, the SSDs will fail and the maintenance costs will increase. adopts the global wear leveling technology that implements wear leveling among all SSDs, preventing failures of SSDs.
 - Global anti-wear leveling: If the wear degree of an SSD reaches the threshold, uses
 the global anti-wear leveling technology to enable the SSD not to be worn. The
 SSDs are worn one by one. This technology prevents concurrent failures of multiple
 SSDs, thereby significantly improving reliability of the storage system.

Disk data pre-copy

The disk data 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.

High Availability (HA)

employs the TurboModule technology, online capacity expansion, and disk roaming to ensure hitless services during routine maintenance. The functions of the TurboModule technology, online capacity expansion, and disk roaming are as follows:

- The TurboModule technology enables hot swap of controllers, 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.

provides multiple advanced data protection technologies to protect data integrity and continuous system running even when catastrophic disasters happen. The advanced data protection technologies include HyperSnap and HyperReplication.

- Writable snapshots are supported. You do not need to reserve space when creating and activating snapshots while performance is not affected during snapshot creation and activation.
- HyperReplication backs up local data onto a remote storage system for disaster recovery.

employs multiple resource application technologies and provides flexible resource management to protect customers' storage investments. The resource application technologies include SmartVirtualization and SmartMigration.

- SmartVirtualization enables a local storage system to centrally manage storage resources
 of third-party storage systems, simplifying storage system management and reducing
 maintenance costs.
- SmartMigration migrates LUNs in or between storage systems, adjusting and allocating resources along with business development.

High System Security

- Storage Network Security
 - Management channel security
 - All management operations from physical ports are controlled by the access authentication mechanism of the storage system, and only authorized users are allowed to manage the storage system.
 - Anti-attack protection for protocols and interfaces
 - The storage system provides necessary external communication connections for system operations and maintenance. All the ports used are listed in the *Communication Matrix*. Dynamic listening ports are functioning in the proper scope, and no unopened ports exist.
 - Service and management ports isolation

The Access Control List (ACL) mechanism is used to isolate Ethernet ports from internal heartbeat network ports, management network ports, and maintenance ports. Service ports and management ports are isolated from each other.

NOTE

Internal heartbeat links exist between the controllers in a storage system and are used to check the operating status of the controllers. No additional links are required.

Storage management security

Users can be disabled and enabled. All management operations are logged.

Virtualization, Intelligence, and Efficiency

adopts the most advanced storage design principle of virtualization, intelligence, and efficiency. Compared with traditional storage systems, achieves higher storage space utilization, faster data reconstruction speed, smarter performance allocation technology, and finer service quality control. To obtain the previous achievements, the following technologies contribute:

• RAID 2.0+ underlying virtualization

The 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.

• Intelligent thin provisioning (SmartThin)

SmartThin allocates storage space on demand rather than pre-allocating all storage space at the initial stage. It is more cost-effective because customers can start business with a few disks and add disks based on onsite requirements. In this way, the initial purchase cost and TCO are reduced.

Deduplication and compression (SmartDedupe&SmartCompression)

uses global and online SmartDedupe&SmartCompression to reduce the storage capacity occupied by data and times of I/Os on SSDs. The two technologies remarkably improve the storage space utilization, prolong the service life of SSDs, and reduce the investment costs as well as the O&M costs.

Economy and Ease-of-Use

employs intelligent CPU frequency control, delicate fan speed control, SmartDedupe, and SmartCompression to ensure cost effectiveness. It also provides a series of management and maintenance tools to simplify operation and maintenance tasks.

Cost-effectiveness

- Intelligent CPU frequency control

This technology automatically changes the CPU frequency based on system loads, for example, it decreases the CPU frequency and power consumption during off-peak hours for a low operation cost and long CPU service life.

Delicate 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

management tool

uses a GUI-based management tool that provides wizard-based operation interfaces, enabling efficient management.

Integrated management

VMware vCenter Plug-in and Hyper-V System Center are integrated for management. In addition, the storage system supports VMware vStorage APIs for Storage Awareness (VASA), vStorage APIs for Array Integration (VAAI), and Volume Shadow Copy Service (VSS) Provider to facilitate management.

- Pad-based management

The storage system can be managed using a pad.

- Various alarm notification methods

The storage system supports alarm notification by sound, indicator, short message service (SMS), and email. Critical information is sent to users in a timely manner.

One-key upgrade tool

Controllers can be upgraded by one click. This upgrade mode simplifies operations. You do not need to stop services during the upgrade process.

3 Typical Applications

is a professional storage system dedicated to medium- and large-sized data centers of enterprises. It provides storage resources for critical service storage, virtual environment storage, and virtual desktops.

Storage of Critical Services

boasts the innovative flash-oriented software architecture, leading hardware specifications, and 100% component redundancy. These advantages enable the storage system to meet requirements of critical service storage, stable latency, and 24/7 services. In addition, features such as writable snapshot and SmartDedupe and SmartCompression are used to improve the storage space utilization and cut down the total cost of ownership (TCO) with lossless performance. These features are applicable to data processing of service systems such as OLTP/OLAP databases and HPC.

Figure 3-1 illustrates critical service storage.

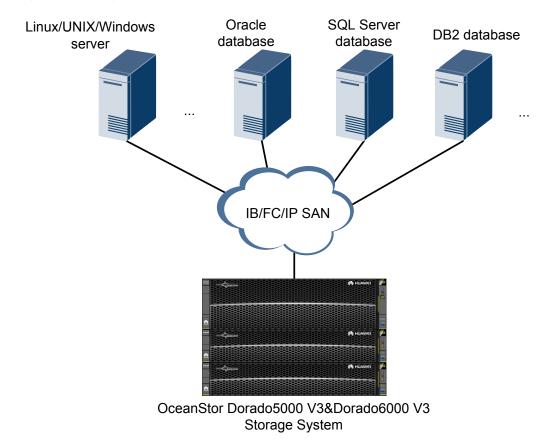


Figure 3-1 Storage of critical services

Storage for Virtual Environments

incorporates server virtualization optimization technologies such as vStorage APIs for Array Integration (VAAI), VMware vStorage APIs for Storage Awareness (VASA), and Site Recovery Manager (SRM). It also employs numerous key technologies to enhance the deployment efficiency, bearing capacity, and operation efficiency of virtual machines (VMs) and simplify storage management in virtual environments, helping you easily cope with storage in virtual environments.

Figure 3-2 illustrates storage for virtual environments.

Wanagement server

VM server cluster

Virtual architecture layer

ESX server cluster

ESX server cluster

CoceanStor Dorado5000 V3&Dorado6000 V3

Storage System

Disaster recovery center

Wanagement server

VM server cluster

VM server cluster

Virtual architecture layer

ESX server cluster

CoceanStor Dorado5000 V3&Dorado6000 V3

Storage System

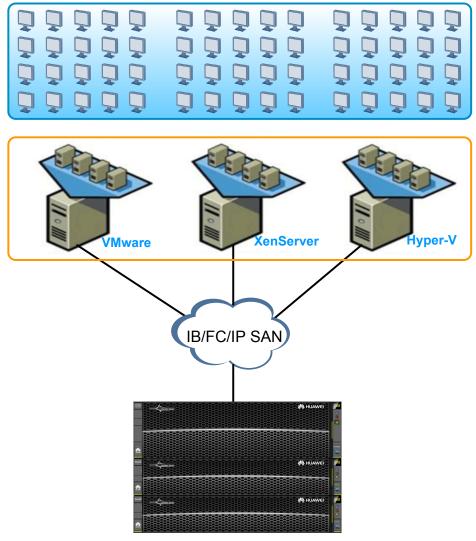
Figure 3-2 Storage for virtual environments

Virtual Desktop Service

Compared with traditional storage systems, used for the virtual desktop solution can meet large-scale virtual desktop deployment and performance requirements and reduce TCO with a small number of SSDs. In addition, provides online deduplication and compression to increase space usage and maximize ROI. Performance-lossless virtual snapshot and asynchronous remote replication of improve data backup and disaster recovery capabilities without affecting normal use of virtual desktops.

Figure 3-3 illustrates virtual desktop services.

Figure 3-3 Virtual desktop service



OceanStor Dorado5000 V3&Dorado6000 V3 Storage System

4 Hardware Architecture

About This Chapter

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

4.3 3 U Controller Enclosure

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

4.4 2 U Disk Enclosure (2.5-Inch Disks)

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

4.5 Device Cables

Device cables used in the storage system include power cables, ground cables, and signal cables. This chapter displays the views 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.

Different product models are configured with different types of controller enclosures and disk enclosures. 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 Dorado5000 V3	2 U disk enclosure with 25 disk slots	-
OceanStor Dorado6000 V3	3 U controller enclosure	2 U disk enclosure with 25 disk slots

4.2 2 U Controller Enclosure

This chapter 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 enclosure, controllers, power-BBU modules, and disk modules.

Overall Structure

Figure 4-1 shows the overall structure of a 2 U 25-disk controller enclosure.

NOTE

 $2~\mathrm{U}$ controller enclosure of OceanStor Dorado5000 V3 can use AC or DC power modules. The preceding figure uses AC power module as an example.

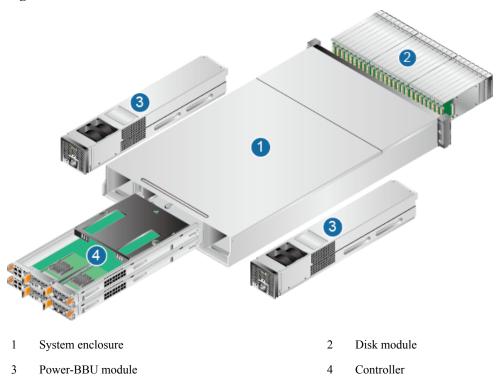


Figure 4-1 Overall structure of a 2 U 25-disk controller enclosure

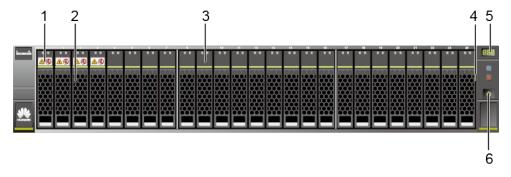
NOTE

In the rear view of a controller enclosure, controller A is above controller B.

Front View

Figure 4-2 shows the front view of a 2 U 25-disk controller enclosure.

Figure 4-2 Front view of a 2 U 25-disk controller enclosure



- 1 Coffer disk label
- 3 Disk module latch
- 5 ID display of the controller enclosure
- 2 Disk module handle
- 4 Information plate (with ESN)
- 6 Power indicator/Power button

NOTE

- The disk slots of a 2 U 25-disk controller enclosure are respectively numbered as 0 to 24 from left to right. The four coffer disks are located in slot 0 to slot 3.
- Slots are used to accommodate and secure disks, interface modules, controller modules, fan modules, and power modules.
- The information plate records device information.

Rear View

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



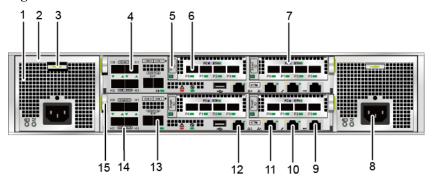
NOTICE

Do not connect the management network port and maintenance network port to the same switch.

NOTE

- Onboard SmartIO ports are supported by the OceanStor Dorado5000 V3.
- A controller enclosure supports 56 Gbit/s IB interface modules, SmartIO interface modules.
- When the maintenance network port is used for management and maintenance, the maintenance network port can only be used by Huawei technical support for emergency maintenance and cannot be connected to the same network with the management network port. Otherwise, a network loopback may occur, causing a network storm. The initial value for the IP address of the maintenance network port is 172.31.128.101 or 172.31.128.102. The default subnet mask is 255.255.0.0. You are advised to only connect the management network port to the network.

Figure 4-3 Rear view of a controller enclosure



1	Power-BBU module	2	Power-BBU module handle
3	Power-BBU module latch	4	SmartIO port
5	Interface module handle	6	SmartIO port
7	SmartIO port mode silkscreen	8	Power socket
9	Serial port	10	Maintenance network port
11	Management network port 1 ^a	12	Management network port 0
13	USB port	14	Expansion port ^a

- 15 Controller handle
- a: Reserved function.

4.2.2 Component Description

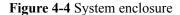
This section provides the illustration and description of each component of the storage system.

4.2.2.1 System Enclosure

The system enclosure integrates a midplane in order to provide reliable connections for interface modules and to distribute power and signals to inner modules.

Appearance

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





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.

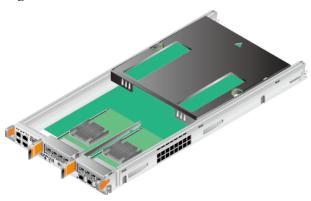
\square NOTE

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.

