

**OceanStor CloudStor CSE  
V100R001**

## **Product Description**

**Issue 04**

**Date 2012-03-15**

**HUAWEI TECHNOLOGIES CO., LTD.**





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# About This Document

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## Version

The following table lists the product version related to this document.

Product Name	Version
OceanStor CloudStor CSE	V100R001
OceanStor CloudStor CSS	V100R001
OceanStor T3000	V100R002
OceanStor ISM	V200R001C04

## Intended Audience






This document describes the OceanStor CloudStor CSE (hereinafter referred to as the CSE) in terms of the appearance, configurations, networkings, application scenarios, functions and features, hardware structure, software structure, technical specifications, standard compliance, and certifications.

This document is intended for:

- Network planning engineers
- Data configuration engineers
- System maintenance engineers
- Network administrators

## Symbol Conventions

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

Symbol	Description
 <b>DANGER</b>	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a hazard with a medium or low level of risk, which if not avoided, could result in minor or moderate injury.
 <b>CAUTION</b>	Indicates a potentially hazardous situation, which if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
 <b>TIP</b>	Indicates a tip that may help you solve a problem or save time.
 <b>NOTE</b>	Provides additional information to emphasize or supplement important points of the main text.

## GUI Conventions

Convention	Description
“ ”	Buttons, menus, parameters, tabs, window, and dialog titles are in <b>boldface</b> . For example, click <b>OK</b> .
>	Multi-level menus are in <b>boldface</b> and separated by the ">" signs. For example, choose <b>File &gt; Create &gt; Folder</b> .

## Update History

Updates between document issues are cumulative. Therefore, the latest document issue contains all updates made in previous issues.

### Updates in Issue 04 (2012-03-15)

Fourth commercial release. The updates are as follows:

- **2.1.1 Virtual Disk**  
Added the operating environment requirements and specifications of the virtual disk.
- **2.1.2 Web Disk**  
Added the operating environment requirements and specifications of the Web disk.
- **2.1.3 Online Storage Service Client**  
Added the operating environment requirements and specifications of the online storage service client.

- **2.2 Online Data Backup**  
Added the specifications of the online backup service client.
- **4.3 T8000 Server, 4.4 BH23C Server Blade, 4.5 T3200 Cloud Storage Node, 4.6 T3500 G2 Cloud Storage Node, and 4.7 S5352C-SI Switch**  
Added hardware information, including dimensions, weight, power consumption, and environment temperature.
- **5.2 Software Deployment**  
Added the matching relationship between service and software in the software development model.

### Updates in Issue 03 (2011-07-20)

Third commercial release. The updates are as follows:

- **6.3 Operating Specifications**  
The operating temperature of CSE is 5°C to 32°C.
- **4.5 T3200 Cloud Storage Node**  
The RAID card in the system data node is LSI RAID card.

### Updates in Issue 02 (2010-12-27)

Second commercial release. Added the virtual disk function, and bugs in the document are fixed.

### Updates in Issue 01 (2010-09-13)

First commercial release.