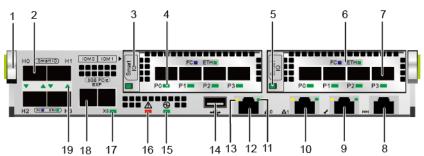
Figure 4-5 Controller



Ports

Figure 4-6 describes the ports of a controller.

Figure 4-6 Ports of a controller



1	Controller handle	2	SmartIO port
3	Interface module handle	4	Link/Active/Mode indicator of the SmartIO port
5	Power indicator/Hot Swap button of the module	6	SmartIO port mode silkscreen
7	SmartIO port	8	Serial port
9	Maintenance network port	10	Management network port 1 ^a
11	Link/Active indicator of the management network port	12	Management network port 0

13	Speed indicator of the management network port	14	USB port
15	Power indicator of the controller	16	Alarm indicator of the controller
17	Expansion port indicator	18	expansion port ^a
19	Link/Active/Mode indicator of the SmartIO port		

a: Reserved function.

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

No.	Indicator	Status and Description
4	Link/Active/Mode indicator of the SmartIO	Blinking blue slowly: The interface module is working in FC mode, and the port link is down.
port	Blinking blue quickly: 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: The interface module is working in ETH mode, and the port link is down.
		 Blinking green quickly: 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.
		Blinking red: The port is being located.
		Off: The port is not powered on.

No.	Indicator	Status and Description
5	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.
11	Link/Active indicator of	Steady green: The port is connected properly.
	the management network	Blinking green: Data is being transferred.
	port	Off: The port is connected abnormally.
13	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.
15	Power indicator of the	Steady green: The controller is powered on.
	controller	 The Power indicator blinking green and the Alarm indicator blinking red: The controller is being located.
		• Blinking green (0.5 Hz): The controller is powered on and in the BIOS boot process, or is powered off.
		 Blinking green (2 Hz): The controller is in the operating system boot process.
		Off: The controller is absent or powered off.
16	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.
16	Expansion port indicator	Steady red: The link is up.
		Off: The link is down.

No.	Indicator	Status and Description
17	Link/Active/Mode indicator of the SmartIO	Blinking blue slowly: The interface module is working in FC mode, and the port link is down.
	port	Blinking blue quickly: 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: The interface module is working in ETH mode, and the port link is down.
		 Blinking green quickly: 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.
		Blinking red: The port is being located.
		Off: The port is not powered on.

4.2.2.3 56 Gbit/s IB Interface Module

Interface modules connect storage devices to application servers.

Function

A 56 Gbit/s IB interface module provides two 4 x 14 Gbit/s IB ports. Both are the service ports used to connect to application servers and to receive data read/write requests from application servers.

Interface

Figure 4-7 shows the appearance of a 56 Gbit/s IB interface module.

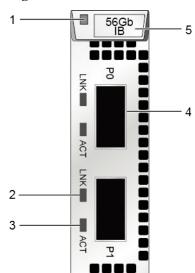


Figure 4-7 56 Gbit/s IB interface module

- 1 Power indicator/Hot Swap button of the module
- 3 56 Gbit/s IB port Active indicator
- 5 Module handle

- 2 56 Gbit/s IB port Link indicator
- 4 56 Gbit/s IB port

Indicators

Table 4-3 describes the states of indicators and their meanings on a 56 Gbit/s IB interface module after the storage device is powered on.

Table 4-3 Indicator status description for a 56 Gbit/s IB interface module

No.	Indicator	Status Description
1	Power indicator/Hot Swap button of the	Steady green: The interface module is working correctly.
	module	• 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.
2	56 Gbit/s IB port Link indicator	Steady green: The port is connected properly.Off: The port link is down.
3	56 Gbit/s IB port Active indicator	 Steady orange: Data is being transmitted. Off: No data is being transmitted.

4.2.2.4 SmartIO Interface Module

Interface modules are mainly used to connect storage devices to application servers.

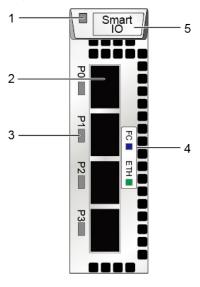
Function

A SmartIO interface module provides 16 Gbit/s, 8 Gbit/s and 10 Gbit/s optical transceiver. They are the service ports used to connect to application servers and to receive data read/write requests from application servers.

Interface

Figure 4-8 shows the components of a SmartIO interface module.

Figure 4-8 SmartIO interface module



- 1 Module Power/Hot Swap indicator
- 3 Port Link/Active/Mode indicator
- 5 Module handle

- 2 SmartIO port
- 4 Port mode silkscreen

Indicators

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

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

No.	Indicator	Status Description
1	Module Power/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.

No.	Indicator	Status Description
3	Port Link/Active/Mode indicator	Blinking blue slowly: The interface module is working in FC mode, and the port link is down.
		 Blinking blue quickly: 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: The interface module is working in ETH mode, and the port link is down.
		 Blinking green quickly: 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.
		Blinking red: The port is being located.
		• 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 configure with 10 Gbit/s optical modules.
- 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 configure with 8 Gbit/s or 16 Gbit/s optical modules.

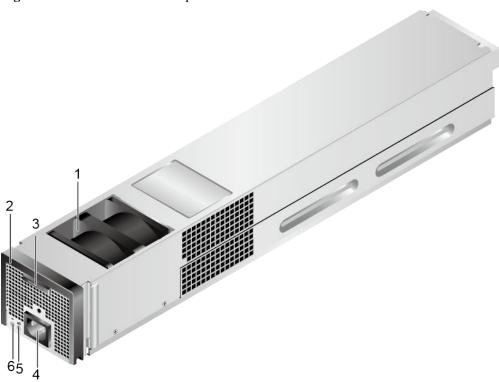
4.2.2.5 Power-BBU Module

A power-BBU module consists of a power module and a BBU. Power modules are classified into AC power modules and DC power modules. Power modules can ensure that the controller enclosure works correctly in maximum power consumption mode. BBUs provide backup power when the external power supply of the system fails to ensure the integrity of the service data on the storage array. If a BBU is faulty, it can be isolated, ensuring the normal running of the storage system. If a power failure occurs, BBUs ensure that the storage system writes cached data to the build-in disks of the controllers, preventing data loss. After the external power supply resumes, the driver reads data from the build-in disks of the controllers.

Appearance

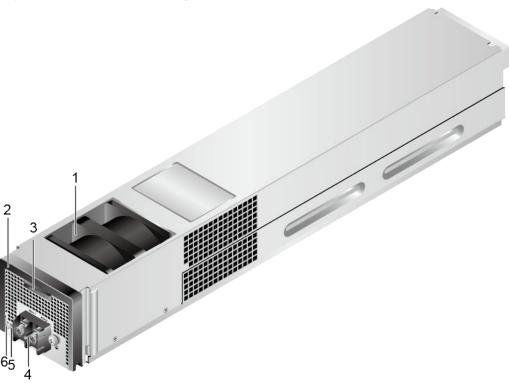
Figure 4-9, **Figure 4-10**, and **Figure 4-11** show the front view of an AC power-BBU module, the front view of a DC power-BBU module, and the rear view of a power-BBU module respectively.

Figure 4-9 Front view of an AC power-BBU module



- 1 Fan built in the power-BBU module
- 3 Power-BBU module latch
- 5 Running/Alarm indicator of the power module
- 2 Power-BBU module handle
- 4 Power module socket
- 6 Running/Alarm indicator of the BBU

Figure 4-10 Front view of a DC power-BBU module



- 1 Fan built in the power-BBU module
- 3 Power-BBU module latch
- 5 Running/Alarm indicator of the power module
- 2 Power-BBU module handle
- 4 Positive and negative terminals of the power module
- 6 Running/Alarm indicator of the BBU

1 Power module 2 BBU

Figure 4-11 Rear view of a power-BBU module

Indicators

Table 4-5 describes indicators on a power-BBU module of a powered-on storage system.

Table 4-5 Indicators on a power-BBU module

No.	Indicator	Status and Description
5	Running/Alarm indicator of the power module	 Steady green: The power supply is correct. Green blinking: 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.
6	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.

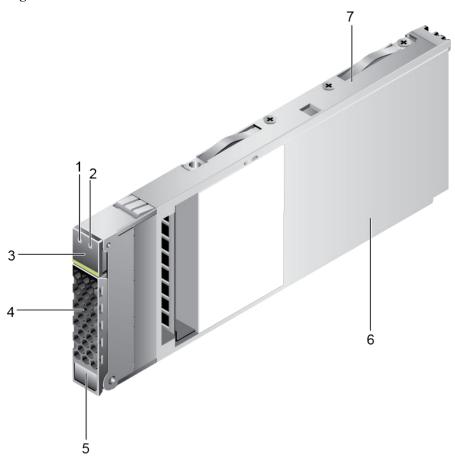
4.2.2.6 Disk Module

Disk modules provide storage capacity for a storage system. Disk modules can be used as a system safe disk, and can save service data, system data, and cache data.

Appearance

Figure 4-12 shows the appearance of a disk module.

Figure 4-12 Disk module



- 1 Running indicator of the disk module
- 3 Disk module latch
- 5 Disk module label
- 7 Disk tray

- 2 Alarm/Location indicator of the disk module
- 4 Disk module handle
- 6 Disk

Indicators

Table 4-6 describes indicators on a disk module of a powered-on storage system.

Table 4-6 Indicators on a disk module

No.	Indicator	Status and Description
1	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.
2	Alarm/Location indicator	Steady red: The disk module is faulty.
	of the disk module	Blinking red: The disk module is being located.
		Off: The disk module is working correctly or hot swappable.

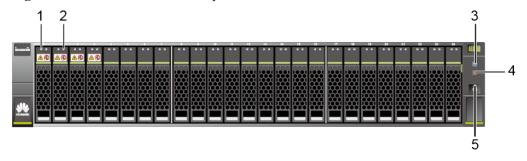
4.2.3 Indicator Introduction

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 4-13 shows the indicators on the front panel of a 2 U 25-disk controller enclosure.

Figure 4-13 Indicators on the front panel of a 2 U 25-disk controller enclosure



- 1 Running indicator of the disk module
- 2 Location/Alarm indicator of the disk module
- 3 Location indicator of the controller enclosure
- 4 Alarm indicator of the controller enclosure
- 5 Power indicator/Power button of the controller enclosure

Table 4-7 describes the indicators on the front panel of the controller enclosure.

Table 4-7 Description of the indicators on the front panel of a controller enclosure

Module	No.	Indicator	Status and Description
Disk 1 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.
	2	Location/Alarm 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 3 Location indicator of the controller enclosure 4 Alarm indicator of the controller enclosure		Location indicator of the controller enclosure	 Blinking blue: The controller enclosure is being located. Off: The controller enclosure is not located.
			 Steady red: An alarm is generated on the controller enclosure. Off: The controller enclosure is working correctly.
	5	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 is being powered off. Off: The controller enclosure is powered off or powered by the BBUs.

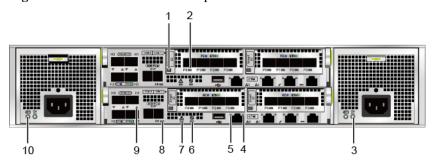
Indicators on the Rear Panel

Figure 4-14 shows the indicators on the rear panel of a controller enclosure.

☐ NOTE

The following figure shows the indicators on the OceanStor 5500 V3.

Figure 4-14 Indicators on the rear panel of a controller enclosure



- 1 Power indicator/Hot Swap button of the module 2 Link/Active/Mode indicator of the SmartIO port
- 3 Running/Alarm indicator of the power module 4 Link/Active indicator of the management network port
- 5 Speed indicator of the management network port 6 Power indicator of the controller
- 7 Alarm indicator of the controller
- 8 Expansion port indicator
- 9 Link/Active/Mode indicator of the SmartIO port 10 Running/Alarm indicator of the BBU

Table 4-8 describes the indicators on the rear panel of the controller enclosure.

Table 4-8 Description of the indicators on the rear panel of a controller enclosure

Module	No.	Indicator	Status and Description
Interface module	1	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.

Module	No.	Indicator	Status and Description
	2	Link/Active/ Mode indicator of the SmartIO port	 Blinking blue slowly: The interface module is working in FC mode, and the port link is down. Blinking blue quickly: 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: The interface module is working in ETH mode, and the port link is down. Blinking green quickly: 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. Blinking red: The port is being located. Off: The port is not powered on.
Power-BBU module	3	Running/ Alarm indicator of the power module Link/Active indicator of	 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. Steady green: The port is connected properly.
	the management network port	 Blinking green: Data is being transferred. Off: The port is connected abnormally. 	
	5	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.

Module	No.	Indicator	Status and Description
	6	Power indicator of	 Steady green: The controller is powered on. The Power indicator blinking green and the Alarm indicator blinking red: The controller is being located.
		the controller	
			 Blinking green (0.5 Hz): The controller enclosure is powered on and in the BIOS boot process, or the controller is in the power-off process.
			 Blinking green (2 Hz): The controller is in the operating system boot process.
			Off: The controller is powered off.
	7	Alarm indicator of	Steady red: An alarm is generated on the controller.
		the controller	The Alarm indicator blinking red and the Power indicator blinking green: The controller is being located.
			Off: The controller is working correctly.
	8	Expansion port indicator	Steady red: The link is up.
			• Off: The link is down.
	9	Link/Active/ Mode	Blinking blue slowly: The interface module is working in FC mode, and the port link is down.
		indicator of the SmartIO port	 Blinking blue quickly: 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: The interface module is working in ETH mode, and the port link is down.
			 Blinking green quickly: 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.
			Blinking red: The port is being located.
			• Off: The port is not powered on.

Module	No.	Indicator	Status and Description
Power- BBU module	10	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.

4.3 3 U Controller Enclosure

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

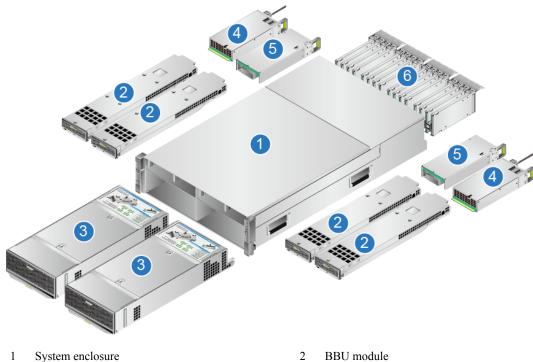
4.3.1 Overview

The disk enclosure consists of a system enclosure, controllers, BBU module, power modules, management modules and interface modules.

Overall Structure

Figure 4-15 shows the overall structure of a controller enclosure.

Figure 4-15 Overall structure of a controller enclosure



Controller 3

- BBU module
- Power module

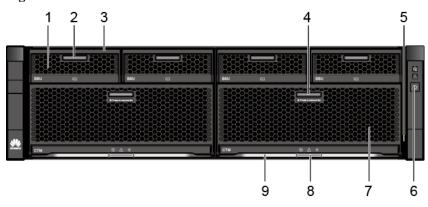
5 Management module

6 Interface module

Front View

Figure 4-16 shows the front view of a controller enclosure.

Figure 4-16 Front view of a controller enclosure



- 1 BBU module
- 3 BBU module latch
- 5 Information plate (with ESN)
- 7 Controller
- 9 Controller handle

- 2 BBU module latch
- 4 Controller panel latch
- 6 Power indicator/Power button
- 8 Controller latch

NOTE

- After opening the controller panel latch, you will see that each controller contains three fan modules.
- BBU slots are numbered from left to right. BBUs of Dorado6000 V3 are inserted into slots 0 and 3.
- The information plate records device information.

Rear View

Figure 4-17 shows the rear view of a controller enclosure.



Do not connect the management network port and maintenance network port to the same switch.

1 2 3 4 5 6 7 8 9

Figure 4-17 Rear view of a controller enclosure

- 1 Power module handle
- 3 Power module socket
- 5 Management network port
- 7 Serial port
- 9 USB port
- 11 SmartIO port

- 2 Power module
- 4 Management module
- 6 Maintenance network port
- 8 Management module handle
- 10 56 Gbit/s IB (InfiniBand) port
- 12 Mini SAS HD expansion port

NOTE

A controller enclosure provides the following interface modules. You can configure them based on service needs.

- Management module (mandatory): used for management and maintenance
- 12 Gbit/s SAS expansion module (mandatory): used for connecting disk enclosures
- Slots A0 and B0 accommodate back-end ports and only allow 12 Gbit/s SAS expansion modules.
- Slots A3 and B3 only allow PCIe Interface Module.
- Interface modules (optional but at least one type required): used for connecting application servers
- When the maintenance network port is used for management and maintenance, the maintenance network port can only be used by Huawei technical support for emergency maintenance and cannot be connected to the same network with the management network port. Otherwise, a network loopback may occur, causing a network storm. The initial value for the IP address of the maintenance network port is 172.31.128.101 or 172.31.128.102. The default subnet mask is 255.255.0.0. You are advised to only connect the management network port to the network.

4.3.2 Component Description

This section provides the illustration and description of each component of the storage system.

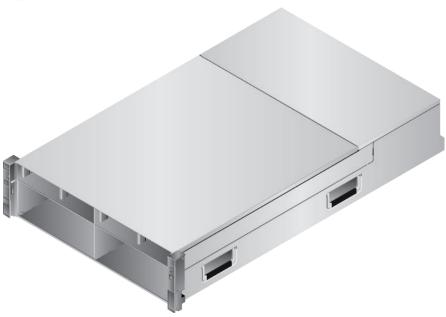
4.3.2.1 System Enclosure

The system enclosure integrates a midplane in order to provide reliable connections for interface modules and to distribute power and signals to inner modules.

Appearance

Figure 4-18 shows the appearance of a system enclosure.

Figure 4-18 System enclosure



4.3.2.2 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.

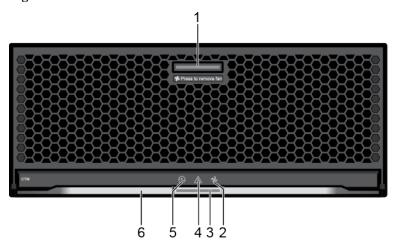
Appearance

Figure 4-19 shows the appearance of a controller. **Figure 4-20** shows the front view of a controller.

Figure 4-19 Appearance of a controller



Figure 4-20 Front view of a controller



- 1 Controller panel latch
- 3 Controller latch
- 5 Controller power indicator

- 2 Fan module indicator
- 4 Controller alarm indicator
- 6 Controller handle

Indicators

Table 4-9 describes the indicators on a controller of a storage system that is powered on.

Table 4-9 Indicators on a controller

No.	Indicator	Status and Description	
2	Fan module indicator	 Steady green: The fan module is working correctly. Steady red: The fan module is faulty. Off: The fan module is powered off. 	
4	Controller alarm indicator	 Steady red: An alarm about the controller is generated. Off: The controller is working correctly. 	
5	Controller power indicator	 Steady green: The controller is powered on. Blinking green (0.5 Hz): The controller is powered on and in the BIOS boot process. Blinking green (2 Hz): The controller is in the operating system boot process. Off: The controller cannot be detected or is powered off. 	

4.3.2.3 Fan Module

A fan module provides heat dissipation and enables a controller enclosure to work properly at the maximum power consumption.

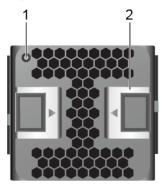
Appearance

Figure 4-21 shows the appearance of a fan module. **Figure 4-22** shows the front view of a fan module.

Figure 4-21 Appearance of a fan module



Figure 4-22 Front view of a fan module



1 Running/Alarm indicator on the fan module

2 Fan module handle

Indicators

Table 4-10 describes indicators on a fan module of a powered-on storage system.

Table 4-10 Indicators on a fan module

No.	Indicator	Status and Description
1	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.

4.3.2.4 BBU

A BBU provides backup power for a storage system during an external power failure, protecting the integrity of service data. When the external power supply is normal, BBUs are standby. In the event of a power failure, BBUs provide power for the storage system. A faulty BBU 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 build-in disks of the controllers, preventing data loss. After the external power supply resumes, the driver reads data from the build-in disks of the controllers.

Appearance

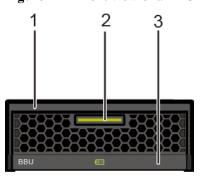
Figure 4-23 shows the appearance of a BBU. **Figure 4-24** shows the front view of a fan module.

Figure 4-23 Appearance of a BBU



3 Running/Alarm indicator on a BBU

Figure 4-24 Front view of a BBU



- 1 BBU handle 2 BBU latch
- 3 Running/Alarm indicator on a BBU

Indicator

Table 4-11 describes the indicator on a BBU of a storage system that is powered on.

Table 4-11 Indicator on a BBU

No.	Indicator	Status and Description
3	Running/Alarm indicator on a 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.
		 Off: The interface module is powered off or hot swappable.

4.3.2.5 56 Gbit/s IB Interface Module

Interface modules connect storage devices to application servers.

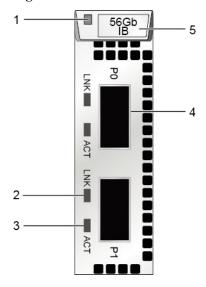
Function

A 56 Gbit/s IB interface module provides two 4 x 14 Gbit/s IB ports. Both are the service ports used to connect to application servers and to receive data read/write requests from application servers.

Interface

Figure 4-25 shows the appearance of a 56 Gbit/s IB interface module.

Figure 4-25 56 Gbit/s IB interface module



- 1 Power indicator/Hot Swap button of the module
- 3 56 Gbit/s IB port Active indicator
- 5 Module handle

- 2 56 Gbit/s IB port Link indicator
- 4 56 Gbit/s IB port

Indicators

Table 4-12 describes the states of indicators and their meanings on a 56 Gbit/s IB interface module after the storage device is powered on.

Table 4-12 Indicator status description for a 56 Gbit/s IB interface module

No.	Indicator	Status Description	
1	Power indicator/Hot Swap button of the	Steady green: The interface module is working correctly.	
	module	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. 	
2	56 Gbit/s IB port Link indicator	Steady green: The port is connected properly.Off: The port link is down.	
3	56 Gbit/s IB port Active indicator	Steady orange: Data is being transmitted.Off: No data is being transmitted.	

4.3.2.6 SmartIO Interface Module

Interface modules are mainly used to connect storage devices to application servers.

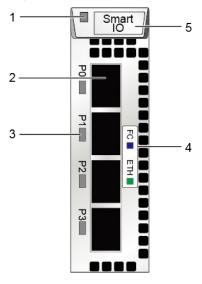
Function

A SmartIO interface module provides 16 Gbit/s, 8 Gbit/s and 10 Gbit/s optical transceiver. They are the service ports used to connect to application servers and to receive data read/write requests from application servers.

Interface

Figure 4-26 shows the components of a SmartIO interface module.

Figure 4-26 SmartIO interface module



- 1 Module Power/Hot Swap indicator
- 3 Port Link/Active/Mode indicator
- 5 Module handle

- 2 SmartIO port
- 4 Port mode silkscreen

Indicators

Table 4-13 describes the states of indicators and their meanings on a SmartIO interface module after the storage device is powered on.

Table 4-13 Indicator status description for a SmartIO interface module

No.	Indicator	Status Description	
1	Module Power/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.	

No.	Indicator	Status Description
3	Port Link/Active/Mode indicator	Blinking blue slowly: The interface module is working in FC mode, and the port link is down.
		 Blinking blue quickly: 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: The interface module is working in ETH mode, and the port link is down.
		 Blinking green quickly: 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.
		Blinking red: The port is being located.
		• 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 configure with 10 Gbit/s optical modules.
- 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 configure with 8 Gbit/s or 16 Gbit/s optical modules.

4.3.2.7 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 4-27 shows the appearance of a 12 Gbit/s SAS expansion module.

1 12Gb sas 4
2 8 12Gb sas 4

P3 ■ ×4

Figure 4-27 12 Gbit/s SAS expansion module

- 1 Power indicator/Hot Swap button of the module
- 3 Indicator of the mini SAS HD expansion port
- 2 Mini SAS HD expansion port
- 4 Module handle

Indicators

Table 4-14 describes indicators on a 12 Gbit/s SAS expansion module of a powered-on storage system.

Table 4-14 Indicators on a 12 Gbit/s SAS expansion module

No.	Indicator	Status and Description
1	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 interface module is powered off or hot swappable.

No.	Indicator	Status and Description
3	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.
		Blinking blue: Data is being 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 6 Gbit/s or 4 x 3 Gbit/s.
		Blinking green: Data is being transferred to the downstream disk enclosure at the rate of 4 x 6 Gbit/s or 4 x 3 Gbit/s.
		Steady red: The port is faulty.
		Off: The link to the port is down.

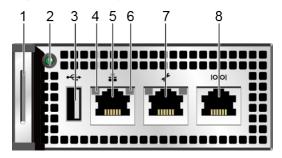
4.3.2.8 Management Module

A management module provides management ports, including a USB port, management network port, serial port, and maintenance network port.

Ports

Figure 4-28 shows a management module.

Figure 4-28 Management module



1 Management module handle 2 Power indicator

3 USB port 4 Speed indicator of the management network port

5 Management network port 6 Link/Active indicator of the management network port

7 Maintenance network port 8 Serial port

Indicators

Table 4-15 describes the indicators on a management module of a storage system that is powered on.