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# 1 Introduction

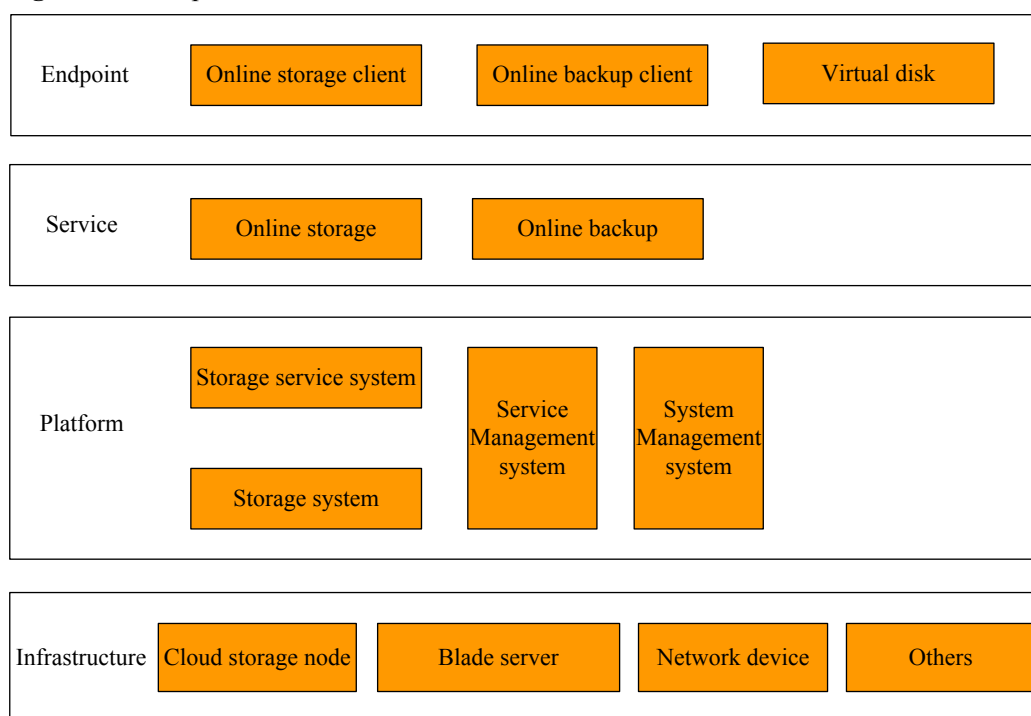
## About This Chapter

This chapter describes the appearance, three types of configuration and networking, and two typical application scenarios of the CSE.

The CSE is an IP-based data storage product that provides cloud services, including online storage and online backup. It delivers data storage and data protection for end users and enables the operation of storage services. The CSE consists of cloud storage nodes, blade servers, network devices, storage service system, storage system, service management system, system management system, online storage, online backup and clients. This integrated system provides external data storage and service access through the clients, or common access interfaces.

**Figure 1-1** describes the components of the CSE.

**Figure 1-1** Components of the CSE



### 1.1 Appearance

This section describes the appearance of the CSE.

### 1.2 Production Configuration

This section describes information about the lowest configuration, standard configuration, and advanced configuration of the CSE.

### 1.3 Networking

This section describes the networkings of the CSE in the lowest, standard, and advanced configurations.

### 1.4 Typical Applications

This section describes two typical application scenarios of the CSE.

## 1.1 Appearance

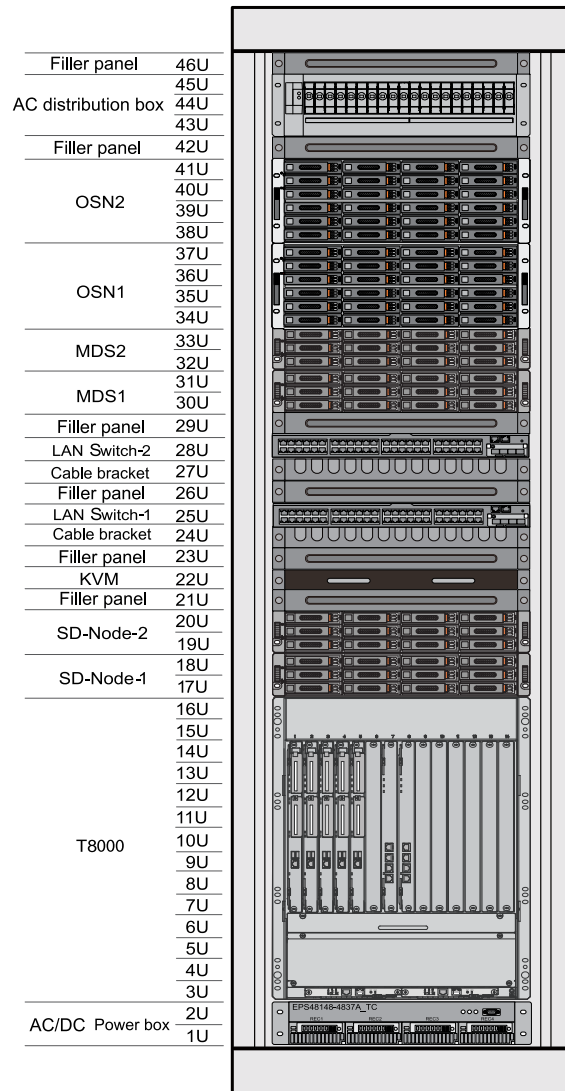
This section describes the appearance of the CSE.

The CSE mainly comprises the cabinet, management node, service node, computation node, system data node, Cloud Storage System (CSS), switch, and keyboard video mouse (KVM).

- The management node, service node, and computation node use the dedicated server board BH23C and reside inside the T8000 shelf.
- The system data node and the metadata server (MDS) node of the CSS use the T3200 (2U).
- The object storage node (OSN) of the CSS uses the T3500 G2 (4U).