Table 4-15 Indicators on a management module

No.	Indicator	Status and Description
1	Power indicator	 Steady green: The module is working correctly. Blinking green: The module receives a hot swap request. Steady red: The module is faulty. Off: The module is powered off or swappable.
4	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.
6	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.

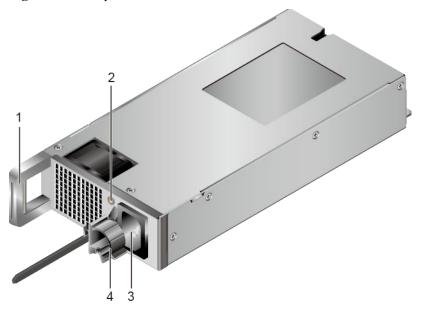
4.3.2.9 Power Module

Power modules are AC power modules that allow a controller enclosure to work properly at the maximum power consumption.

Appearance

Figure 4-29 shows the appearance of an AC power module.

Figure 4-29 AC power module



1 Power module handle

2 Running/Alarm indicator of the power module

- 3 Power module socket
- 4 Cable tie

Indicators

Table 4-16 describes indicators on a power module of a powered-on storage system.

Table 4-16 Indicators on a power module

No.	Indicator	Status and Description
2	Running/Alarm indicator of the power module	 Steady green: The power supply is correct. Green blinking: 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.

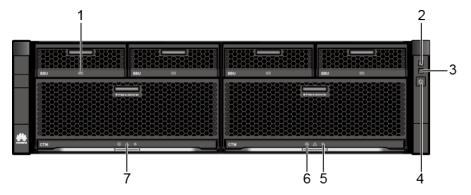
4.3.3 Indicator Introduction

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 4-30 shows the indicators on the front panel of a controller enclosure.

Figure 4-30 Indicators on the front panel of a controller enclosure



- 1 Running/Alarm indicator on a BBU
- 2 Location indicator on the controller enclosure
- 3 Alarm indicator on the controller enclosure
- 4 Power indicator/Power button on the controller enclosure
- 5 Fan module running/alarm indicator
- 6 Controller power indicator

7 Controller alarm indicator

Table 4-17 describes the indicators on the front panel of a controller enclosure.

Table 4-17 Indicators on the front panel of a controller enclosure

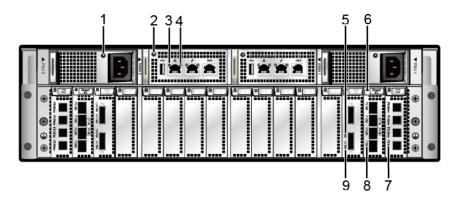
Module	No.	Indicator	Status and Description
BBU	1	Running/Alarm indicator on a BBU	 Steady green: The BBU is fully charged. Blinking green (1 Hz): The BBU is being charged. Blinking green (4 Hz): The BBU is being discharged.
			Steady red: The BBU is faulty.
System enclosure	2	Location indicator on the controller enclosure	 Blinking blue: The controller enclosure is being located. Off: The controller enclosure is not located.
	3	Alarm indicator on the controller enclosure	 Steady red: An alarm about the controller enclosure is generated. Off: The controller enclosure is working properly.
	4	Power indicator/Power button on the controller enclosure	 Steady green: The controller enclosure is powered on. Blinking green (0.5 Hz): The controller enclosure is powered on for a short time. 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 BBUs.
Controller	5	Fan module running/alarm indicator	 Steady green: Fan modules are working correctly. Steady red: A fan module is faulty. Off: Fan modules are powered off.

Module	No.	Indicator	Status and Description
	6	Controller power indicator	Steady green: The controller is powered on.
			 Blinking green (0.5 Hz): The controller is powered on and in the BIOS boot process.
			 Blinking green (2 Hz): The controller is in the operating system boot process.
			Off: The controller cannot be detected or is powered off.
	7	Controller alarm indicator	Steady red: An alarm about the controller is generated.
			Off: The controller is working correctly.

Indicators on the Rear Panel

Figure 4-31 shows the indicators on the rear panel of a controller enclosure.

Figure 4-31 Indicators on the rear panel of a controller enclosure



- 1 Running/Alarm indicator on a power module
- 2 Power indicator on a management module
- 3 Speed indicator of the management network port 4 Link/Active indicator of the management network port
- 5 Link indicator of a 56 Gbit/s IB port
- 6 Power indicator/Hot Swap button on an interface module
- 7 Mini SAS HD expansion port indicator
- 8 Link/Active/Mode indicator of a SmartIO port
- 9 Active indicator of a 56 Gbit/s IB port

Table 4-18 describes the indicators on the rear panel of a controller enclosure.

Table 4-18 Indicators on the rear panel of a controller enclosure

Module	No.	Indicator	Status and Description
Power module	1	Running/ Alarm indicator on a power module	 Steady green: The power supply is normal. Blinking green: The power input is normal but the device is powered off. Steady red: The power module is faulty. Off: No external power input is available.
Managem ent module	2	Power indicator on a management module	 Steady green: The module is working correctly. Blinking green: The module receives a hot swap request. Steady red: The module is faulty. Off: The module is powered off or hot swappable.
	3	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.
	4	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.
Interface module	5	Link indicator of a 56 Gbit/s IB port	 Steady green: The port is connected properly. Off: The port link is down.
	6	Power indicator/Hot Swap button on an 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 swappable.
	7	Mini SAS HD expansion port indicator	 Steady blue: The data transfer rate between the controller enclosure and a disk enclosure is 4 x 12 Gbit/s. Steady green: The data transfer rate between the controller enclosure and a disk enclosure is 4 x 6 Gbit/s or 4×3 Gbit/s. Steady red: The port is faulty. Off: The link to the port is down.

Module	No.	Indicator	Status and Description	
	8	Link/Active/ Mode	Blinking blue slowly: The interface module is working in FC mode, and the port link is down.	
		indicator of a SmartIO port	 Blinking blue quickly: 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: The interface module is working in ETH mode, and the port link is down. 	
				Blinking green quickly: 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.	
			Blinking red: The port is being located.	
			Off: The port is not powered on.	
	9	Active indicator of a 56 Gbit/s IB port	 Steady orange: Data is being transmitted. Off: No data is being transmitted. 	

4.4 2 U Disk Enclosure (2.5-Inch Disks)

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

4.4.1 Overview

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

Overall Structure

Figure 4-32 shows the overall structure of a 2 U SAS disk enclosure.

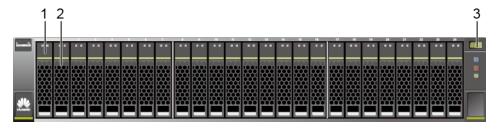
1 System enclosure 2 Disk module 3 Power module 4 Expansion module

Figure 4-32 Overall structure of a 2 U SAS disk enclosure with AC power modules

Front view

Figure 4-33 shows the front view of a 2 U disk enclosure.

Figure 4-33 Front view of a 2 U disk enclosure



1 Disk module latch

2 Disk module handle

3 ID display of the disk enclosure

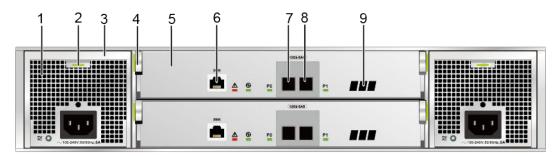
NOTE

The disk slots are numbered 0 to 24 from left to right.

Rear View

Figure 4-34 shows the rear view of a disk enclosure.

Figure 4-34 Rear view of a disk enclosure



- 1 Power module
- 3 Power module handle
- 5 Expansion module
- 7 Mini SAS HD P0 expansion port
- 9 Disk enclosure ID display

- 2 Power module latch
- 4 Expansion module handle
- 6 Serial port
- 8 Mini SAS HD P1 expansion port

Disk enclosure ID display shows DAEXXX. DAEXXX indicates a disk enclosure number, where the first X represents the controller number, the second X represents the loop number, and the third represents the enclosure number in the domain.

For example, DAE020 indicates disk enclosure 0 in the third loop of controller 0.

4.4.2 Component Description

This section provides the illustration and description of each component of the storage system.

4.4.2.1 System Enclosure

The system enclosure integrates a midplane in order to provide reliable connections for interface modules and to distribute power and signals to inner modules.

Appearance

Figure 4-35 shows the appearance of a system enclosure.

Figure 4-35 System enclosure



4.4.2.2 Expansion Module

An expansion module provides expansion ports for communication between the disk enclosure and the controller enclosure. Each expansion module provides a PRI expansion port and an EXP expansion port.

Appearance

Figure 4-36 shows the appearance of an expansion module.

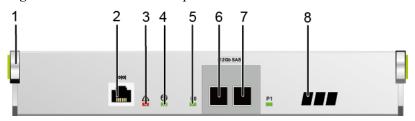
Figure 4-36 Expansion module



Ports

Figure 4-37 shows the ports of an expansion module.

Figure 4-37 Interfaces of an expansion module



- 1 Expansion module handle
- 3 Alarm indicator of the expansion module
- 5 Indicator of the mini SAS HD expansion port
- 7 Mini SAS HD P1 expansion port

- 2 Serial port
- 4 Power indicator of the expansion module
- 6 Mini SAS HD P0 expansion port
- 8 Disk enclosure ID display

Indicators

Table 4-19 describes indicators on an expansion module of a powered-on storage system.

Table 4-19 Indicators on an expansion module

No.	Indicator	Status and Description
3	Alarm indicator of the expansion module	Steady red: An alarm is generated in the expansion module.
		Off: The expansion module is working correctly.
4	Power indicator of the expansion module	• Steady green: The expansion module is powered on.
		• Off: The expansion module is powered off.
5	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.
		 Blinking blue: Data is being 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 6 Gbit/s or 4 x 3 Gbit/s.
		• Blinking green: Data is being transferred to the downstream disk enclosure at the rate of 4 x 6 Gbit/s or 4 x 3 Gbit/s.
		Steady red: The port is faulty.
		Off: The link to the port is down.

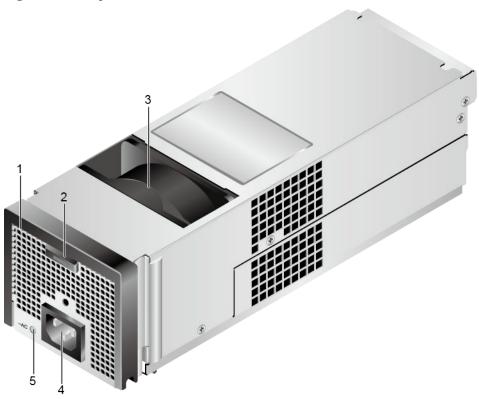
4.4.2.3 Power Module

The storage system supports AC power modules. Power modules can ensure that the disk enclosure works correctly in maximum power consumption mode.

Appearance

Figure 4-38 shows the appearance of an AC power module.

Figure 4-38 AC power module



- 1 Power module handle
- 3 Fan built in the power module
- 5 Running/Alarm indicator of the power module

- 2 Power module latch
- 4 Power module socket

Indicators

Table 4-20 describes indicators on a power module of a powered-on storage system.

Table 4-20 Indicators on a power module

No.	Indicator	Status and Description
5	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.

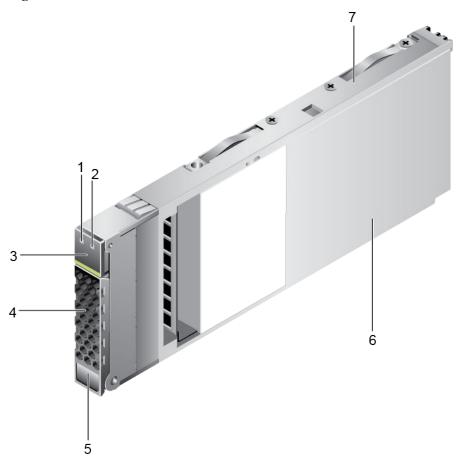
4.4.2.4 Disk Module

Disk modules provide storage capacity for a storage system. Disk modules can be used as a system safe disk, and can save service data, system data, and cache data.

Appearance

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

Figure 4-39 Disk module



¹ Running indicator of the disk module

² Alarm/Location indicator of the disk module

3 Disk module latch

4 Disk module handle

5 Disk module label

6 Disk

7 Disk tray

Indicators

Table 4-21 describes indicators on a disk module of a powered-on storage system.

Table 4-21 Indicators on a disk module

No.	Indicator	Status and Description
1	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.
2	Alarm/Location indicator	Steady red: The disk module is faulty.
	of the disk module	Blinking red: The disk module is being located.
		Off: The disk module is working correctly or hot swappable.

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 4-40 shows the indicators on the front panel of a disk enclosure.