The system manage system is deployed in the management node; The online storage service, online backup service, and service management system are deployed in the service node; The storage service system is deployed in the computation node; The system data service is deployed in the system data node.

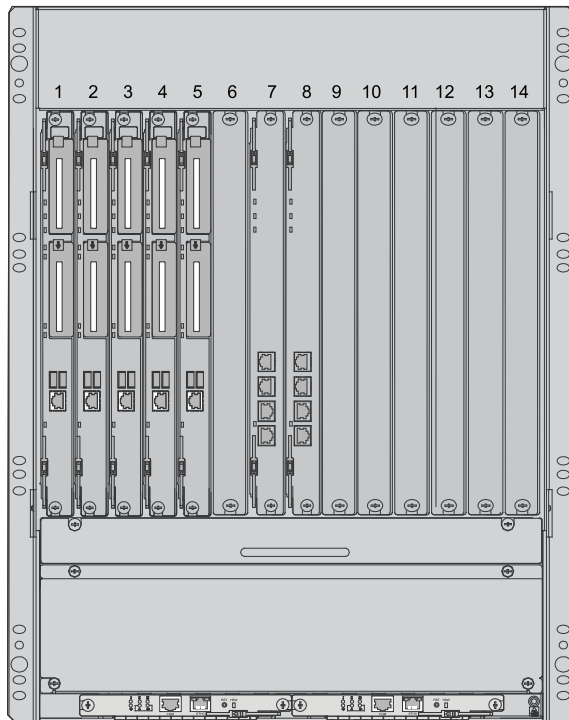
**Figure 1-2** shows the appearance of the CSE in the lowest configuration.

**Figure 1-2** Appearance of the CSE in the lowest configuration

**Figure 1-3** shows the BH23Cs in the slots of the T8000. The function of each BH23C is as follows:

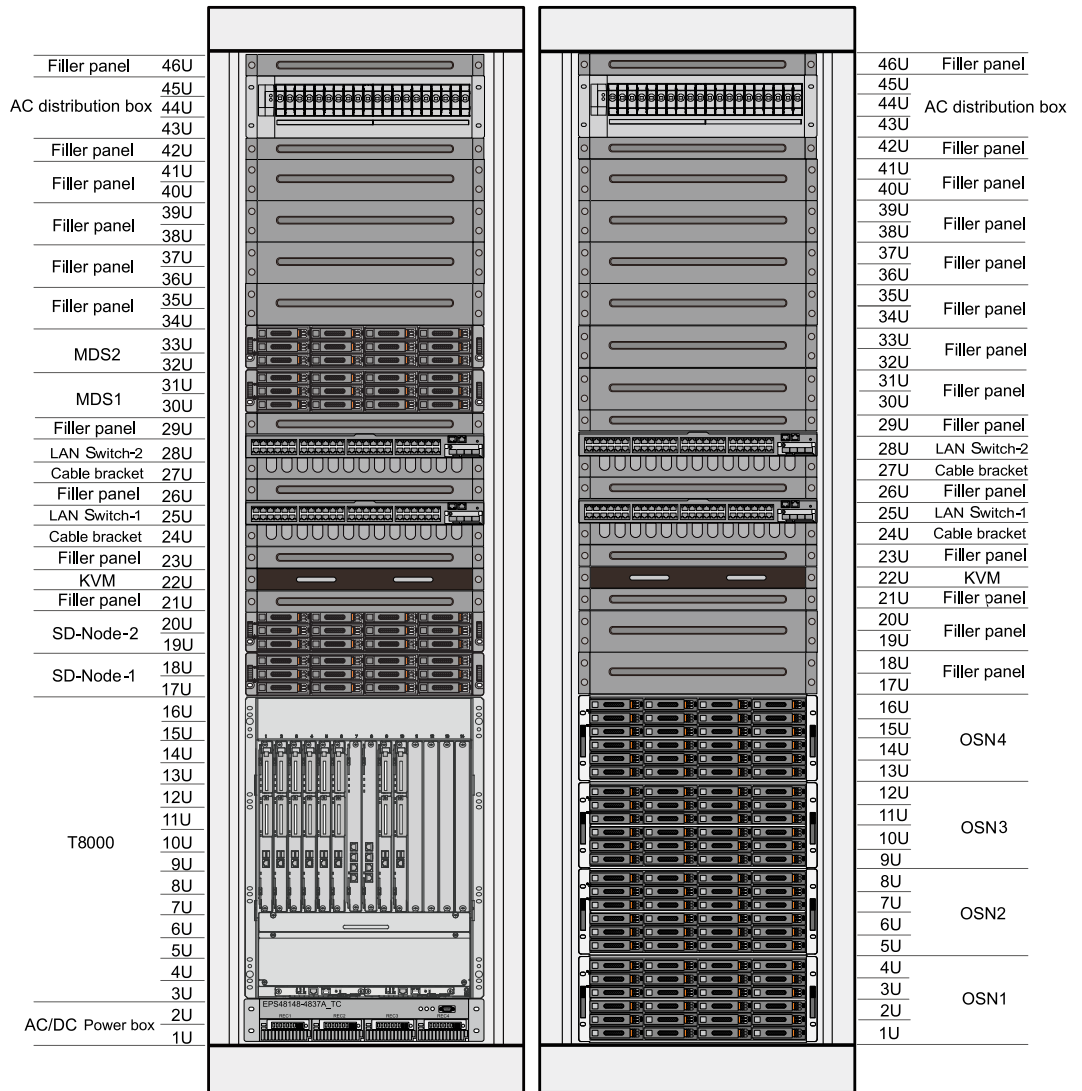
- The BH23C in slot 1 works as the management node.
- The BH23Cs in slots 2 and 3 work as the service nodes.
- The BH23Cs in slots 4 and 5 work as the computation nodes.

**Figure 1-3** Slots of the BH23Cs in the lowest configuration



**Figure 1-4** shows the appearance of the CSE in the standard configuration.

**Figure 1-4** Appearance of the CSE in the standard configuration

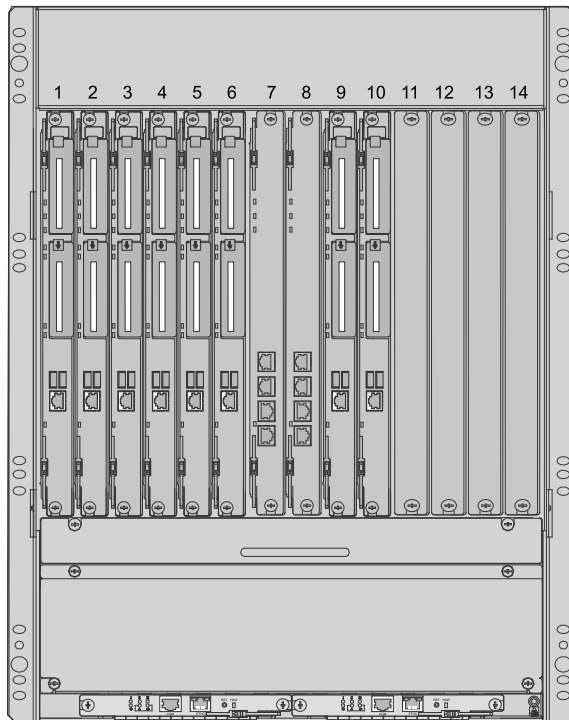


**Figure 1-5** shows the BH23Cs in the slots of the T8000. The function of each BH23C is as follows:

- The BH23C in slot 1 works as the management node.
- The BH23Cs in slots 2 to 4 work as the service nodes.
- The BH23Cs in slots 5, 6, 9, and 10 work as the computation nodes.