Figure 4-40 Indicators on the front panel of a disk enclosure



- 1 Running indicator of the disk module
- 2 Location/Alarm indicator of the disk module
- 3 Location indicator of the disk enclosure
- 4 Alarm indicator of the disk enclosure

5 Power indicator of the disk enclosure

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

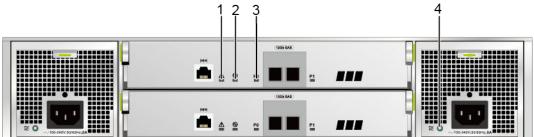
Table 4-22 Description of the indicators on the front panel of a disk enclosure

Module	No.	Indicator	Status and Description
Disk module	1	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.
	2	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	3	Location indicator of the disk enclosure	 Blinking blue: The disk enclosure is being located. Off: The disk enclosure is not located.
	4	Alarm indicator of the disk enclosure	 Steady red: An alarm is generated in the disk enclosure. Off: The disk enclosure is working correctly.
	5	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 4-41 shows the indicators on the rear panel of a disk enclosure.

Figure 4-41 Indicators on the rear panel of a disk enclosure



- 1 Alarm indicator of the expansion module
- 2 Power indicator of the expansion module
- 3 Indicator of the mini SAS HD expansion port
- 4 Running/Alarm indicator of the power module

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

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

Module	No.	Indicator	Status and Description
Expansion module	-	 Steady red: An alarm is generated on the expansion module. Off: The expansion module is working correctly. 	
	2	Power indicator of the expansion module	 Steady green: The expansion module is powered on. Off: The expansion module is powered off.
	3	Indicator of the mini SAS HD expansion port	 Steady blue: Data is transferred to the upstream disk enclosure at the rate of 4 x 12 Gbit/s. Blinking blue: Data is being transferred to the upstream 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 6 Gbit/s or 4 x 3 Gbit/s. Blinking green: Data is being transferred to the upstream disk enclosure at the rate of 4 x 6 Gbit/s or 4 x 3 Gbit/s. Steady red: The port is faulty. Off: The link to the port is down.

Module	No.	Indicator	Status and Description
Power module	4	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.

4.5 Device Cables

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

4.5.1 Power Cables

Power cables are classified into DC power cables, 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 scenario

Each AC power module is equipped with one AC power cable. Power cables supply power to devices in a cabinet. One end of a power cable is connected to the power socket of a device, and the other end to an external power supply. Figure 4-42 shows the appearance of an AC power cable.

Figure 4-42 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 4-43** shows the appearance of a PDU power cable.

Figure 4-43 PDU power cable



4.5.2 Ground Cables

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

Appearance

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

Figure 4-44 Ground cable



4.5.3 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 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 others.

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

NOTE

GE electrical ports employ CAT5 network cables or CAT6A shielded network cables.

Figure 4-45 Network cable



4.5.4 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 4-46 shows the appearance of a serial cable.

Figure 4-46 Serial cable



4.5.5 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 4-47 shows the appearance of a mini SAS HD electrical cable.



Figure 4-47 mini SAS HD electrical cable

4.5.6 Mini SAS HD optical cables

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

Figure 4-48 shows the appearance of a mini SAS HD optical cable.

Figure 4-48 mini SAS HD optical cable



NOTE

The optical connector of a mini SAS HD optical cable has an O/E conversion module built in and provides electrical ports.

4.5.7 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 4-49 shows the appearance of an optical fiber.

NOTE

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

Figure 4-49 Optical Fiber



4.5.8 FDR Cables

FDR (Fourteen Data Rate) are used for 56 Gbit/s IB interface module.

Figure 4-50 shows the appearance of an FDR cable.

Figure 4-50 FDR cable



5 Software Architecture

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

The software suite provided by OceanStor storage system consists of software running on a storage system, software running on a maintenance terminal, and software running on an application server. These three types of software work jointly to deliver storage, backup, and disaster recovery services in a smart, efficient, and cost-effective manner.

Figure 5-1 shows the storage system software architecture.

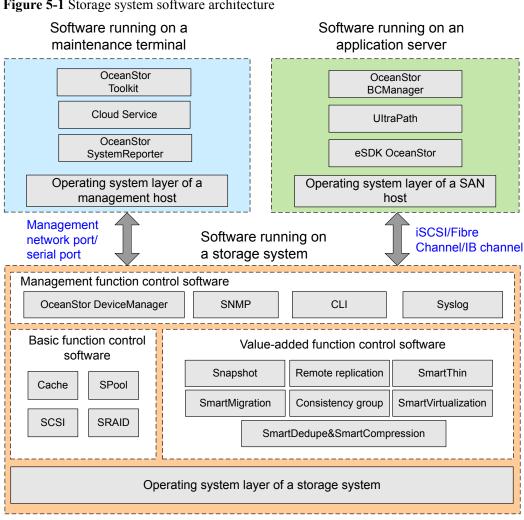


Figure 5-1 Storage system software architecture

Table 5-1 describes the storage system software architecture.

Table 5-1 Description of storage system software architecture

Software	Function
Software running on a storage system	The dedicated operating system manages storage system hardware and supports the running of storage service software. The basic function control software provides basic data storage and access functions. The value-added function control software provides advanced functions such as backup, disaster recovery, and performance tuning. The management function control software provides the management utilities to the storage system.
Software running on a maintenance terminal	Configures and maintains the storage system. The software includes OceanStor Toolkit, OceanStor SystemReporter and Cloud Service.

Software	Function
Software running on an application server	On a SAN network, software running on an application server enables the application server to communicate and cooperate with the storage system. This software category includes OceanStor BCManager, UltraPath, and eSDK OceanStor.

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

Table 5-2 Description of software running on a storage system

Software Set	Software	Function	
Storage system operating system	-	Manages storage system hardware and supports the running of storage service software.	
Management function control software	OceanStor DeviceManager	The OceanStor DeviceManager is an integrated storage management platform developed by Huawei. The OceanStor DeviceManager provides easy configuration, management, and maintenance of storage devices.	
	SNMP ^{a, b}	The storage system can be connected to third-party management software using the SNMP protocol. In addition, the storage system provides the functions supported by the third-party management software using the MIB interface. A variety of network management software supports SNMP. Users can choose the software based on their requirements.	
	CLIc	The storage system supports CLI-based management and configuration. 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.	
	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	Manages the status of SCSI commands, and dispatches, resolves, and processes SCSI commands.	

Software Set	Software	Function
	SRAID software module	Uses data stripping and redundancy to provide high performance, large capacity, and high reliability for data storage.
		A wide range of RAID levels are provided for diversified data reliability and access performance.
	SPool software module	Logically combines disks from different disk enclosures into a disk domain, in which storage pools are created to provide storage resources for services.
	Cache software module	Converts a high-speed and small-capacity memory to a buffer of low-speed and large-capacity disks for tiered storage and improved system performance. Its major functions include data caching, delayed writes, and prefetch.
Value-added function control software	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.
	Consistency group software module	Provides the consistency group function. A consistency group manages remote replication tasks in batches. Any operation to the consistency group is also applied to the remote replication tasks in the group, ensuring data consistency throughout those remote replication tasks.
	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.
	SmartMigration software module	Provides the SmartMigration function. SmartMigration migrates services on a source LUN transparently to a target LUN without interrupting host services. After the migration, the target LUN can replace the source LUN to carry the services.

Software Set	Software	Function
	SmartVirtualiza- tion software module	Provides the SmartVirtualization function. SmartVirtualization enables a local storage system to centrally manage storage resources of third-party storage systems, simplifying storage system management and reducing maintenance costs.
	SmartDedupe&Sm artComPression software module	Provides deduplication and compression. The deduplication function is used to analyze and delete duplicate data in a storage system. The compression function is used to minimize space occupied by data.

- a: Simple Network Management Protocol
- b: The supported character encoding is UTF-8.
- c: Command Line Interface

Table 5-3 describes the software running on a maintenance terminal.

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

Software	Function
OceanStor Toolkit	OceanStor Toolkit helps service engineers and O&M engineers deploy, maintain, and upgrade devices.
Cloud Service	Cloud Service is a piece of remote maintenance and management software used for device monitoring, alarm reporting, and device inspection.
OceanStor SystemReporter	OceanStor SystemReporter is a dedicated performance and capacity report analysis tool for the storage system.

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

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

Software	Function
OceanStor BCManager	Provides data protection and disaster recovery for application servers based on the related storage system value-added features (asynchronous remote replication and snapshot). It centrally manages the requirements for data protection and disaster recovery between the storage system and application servers.

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 .

6.1 Hardware Specifications

Hardware specifications cover the hardware configuration, port specifications, disk specifications, dimensions, weight, electrical specifications, and reliability specifications.

6.2 Software Specifications

The software specifications include the basic specifications, feature specifications, performance specifications, supported operating systems, and license control.

6.1 Hardware Specifications

Hardware specifications cover the hardware configuration, port specifications, disk specifications, dimensions, weight, electrical specifications, and reliability specifications.

Table 6-1 describes the hardware specification categories to help you quickly find out the specification information you need.

Table 6-1 Description of hardware specification categories

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

Item	Dorado5000 V3	Dorado6000 V3
Processors per controller	1 x 14-core processors	2 x 10-core processors
Cache size per controller	256 GB	512 GB
Maximum number of controllers per enclosure	2	2
Maximum number of controllers	2	2
Maximum number of disks	25	100
Controller enclosure configuration	2 U controller enclosure (disk and controller integration) with twenty-five 2.5-inch NVMe SSDs	3 U controller enclosure without disks

Item	Dorado5000 V3	Dorado6000 V3
Supported disk enclosure types	-	2 U SAS disk enclosure with twenty-five 2.5-inch disks
Maximum number of disk enclosures connected to a controller enclosure	-	4
Supported hot-swappable	• 56 Gbit/s IB	• 56 Gbit/s IB
interface module types	SmartIO	SmartIO
Supported hot-swappable expansion module type	-	12 Gbit/s SAS
Maximum number of hot- swappable interface modules	2	8
Length of expansion SAS cables	-	• Electrical cables: 1 m, 3 m, 5 m
		• Optical cable: 15 m
Redundancy of main	• BBUs: 1+1	• BBUs: 3+1
components	• Power modules: 1+1	• Power modules: 1+1
	• Fans: 3+1	• Fans: 5+1
		• Management modules: 1+1

Port specifications

Port Specifications	Dorado5000 V3	Dorado6000 V3
56 Gbit/s IB interface module	Two ports for each front-end module	Two ports for each front-end module
SmartIO interface module	Four ports for each front-end module	Four ports for each front-end module
12 Gbit/s SAS interface module	-	Four ports for each back-end module

Max. Number of Ports Per Controller	Dorado5000 V3	Dorado6000 V3
8 Gbit/s Fibre Channel port	12	28

Max. Number of Ports Per Controller	Dorado5000 V3	Dorado6000 V3
16 Gbit/s Fibre Channel port	12	28
10 GE port	12	28
56 Gbit/s IB port	4	14
12 Gbit/s SAS expansion port	-	16

Disk specifications

Disk Type ^a	Dimensions	Weight	Capacity
SAS SSD (for Dorado6000 V3)	2.5-inch	0.25 kg (0.55 lb)	900 GB
NVMe SSD (for Dorado5000 V3)		0.25 kg (0.55 lb)	1 TB
		0.30 kg (0.66 lb)	2 TB
		0.35 kg (0.79 lb)	4 TB

a: SSDs where no data is stored can be preserved for a maximum of 12 months while they are powered off. SSDs where data has been stored can be preserved for a maximum of 3 months while they are powered off. If the maximum preservation time is exceeded, data loss or SSD failure may occur.

Dimensions and weight

Module	Parameter	Dorado5000 V3	Dorado6000 V3
Controller enclosure	Dimensions	• Depth: 750 mm (29.53 in.)	• Depth: 750 mm (29.53 in.)
		• Width: 447 mm (17.60 in.)	• Width: 447 mm (17.60 in.)
		• Height: 86.1 mm (3.39 in.)	• Height: 130.5 mm (5.14 in.)
	Weight (without disks)	21 kg (46.30 lb)	50 kg (110.23 lb)

Module	Parameter	Dorado5000 V3	Dorado6000 V3
2 U SAS disk enclosure	Dimensions	_	 Depth: 488 mm (19.21 in.) Width: 447 mm (17.60 in.) Height: 86.1 mm (3.39 in.)
	Weight (without disks)	-	13.3 kg (29.32 lb)

Electrical specifications

Item		Dorado5000 V3	Dorado6000 V3
Power consumption	Controller enclosure	Max: 930 WTypical: 800 WMin: 600 W	Max: 1050 WTypical: 850 WMin: 600 W
	2 U disk enclosure	-	Max: 300 WTypical: 250 WMin: 150 W
Power voltage and rated currency	Controller enclosure	AC: • 200 V to 240 V, ±10%, 960 W, 5 A • Supports 110 V dual- live-line input High voltage DC (N/A for North America and Canada): • 240 V、±20%、960 W、5 A	AC: • 200 V to 240 V, ±10%, 1800 W, 10 A • Supports 110 V dual- live-line input High voltage DC (N/A for North America and Canada): • 240 V, ±20%, 1800 W, 10 A
	AC power input type (socket type)	 AC: IEC60320-C14 High voltage DC: IEC60320-C14 	AC: ■ 100 V to 240 V, ±10%, 800 W, 10 A High voltage DC (N/A for North America and Canada): ■ 240 V、±20%、800 W、10 A ■ AC: IEC60320-C14 ■ High voltage DC: IEC60320-C14

Item	Dorado5000 V3	Dorado6000 V3
Each BBU capacity / Overall discharge time	20 Wh / 250 seconds	38.5 Wh / 430 seconds

Reliability specifications

Item	Dorado5000 V3	Dorado6000 V3
System reliability	99.999%	
Mean time between failures (MTBF)	700,000 hours	
Mean time to repair (MTTR)	2 hours	

6.2 Software Specifications

The software specifications include the basic specifications, feature specifications, performance specifications, supported operating systems, and license control.