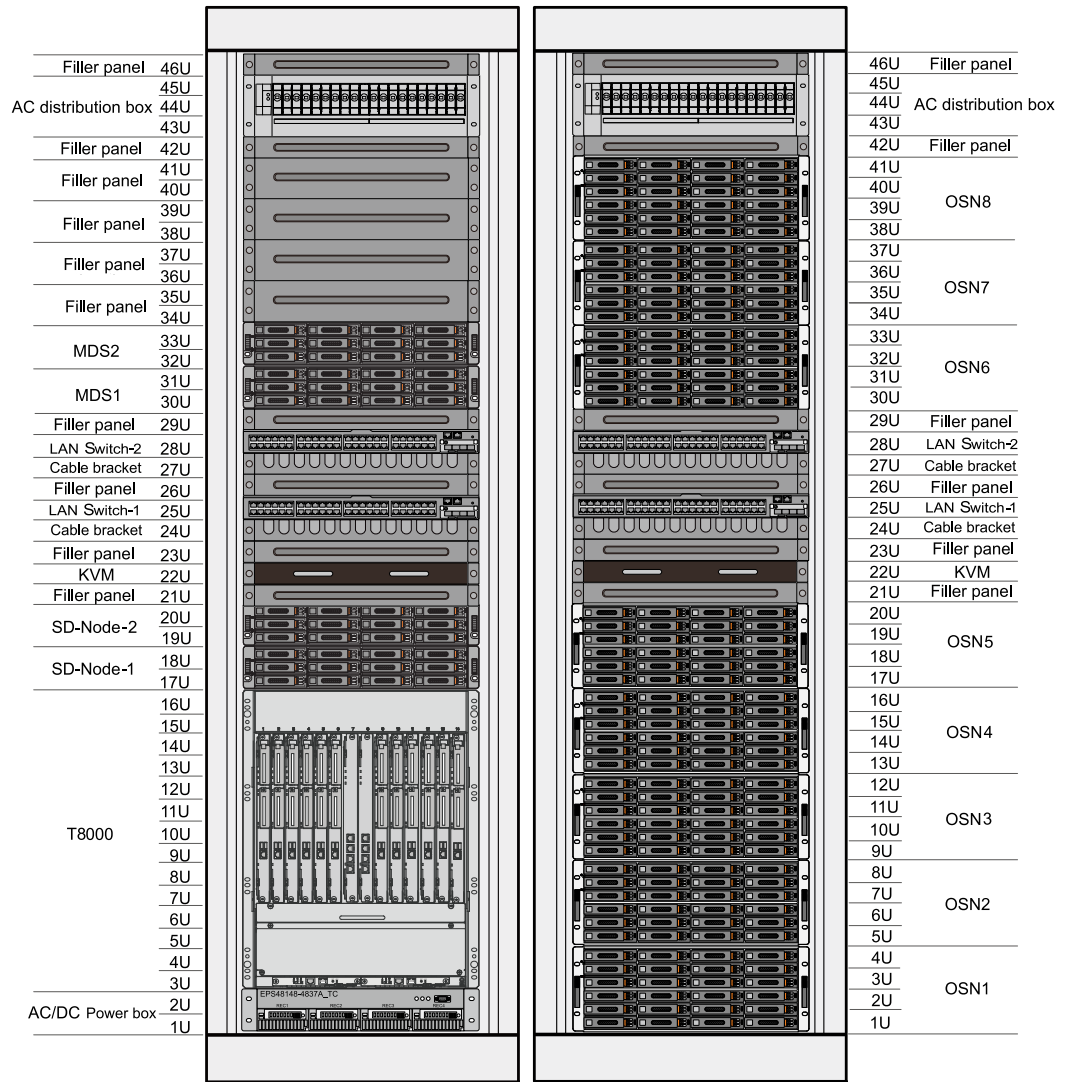


**Figure 1-5** Slots of the BH23Cs in the standard configuration



**Figure 1-6** shows the appearance of the CSE in the advanced configuration.

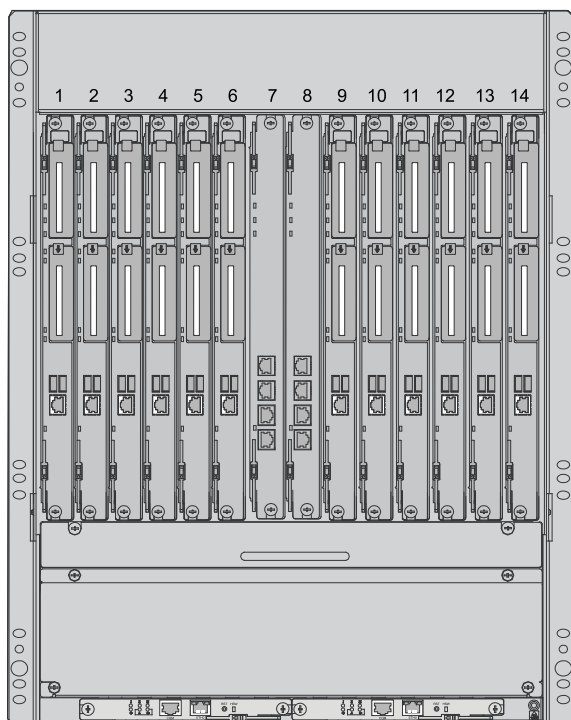
**Figure 1-6** Appearance of the CSE in the advanced configuration



**Figure 1-7** shows the BH23Cs in the slots of the T8000. The function of each BH23C is as follows:

- The BH23C in slot 1 works as the management node.
- The BH23Cs in slots 2 to 5 work as the service nodes.
- The BH23Cs in slots 6 and 9 to 14 work as the computation nodes.