Table 6-2 describes the categories of the storage unit software specification to help you quickly find out the specification information you need.

Table 6-2 Description of software specification categories

Category	Description
Basic specifications	Describes the basic software specifications of the storage unit, including the maximum number of connected application servers, maximum number of LUNs, and maximum number of mapping views.
Feature specifications	Describes the feature specifications of the storage unit, such as snapshot, remote replication, and SmartMigration.
Performance Specifications	Describes the performance specifications of the storage unit.
Supported operating systems	Describes the operating systems supported by the storage unit.
License control	Describes whether software features of the storage unit are controlled by licenses.

Basic Specifications

Item	Dorado5000 V3	Dorado6000 V3	
Maximum number of hosts	8192	8192	
Maximum number of host groups	8192	8192	
Maximum number of hosts in a host group	64	64	
Maximum number of host groups that a host can join at the same time	64	64	
Maximum number of port groups	4096	4096	
Maximum number of ports in a port group	24	56	
Maximum number of port groups that a port can join at the same time	64	64	
Maximum number of LUNs	16384	16384	
Maximum number of LUN groups	8192	8192	
Maximum number of LUNs in a LUN group	4096	4096	
Maximum number of LUN groups that a LUN can join at the same time	64	64	
Maximum number of LUNs that can be mapped to a host	512	512	
Maximum number of mapping views	8192	8192	
Maximum number of disk domains	1	1	
Maximum number of disks in a disk domain	25	100	
Minimum number of disks in a disk domain	8	8	
Maximum number of storage pools	1	1	

Item	Dorado5000 V3	Dorado6000 V3
Maximum of LUNs in a storage pool	16384	16384
Minimum capacity of a LUN	512 KB	512 KB
Maximum capacity of a LUN	256 TB	256 TB
Maximum number of Fibre Channel initiators (WWN initiators) that can be configured	8192	8192
Maximum number of iSCSI initiators that can be configured	256	256
Maximum number of application server connections	iSCSI ports: 512Fibre Channel: 8192	iSCSI ports: 512Fibre Channel: 8192

Feature specifications

Feature	Parameter	Dorado5000 V3	Dorado6000 V3
RAID levels	-	RAID 5, RAID 6, RAID-TP	RAID 5, RAID 6, RAID-TP
Snapshot	Maximum number of LUN snapshots	8192	8192
	Maximum number of source LUNs	8192	8192
	Maximum number of snapshots for a source LUN	1024	1024
	Maximum number of LUNs activated in a consistency group	2048	2048
	Max. number of snapshots that can be simultaneously rolled back	64	64

Feature	Parameter	Dorado5000 V3	Dorado6000 V3
	Minimum snapshot interval	1 minute	1 minute
	Snapshot recovery time	Less than 10 s	Less than 10 s
Remote replication	Maximum number of pairs in a remote replication	2048	2048
	Maximum number of secondary LUNs in a pair	1:1	1:1
	Maximum number of connected remote storage devices	64	64
	Maximum number of remote replication consistency groups	512	512
	Maximum number of pairs in a remote replication consistency group	512	512
SmartThin	Maximum number of thin LUNs	16384	16384
	Maximum capacity of a thin LUN	256 TB	256 TB
	Granularity of a thin LUN	8 KB	8 KB
SmartMigration	Maximum number of LUNs that can be simultaneously migrated by each controller	8	8

Feature	Parameter	Dorado5000 V3	Dorado6000 V3
	Maximum number of LUNs for which migration can be configured at a time	256	256
SmartVirtualization	Maximum number of external LUNs	512	512
	Maximum number of external storage arrays	128	128
	Maximum number of paths for each external LUN	8	8
	Maximum number of masqueraded external LUNs	2048	2048
SmartCompression	Compression ratio	1.5 to 4 times	1.5 to 4 times
	Granularity of data block compression	8 KB	8 KB
	Size of the compressed data block	1 KB	1 KB
SmartDedupe	Deduplication ratio	1.5 to 16 time	1.5 to 16 time
	Granularity of data block deduplication	8 KB	8 KB

Performance Specifications

Item	Dorado5000 V3	Dorado6000 V3
Maximum IOPS (full cache read hit)	1,500,000	2,000,000

Item	Dorado5000 V3	Dorado6000 V3
Maximum bandwidth (MB/s)	21,000	28,000

Supported operating systems

Only the common operating systems supported by the storage systems are listed. For details, contact Huawei technical support engineers.

Operating System	Dorado5000 V3	Dorado6000 V3		
Windows operating system	Mainstream Windows operating systems are supported, including but not limited to the following:			
	Windows Server 2003 R2 Standard SP2			
	Windows Server 2003 R2 Datacenter SP2			
	• Windows Server 2003 R2 E	Interprise Edition SP2		
	Windows Server 2008 R2 S	tandard SP1		
	Windows Server 2008 R2 Datacenter SP1			
	Windows Server 2008 R2 Enterprise Edition SP1			
	Windows Server 2012 Standard			
	Windows Server 2012 Datacenter			
	• Windows Server 2012 Essentials			
	Windows Server 2012 Four	dation X64 Edition		
Linux operating system	Mainstream Linux operating systems are supported including but not limited to the following:			
	• SUSE Linux Enterprise Server 10			
	SUSE Linux Enterprise Server 11			
	• RedHat Enterprise Server AS 5			
	RedHat Enterprise Server AS 6			

Operating System	Dorado5000 V3	Dorado6000 V3			
Other mainstream	• HP-UX 11i v2				
operating systems	● HP-UX 11i v3				
	● AIX 6.1				
	• AIX 7.1				
	Solaris 10 for Sparc				
	Solaris 11 for Sparc				
	VMware ESXi 4.1				
	• VMware ESXi 5.0				
	• Citrix XenServer 5.6				
	• Citrix XenServer 6.0				
	• MAC OS X 10.7				
	Other mainstream operating	g systems			

License Control

Function	Whether License Control Is Required
Snapshot	√
Remote replication	√
SmartThin	√
SmartMigration	√
SmartVirtualization	√
SmartDedupe	√
SmartCompression	√

Interoperability and Host Connectivity

Use the **Compatibility Check Assistant** to check the interoperability of the storage system.

Z 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 risks of corrosive failure. This clause 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 Temperature, humidity, and altitude requirements of the storage systems

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. 		
	Storage temperature	-40°C to +70°C (-40°F to +158°F)		
Humidity	Operating humidity	10% RHa to 90% RH		
	Non-operating humidity	5% RH to 95% RH		
	Storage humidity	5% RH to 95% RH		
Altitude	Operating altitude of disks	-305 m to +3048 m (-1000.64 ft. to +9999.99 ft.)		
	Non-operating altitude of disks	-305 m to +12192 m (-1000.64 ft. to +39999.51 ft.)		
a: RH, Relative Humidity				

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 Hz to 300 Hz: 1.5 m/s ² , 0.5 oct/min 3 axes, 1 sweep cycles per axis; 5 Hz to 500 Hz: 0.27 Grms, 3 axes, 10 min per axis

Parameter	Requirement
Non-operating vibration	5 Hz to 20 Hz, PSD: 1.0 m ² /s ³ ; 20 Hz to 200 Hz, - 3 dB/oct; 3 axes, 30 min per axis
Non-operating shock	Half sine, 6 ms, 300 m/s ² , 6 directions, 3 times per direction

7.3 Particle Contaminants

Particle contaminants and other negative environmental factors (such as abnormal temperature and humidity) may expose IT equipment to a higher risks of corrosive failure. This clause 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 American Society of Heating Refrigerating and Airconditioning 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 equal to or greater than 0.5 μm.
- Each cubic meter contains not more than 832,000 particles that are equal to or greater than 1 μ m.
- Each cubic meter contains not more than 29,300 particles that are equal to or greater than 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	-	-	-	-

ISO Class	Maximum allowable concentrations (particles/m ₃) for particles equal to and greater than the considered sizes shown below							
	≥ 0.1 µm	≥ 0.1 μm ≥ 0.2 μm ≥ 0.3 μm ≥ 0.5 μm ≥ 1 μm ≥ 5 μm						
Class 2	100	24	10	4	-	-		
Class 3	1000	237	102	35	8	-		
Class 4	10,000	2,370	1,020	352	83	-		
Class 5	100,000	23,700	10,200	3,520	832	29		
Class 6	1,000,000	237,000	102,000	35,200	8,320	293		
Class 7	-	-	-	352,000	83,200	2,930		
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 ₂ S	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
С	Incomplete combustion (aerosol constituent), foundry

Symbol	Sources
СО	Combustion, automobile emissions, microbiological activities, tree rot
Cl ₂ , ClO ₂	Chlorine manufacture, aluminum manufacture, zinc manufacture, refuse decomposition
HCI	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 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.
G3 (Harsh)	1000 Å/month to 2000 Å/month	An environment in which there is high probability that corrosion will occur.

Severity Level	Copper Reactivity Level	Description
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 ₂ S	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: Parts per billion (ppb) is the number of units of mass of a contaminant per 1000 million 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 the storage system

System airflow	Dorado6000 V3
Controller enclosure	 220 CFM ^a (at max. fan speed) 83.6 CFM (25°C)
2 U disk enclosure	117 CFM (at max. fan speed)38 CFM (25°C)
a: CFM, Cubic Feet per Minute	

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	6000 V3
Controller enclosure	3580.5 BTU ^a /h
2 U disk enclosure	1023 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 the storage system

Device	Noise power
3 U controller enclosure	69.4 dB
2 U disk enclosure	67.5 dB

8 Standards 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
	iSCSI RFC 3720/7143
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
	PCI Express Base Specification v3.0

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.

Name	Description
VASA	An API used for VMware vSphere ESXi hosts to communicate with storage devices. It enables vCenter to manage storage arrays in a unified manner.
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.
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://support.huawei.com/enterprise/ , in the search field, enter eSDK Storage, and select a path from the paths that are automatically displayed to go to the document page. Search, browse, and download the SMI-S Provider documents of the corresponding version to get more information (such as information about monitored components).
ODX	Offloaded data transfer (ODX) is a feature of Windows 2012 server. The feature unloads files into storage arrays for transmission. High transmission bandwidth between storage arrays to largely shorten the data transmission delay and improve the data copy speed, while reduce the host server resource utilization rate.

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	LVD 2006/95/EC
European safety standard	EN 60950-1
China EMC standard	GB9254-2008 (idt CISPR 22: 2006)

Name	Standard No.
	GB17625.1-2003 (idt IEC 61000-3-2: 2001)
Canada EMC standard	ICES-003: 2004
	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 55022
	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
VLAN	IEEE 802.1q
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

Name	Standard No.
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 that the storage system passes.

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

Table 9-1 Certifications

Name	Description	
СВ	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.	

Product Description 9 Certifications

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. 		
СЕ	Conformite Europeenne (CE): Products marked with CE conform to EMC (2004/108/EC) and low-voltage (2006/95/EC) 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 55022 (CISPR 22)-Electro Magnetic Interference		
	 EN 55024 (IEC61000-4-2, 3, 4, 5, 6, 8, 11)-Electro Magnetic Immunity EN 60950 (IEC 60950)-Product Safety 		
	LIN 00/30 (IEC 00/30)-1 loddet salety		

Product Description 9 Certifications

Name	Description	
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. Thus, both humans and environment are protected.	
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 an 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) can not 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.	
GOST	The national standard certification of Russia. Based on Russian Consumer Protection Law, certain consumable products that are sold to Russia must meet the security, Electro Magnetic Interference (EMI), and sanitation requirements. Based on the product certification and service laws, the products should be awarded the GOST certification.	
C-TICK	A mandatory certification issued by Australian Communications Authority (ACA) for communication equipment, mainly concerning EMC requirements.	
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.	

10 Operation and Maintenance

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

Introduction to the DeviceManager

Figure 10-1 shows the DeviceManager main window.

Figure 10-1 DeviceManager main window

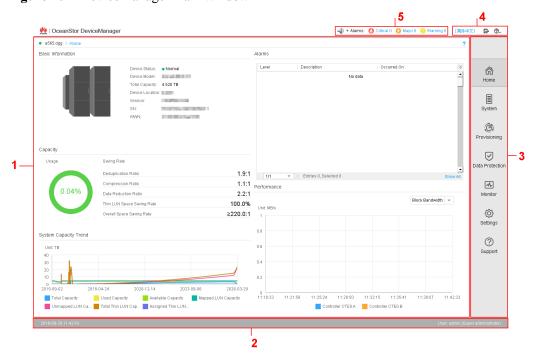


Table 10-1 describes the components of the DeviceManager main window.

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	This area displays an exit button, a help button, and a language selection 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

Table 10-1 Components of the DeviceManager main window

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

storage system.

Introduction to the CLI

The CLI enables users to manage and maintain the storage systems using command lines.

Users need to log in to the CLI by using terminal software, such as the HyperTerminal provided by Windows, or 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.



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

A

AC power module

The module that transfers the external AC power supply into the

power supply for internal use.

Application server

A service processing node (a computer device) in the network. Application programs of data services are run on the application

server.

Asynchronous remote replication

A kind of remote replication. When the data on the primary site is updated, the data does not need to be updated on the mirroring site synchronously to finish the update. In this way, the performance

deterioration caused by data mirroring is mitigated.

B

Backup A periodic operation performed on the data stored in the database for

the purposes of database recovery in case that the database is faulty. The backup also refers to data synchronization between active and

standby boards.

Bandwidth A range of transmission frequencies a transmission line or channel

can carry in a network. In fact, the bandwidth is the difference between the highest and lowest frequencies in the transmission line or channel. The greater the bandwidth, the faster the data transfer rate.

Baud rate The number of times per second the signal can change on a

transmission line. Commonly, the transmission line uses only two signal states, making the baud rate equal to the number of bits per second that can be transferred. The underlying transmission technique may use some of the bandwidth, so it may not be the case that user

data transfers at the line's specified bit rate.

Bit error An incompatibility between a bit in a transmitted digital signal and

the corresponding bit in the received digital signal.

Bit error rate Ratio of received bits that contain errors. BER is an important index

used to measure the communications quality of a network.

Bonding Bonding can bind multiple independent physical network ports into a

logical port, which ensures the high availability of server network

connections and improves network performance.

Boundary scan A test methodology that uses shift registers in the output connections

of integrated circuits. One IC often is connected to the next. A data pattern is passed through the chain and the observed returned data stream affected by the circuit conditions gives an indication of any faults present. The system is defined under IEEE standard 1149.1, which is also often known as JTAG (Joint Test Action Group).

Browser/Server An architecture that defines the roles of browser and server, where the

browser is the service request party and the server is the service

provider.

Backup window An interval of time during which a set of data can be backed up

without seriously affecting applications that use the data.

 \mathbf{C}

Cache hit ratio The ratio of directly accessed I/O from Cache to all the I/O operation

during the read operation.

Cache prefetch strategy

refetch According to the operation in which data has been read or is being read, the required data is read from a disk into the cache in advance.

Captive screw After the screw is loosened, screw caps and bolts are not disconnected

from the main body.

Cascading Connect the storage system to more disk enclosures through

connection cables, thus expanding the capacity of the storage system.

CHAP A method to periodically verify the identity of the peer using a 3-way

handshake. During the establishment of a link, the authenticator sends a "challenge" message to the peer. The peer responds with a value calculated using a "one-way hash" function. The authenticator checks the response against its own calculation of the expected hash value. If the values match, the authentication is acknowledged. CHAP

provides protection against playback attack.

Clone A snapshot technology. The source data is completely copied to

generate a data duplicate; therefore the duplicate needs the storage space as the same size as the source data. It is also called split mirror.

Cluster A mechanism adopted to improve the system performance. Several

devices of the same type form a cluster. The exterior of a cluster is some like a kind of equipment. In the interior of a cluster, the nodes

share the load.

Coffer A technology for ensuring data security and integrity in a storage

system. It is used to store the mission-critical data of the system.

Coffer disk Disks that build up the coffer.

Command device A special LUN through which the host can send inband commands to

storage devices.

Compliance mode A protection mode of WORM. In compliance mode, files within their

protection period can be changed or deleted neither by the file users or by the system administrator, and files whose protection period has expired can be deleted but not changed by the file users or the system

administrator.

Constant prefetch A cache prefetch strategy. The size of the data to be prefetched is the

size as set. This strategy applies to the applications that require reading data of a fixed size in a certain order. An example is the streaming media demanded by multiple subscribers who use the same

bit rate.

Controller The core module that processes services in a storage system. It

contains physical components such as system-level CPUs and

memory.

Controller An enclosure that accommodates controllers and provides storage services. It is the core component of a storage system, and generally

consists of components such as controllers, power supplies, and fans.

Copyback The process of copying the data from the hot spare disk back to the

member disk after the reconstruction of a RAID group is complete.

Copying A state of pair. The state indicates that the source LUN data is being

synchronized to the target LUN.

D

Data compression Encoding data to take up less storage space and less bandwidth for

transmission.

Data

deduplication grained redundant data, typically to improve storage utilization. In the

deduplication process, duplicate data is deleted, leaving only one copy of the data to be stored, along with references to the unique copy of data. Deduplication is able to reduce the required storage capacity

A specialized data compression technique for eliminating coarse-

since only the unique data is stored.

Data flow A process that involves processing the data extracted from the source

system, such as filtering, integration, calculation, and summary, finding and solving data inconsistency, and deleting invalid data so that the processed data meets the requirements of the destination

system for the input data.

Data migration It is the process to cleanse and transform history data, and then load

them to the new system.

Data source A system, database, or file that can make BOs persistent. A data

source can be a database instance or a database user.

Data switch A data switch used for interconnections between controllers.

Dirty data The data that is stored temporarily on cache and has not been written

onto disks.

Disaster recovery A system deployment solution aiming at reducing loss in disasters. A

set of disaster recovery system that is the same as the production system is deployed as a backup to store the production data when a fault occurs in the production system. The applications are switched over to the disaster recovery system before the production system recovers. After the production system recovers, the applications are

switched back to the production system.

Disk array A set of disks formed by disks in one or more commonly accessible

disk subsystems. These disks are combined and controlled by the control software. The control software provides the storage capacity

of these disks for hosts as one or more virtual disks.

Disk domain A combination of disks. A disk domain consists of the same type or

different types of disks. Disk domains are isolated from each other. Therefore, services carried by different disk domains do not affect

each other in terms of performance and faults (if any).

Disk location The process of locating a hard disk, that is, determining the enclosure

ID and slot ID of the hard disk in the storage system.

Disk enclosure It consists of the following parts in redundancy: expansion module,

hard disk, power module, and fan module. System capacity can be

expanded by cascading multiple disk enclosures.

Disk utilization The percentage of used capacity in the total available capacity.

 \mathbf{E}

eDevLUN (external device

(external devic

LUN)

Storage array logic space created by third-party storage array.

Engine Two controllers in one enclosure are called Engine.

Expansion Connecting a storage system to more disk enclosures through

connection cables, thus expanding the capacity of the storage system.

Expander module A component used for expanding.

F

Failover The automatic substitution of a functionally equivalent system

component for a failed one. The term failover is most often applied to intelligent controllers connected to the same storage devices and host computers. If one of the controllers fails, failover occurs, and the

survivor takes over its I/O load.

File engine The component in a unified storage system that provides file-level

service.

File change log A type of log which is used to record the changes of file and directory

in file system.

File system snapshot

A type of snapshot created for a file system. This snapshot is both readable and writable, and is mainly used to provide a new file system out of a file system read-only snapshot.

Field replaceable unit

A unit that can function as a circuit board, part, or component of an electronic device. It can be quickly and easily removed from a personal computer or other electronic devices. If an FRU becomes faulty, users can replace it with a new one instead of sending the entire product or system for maintenance.

Firmware

The programmable software part in a hardware component. A firmware is a part of hardware, but is scalable as software.

Flash translation layer

The software layer of flash memory, which is responsible for the logical to physical address mapping, and also includes functions such as gabage collection, wear leveling and bad blocks management, etc.

Front-end host port

The port that connects the controller enclosure to the service side and transfers service data. There are three types of front-end host ports: SAS, FC, and iSCSI.

G

Garbage collection

A form of automatic memory management for freeing available resources. In SSD, this process is used for free the blocks by moving the available pages to a new block and erasing the old blocks.

Gateway

A device that connects two network segments using different protocols. It is used to translate the data in the two network segments.

Global system for mobile communications

The second-generation mobile networking standard defined by European Telecommunications Standards Institute (ETSI). It is aimed at designing a standard for global mobile phone networks. The standard allows a subscriber to use a phone globally. GSM consists of three main parts: mobile switching subsystem (MSS), base station

subsystem (BSS), and mobile station (MS).

Group quota

The maximum storage space which is allocated to a users group, and the quota is adjustable if necessary.

H

Hard disk A non-volatile storage device that stores digitally encoded data on

rapidly rotating platters with magnetic surfaces. Hard disks generally offer more storage and quicker access to data than floppy disks do.

Hard disk tray The tray that bears the hard disk.

Hard quota The value to limit the space used in quota configuration. If the space

used arrives hard quota, file operation is not allowed to continue.

Heartbeat Heartbeats are the packets, requiring no acknowledgement,

transmitted between two devices. The device can judge the validity status of the peer device. Heartbeat supports node communication,

fault diagnosis, and event triggering.

Hit ratio The ratio of directly accessed I/Os from cache to all I/Os.

Hot swap A technology used to replace system components without shutting

down the system, which improves the reliability and maintainability

of a system.

HyperVault A self-protective property of the data built in storage device.

HyperMetro A value-added service of storage systems. HyperMetro means that

two datasets on two storage systems can provide storage services as one dataset to achieve load balancing among applications and failover

without service interruption.

HyperMetro Domain A HyperMetro configuration object. Several storage arrays and Quorum Servers constitute a HyperMetro Domain. HyperMetro

services can be created on a HyperMetro Domain.

I

I/O Data movement process between memory and peripheral devices in

the computer system. I/O is a collective name, indicating the operations reading data into the memory and writing data to other

places from computer memory.

Inband management Inband management means that the management control information of the network and the carrier service information of the user network are transferred through the same logical channel. Inband management

enables users to manage storage arrays through commands.

Management commands are sent through service channels, that is, I/O write and read channels. The advantages of inband management include high speed, stable transfer, and no additional management

network ports required.

Initiator A system component that can initiate an I/O operation on an I/O bus

or on a network.

Intelligent prefetch

A cache prefetch strategy. The system software calculates a proper size of prefetched data. This strategy applies to a read application involving a single bit stream or to the situations where you do not

know whether the data is read in a certain order. An example is

reading or writing a file.

Interface module A field replaceable module that accommodates the service or

management ports.

L

Load balance A method of adjusting the system, application components and data to

averagely distribute the applied I/O or computing requests for

physical resources of the system.

Local backup A way to back up file system data by creating a copy (snapshot) of

the local file system.

Local restore A way to restore file system data by using the data copy backed up in

the local storage array.

Logical unit The entity is located inside the SCSI object, and can execute I/O

commands. After a SCSI I/O command is sent to an object, the logic unit inside the object executes this command. Usually, each SCSI physical disk has one logic unit. A tape drive and array controller may have multiple logic units, which process different I/O commands. Each logic unit inside an array controller corresponds to a virtual

disk.

Logical unit number

The number of a logical disk that the host can access.

LUN copy The function of copying the original LUN data to one or multiple

target LUNs.

LUN formatting The process of writing 0 bits in the data area on the logical drive and

generating related parity bits so that the logical drive can be in the

ready state.

LUN mapping The storage system maps LUNs to ASs so that the ASs can access the

storage resources.

LUN migration A method for the data in the LUN to migrate between different

physical storage space while ensuring data integrity and uninterrupted

operation host services.

LUN snapshot A type of snapshot created for a LUN. This snapshot is both readable

and writable, and is mainly used to provide a snapshot LUN from a

point-in-time data of a LUN.

M

Maintenance terminal

The computer that is connected through a serial port or management

network port and maintains the storage system.

Management interface module

The module that integrates one or more management network ports.

Management network

An entity that provides a means to transmit and process the

information related to network management.

Management network port

The network port on the controller enclosure that is connected to the maintenance terminal. It is provided for the remote maintenance

terminal. Its IP address can be modified with the change of customers'

environment.

Minimum file	
system loading	g

A method of restoring the user data in an offline file system.

N

Node A managed device in the network. For a device with a single frame,

one node stands for one device. For a device with multiple frames,

one node stands for one frame of the device.

NVMe A host controller interface with a register interface and command set

designed for PCI Express-based SSDs.

NVMe SSD A solid state disk (SSD) with a non-volatile memory express (NVMe)

interface. Compared with other SSDs, such SSDs can deliver higher

performance and shorter latency.

O

Out-of-band management

A management mode used during out-of-band networking. In the outof-band management mode, the management and control information of the network and the bearer service information of the user network

are transmitted through different logical channels.

Owning controller

The controller that can prior access a certain LUN.

P

Power failure protection

When the external power failure occurs, the AC PEM depends on the battery for power supply, which ensures the integrity of the dirty data

in cache.

Pre-copy When the system monitors that a member disk in a RAID group is to

fail, the system copies the data on the disk to a hot spare disk in

advance. This technology is called pre-copy.

Primary storage controller

The controller that plays a leading role in controlling the management is the primary storage controller. It can perform relevant management

operations on the controller enclosure.

Primary/ Secondary switchover A process for the conversion of the primary/secondary relationship.

Prior controller For the application server LUN, prior controller means that the

working controller is the owner controller of the corresponding array

LUN.

Protocol endpoint A proxy to process VM I/Os. After VM I/Os are sent to a PE, the PE

redirects the I/Os to virtual volumes.

Q

Quota tree A first-level directory of file system that can be managed with quota.

Quorum server A server that can provide arbitration services. The server can provide

arbitration services for clusters or HyperMetro to prevent conflicts of

resource access by multiple application servers.

Quorum server

mode

A HyperMetro arbitration mode. When a HyperMetro arbitration occurs, the Quorum server decides which site wins the arbitration.

R

RAID level The application of different redundant types to a logical drive. A

RAID level improves the fault tolerance or performance of the logical drive but reduces the available capacity of the logical drive. You must

specify a RAID level for each logical drive.

Read-only file system snapshot

A type of snapshot created for a file system. This snapshot is read-

only, mainly for data backup or restore.

Reconstruction The process of restoring the data saved on a faulty member disk in a

RAID group.

Redundancy The scheme to add more than one channels, elements or parts that

have the same functions with the counterparts in the system or device at a critical place. When a fault occurs, the system or device can work

well, and the reliability is then improved.

Remote backup A way to back up file system data by copying data from the file

system in the local storage array to the file system in the backup

storage array.

Remote A core technology for disaster recovery and a foundation that replication implements remote data synchronization and disaster recovery

implements remote data synchronization and disaster recovery. This technology remotely maintains a set of data mirror through the remote data connection function of the storage devices that are separated in different places. Even when a disaster occurs, the data backup on the remote storage device is not affected. Remote replication can be divided into synchronous remote replication and asynchronous remote

replication by whether the host that requires mirrors needs the confirmation information of the remote replication site.

Remote restore A way to restore file system data by copying backup data from the

backup storage array to the file system in the local storage array.

Reverse synchronizing

The process of restoring data from the redundancy machine (RM) when the services of the production machine (PM) are recovering.

Route The path that network traffic takes from its source to its destination.

In a TCP/IP network, each IP packet is routed independently. Routes

can change dynamically.

 \mathbf{S}

Script A collection of data statements used to perform an operation.

SCSI (Small computer system interface)

A set of standards for physically connecting and transferring data between computers and peripheral devices. SCSI is most commonly used for hard disks and tape drives, but it can connect a wide range of other devices, including scanners, and optical drive.

Secondary controller

(1) A controller that backs up service and management data of the primary controller in a clustered system. When the primary controller fails, the secondary controller is upgraded to the primary controller and takes over the management and services of the controller enclosure. (2) A controller that backs up the management data of the primary controller in a block-level array. When the primary controller fails, the secondary controller is upgraded to the primary controller and takes over the management of the system.

Security style An ACL authentication mode used in file system or Quota tree. The

security style affects the user quota calculations.

Serial port An input/output location (channel) that sends and receives data to and

from a computer's CPU or a communications device one bit at a time. Serial ports are used for serial data communication and as interfaces

with some peripheral devices, such as mice and printers.

Service data The user and/or network information required for the normal

functioning of services.

Service network The network port that is used to store services.

SFP optical transceiver

port

A component that can make data conversion between optical signals and electrical signals and that can receive and transfer data.

Simple network management protocol

A network management protocol of TCP/IP. It enables remote users to view and modify the management information of a network element. This protocol ensures the transmission of management information between any two points. The polling mechanism is adopted to provide basic function sets. According to SNMP, agents, which can be hardware as well as software, can monitor the activities of various devices on the network and report these activities to the network console workstation. Control information about each device is maintained by a management information block.

Single point of failure

Slot

A type of failure. Data transmission over a network is stopped and cannot be recovered automatically if a single point failure occurs. The point can be an interface, a board, a device, or a link.

A position defined by a upper guide rail and the corresponding lower guide rail in a frame. A slot houses a board.

SmartTenancy A feature of Huawei storage system. With SmartTenancy, multiple

virtual storage systems can be created in one physical storage system, which allows tenants to share the same storage system hardware resource without affecting data security and privacy of each other. This feature achieves more flexible, easy-to-manage and low-cost shared storage in a multi-protocol unified storage architecture.

Snapshot A data backup technology through which a fully usable copy of a data

object can be quickly generated. The duplicate contains the image of

the data object at a point in time.

Snapshot copy A copy of the snapshot LUN, which is also a snapshot LUN.

Snapshot file system

A type of snapshot. A snapshot is created for a file system and this

snapshot is called snapshot file system.

Snapshot quota The maximum storage space which is used for snapshot of file

system, and the quota is adjustable if necessary.

Soft quota A method used by the storage system to control resource usage. This

method allows a user to use a resource for a specific period after the

threshold for the resource has been exceeded.

Source LUN The LUN where the original data is located.

Static Priority Mode A HyperMetro arbitration mode. When a HyperMetro arbitration

occurs, the preferred site always wins the arbitration.

Storage Pool Shrinking A method of shrinking the total capacity of Storage Pool.

Storage system An integrated system. It consists of the following parts: controller,

storage array, host bus adapter, physical connection between storage

units, and all control software.

Storage unit An abstract definition of backup storage media for storing backup

data. The storage unit is connected with actual storage media, used to

back up data.

Streaming media The media by which content is transmitted continuously with the

streaming method in real time. Streaming media ensure high-quality playback effects at low bandwidth by integrating with the following technologies: data collection, data compression, encoding, storage, transmission, terminal playback, and network communication.

Stripe The set of strips at corresponding locations of each member extent of

a disk array which uses striped data mapping. The strips in a stripe are associated with each other in a way (e.g., relative extent block addresses) that allows membership in the stripe to be quickly and uniquely determined by a computational algorithm. Parity RAID uses stripes to map virtual disk block addresses to member extent block

addresses.

Subnet A type of smaller networks that form a larger network according to a

rule, for example, according to different districts. This facilitates the

management of the large network.

Subnet mask The technique used by the IP protocol to determine which network

segment packets are destined for. The subnet mask is a binary pattern

that is stored in the device and is matched with the IP address.

Synchronous remote replication

A kind of remote replication. When the data on the primary site is updated, the data must be synchronously updated on the mirroring site before the update is complete. In this way, the data that is stored on both the primary and mirroring sites can be synchronized.

T

Target A system component that can receive SCSI I/O operation commands.

Target LUN The LUN on which target data resides.

Tenant A property of SmartTenancy, which represents a virtual storage

system in a physical one. The private and independent logical resource of a tenant mainly includes disk domain space, LUN, file system and ports. Tenants get complete storage services, but also remain resource and network isolation with other tenants, which

avoids interference.

Thin provisioning Thin provisioning is the act of using virtualization technology to give

the appearance of having more physical resources than are actually available. If a system always has enough resource to simultaneously support all of the virtualized resources, then it is not thin provisioned. The term thin provisioning is applied to disk later in this article, but could refer to an allocation scheme for any resource. For example, real memory in a computer is typically thin provisioned to running tasks with some form of address translation technology doing the virtualization. Each task believes that it has real memory allocated. The sum of the allocated virtual memory assigned to tasks is typically

greater than the total of real memory.

Thin LUN The thin LUN is a logic disk that can be accessed by hosts. The thin

LUN dynamically allocates storage resources from the thin pool

according to the actual capacity requirements of users.

Timing Snapshot To create snapshots periodically to continuously protect data.

Topology The configuration or layout of a network formed by the connections

between devices on a local area network (LAN) or between two or

more LANs.

Trap A type of SNMP message used to signal that an event has occurred.

Trap delivery to recipients uses UDP and is not completely reliable.

TRIM A Trim command (commonly typeset as TRIM) allows an operating

system to inform a solid-state drive (SSD) which blocks of data are no longer considered in use and can be wiped internally, improving

SSD performance.

Trunking The process of aggregating multiple physical ports into a logical path

on the configuration software. The bandwidths of multiple ports are combined, so the bandwidth between switches and network nodes increases. The logical port enjoys a high bandwidth that is several

times of that of an independent physical port.

U

User datagram protocol

A TCP/IP standard protocol that allows an application program on one device to send a datagram to an application program on another. User Datagram Protocol (UDP) uses IP to deliver datagram. UDP provides application programs with the unreliable connectionless packet delivery service. There is a possibility that UDP messages will be lost, duplicated, delayed, or delivered out of order. The destination device does not confirm whether a data packet is received.

User interface

The space in which users interact with a machine.

User quota

For the quota set for one user to limit the space used or the number of files used. The amount can be adjusted according to need.

V

Variable prefetch

A cache prefetch strategy. The size of the data to be prefetched is the multiple for prefetching multiplied by the length of a read command.

This strategy applies to the applications that require reading data of variable size in a certain order or to the situations where multiple subscribers read data concurrently but no fixed prefetch size can be set, because the amount of pre-read data cannot be judged. An example is the streaming media demanded by multiple subscribers who use different bit rates.

Virtual volume

A VMware virtual volume. A VM consists of a group of virtual

volumes.

vStore

A property of SmartTenancy. In Huawei SmartTenancy, a tenant is called a vStore, which represents a virtual storage system.

W

Wear leveling

A technique for prolonging the service life of NAND flash. It is a way to average the erase operations in different blocks, in order to avoid some specific blocks to become bad blocks due to excessive use.

Working controller

The controller that reads data from and writes data onto LUNs or file

systems in a storage array.

Write amplification

An undesirable effect associated with flash memory and SSDs where the actual amount of physical information written is a multiple of the logical amount intended to be written. Because flash memory must be erased before it can be rewritten, the process to perform these operations results in moving (or rewriting) data more than once.

Write amplification factor

A value to measure the write amplification effect of flash memory and SSDs, which is caculated by the ratio of the actual data witten to the flash memory and expected data written by the host.

Write back

A caching technology in which the completion of a write request is signaled as soon as the data is in cache, and actual writing to non-volatile media occurs at a later time. Write back includes an inherent risk that an application will take some action predicated on the write completion signal, and a system failure before the data is written to non-volatile media will cause media contents to be inconsistent with that subsequent action. For this reason, good write back implementations include mechanisms to preserve cache contents across system failures (including power failures) and to flush the cache at system restart time.

Write through

A caching technology in which the completion of a write request is not signaled until data is safely stored on non-volatile media. Write performance with the write through technology is approximately that of a non-cached system, but if the data written is also held in cache, subsequent read performance may be dramatically improved.

Write once read many

A type of data protection method. After being written, the data can be read and reread but cannot be altered.

 \mathbf{Z}

Zone

A Fibre Channel switch function that is similar to the VLAN function for Ethernet switches. It logically allocates the devices including hosts and storage systems on a SAN to different zones. In this way, the devices in different zones cannot directly access each other over a Fibre Channel network, implementing device isolation on the SAN.

C Acronyms and Abbreviations

В

BBU Backup Battery Unit

 \mathbf{C}

CLI Command Line Interface

F

FC Fibre Channel

H

HBA Host Bus Adapter

HPC High-performance Computing

I

IOPS Input/Output Operations Per Second

iSCSI Internet Small Computer Systems Interface

L

LUN Logical Unit Number

N

NVMe Non-volatile Memory Express

 \mathbf{o}

ODX Offloaded Data Transfer

OLTP Online Transaction Processing

OLAP Online Analytical Processing

R

RAID Redundant Array of Independent Disks

ROW Redirect-On-Write

 \mathbf{S}

SAS Serial Attached SCSI

SNMP Simple Network Management Protocol

SRM Site Recovery Manager

SSD Solid-State Drive

T

TCO Total Cost of Ownership

V

VAAI vSphere Storage APIs for Array Integration

VDI Virtual Desktop Infrastructure

VSS Volume Shadow Copy Service