**Figure 1-7** Slots of the BH23Cs in the advanced configuration



## 1.2 Production Configuration

This section describes information about the lowest configuration, standard configuration, and advanced configuration of the CSE.

**Table 1-1** The configurations of the CSE

Configuration	Lowest configuration	Standard configuration	Advanced configuration
Cabinet Quantity	1	2	2
T8000 Quantity	1	1	1
BH23C Quantity	5	8	12
T3200 Quantity	4	4	4
T3500 G2 Quantity	2	4	8
Switch Quantity	2	4	4
KVM Quantity	1	2	2
Maximum Capacity of a Raw Disk	44TB	92TB	188TB

Configuration	Lowest configuration	Standard configuration	Advanced configuration
Maximum number of concurrent	800	1,600	2,800

## 1.3 Networking

This section describes the networkings of the CSE in the lowest, standard, and advanced configurations.

### [1.3.1 Networking of the CSE in the Lowest Configuration](#)

This section describes the networking of the CSE in the lowest configuration.

### [1.3.2 Networking of the CSE in the Standard Configuration](#)

This section describes the networking of the CSE in the standard configuration.

### [1.3.3 Networking of the CSE in the Advanced Configuration](#)

This section describes the networking of the CSE in the advanced configuration.

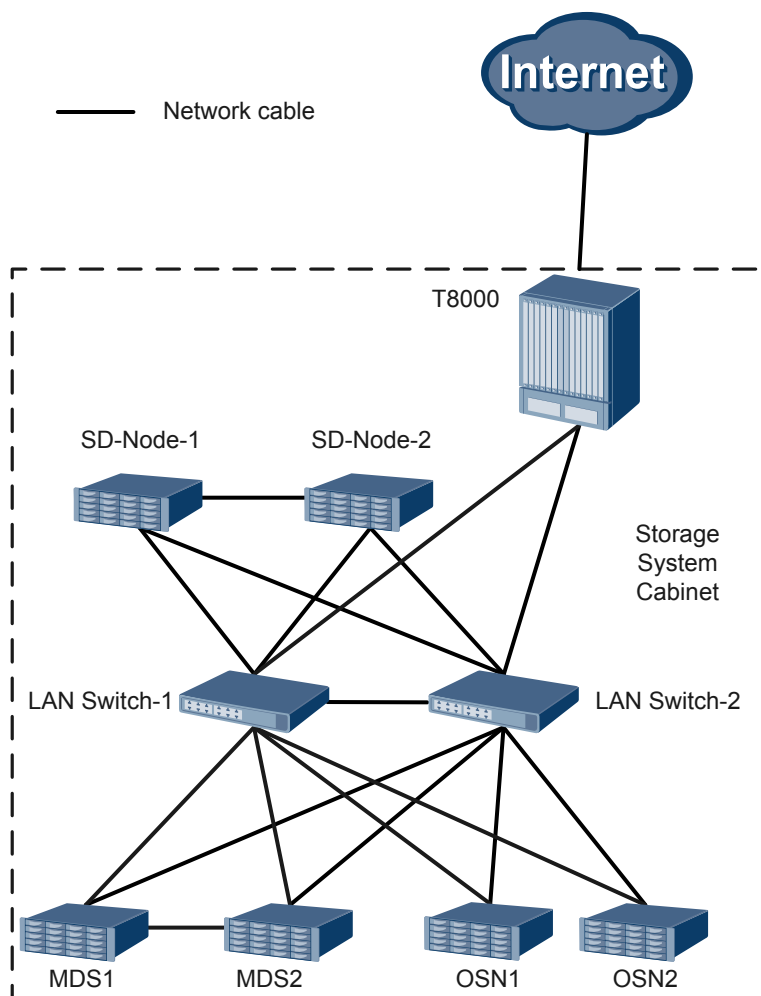
## 1.3.1 Networking of the CSE in the Lowest Configuration

This section describes the networking of the CSE in the lowest configuration.

The CSE in the lowest configuration consists of one T8000, two system data nodes (SD-Nodes), two switches, and a CSS. The CSS contains two MDSs and two OSNs.

**Figure 1-8** shows the networking of the CSE in the lowest configuration.

**Figure 1-8** Networking of the CSE in the lowest configuration



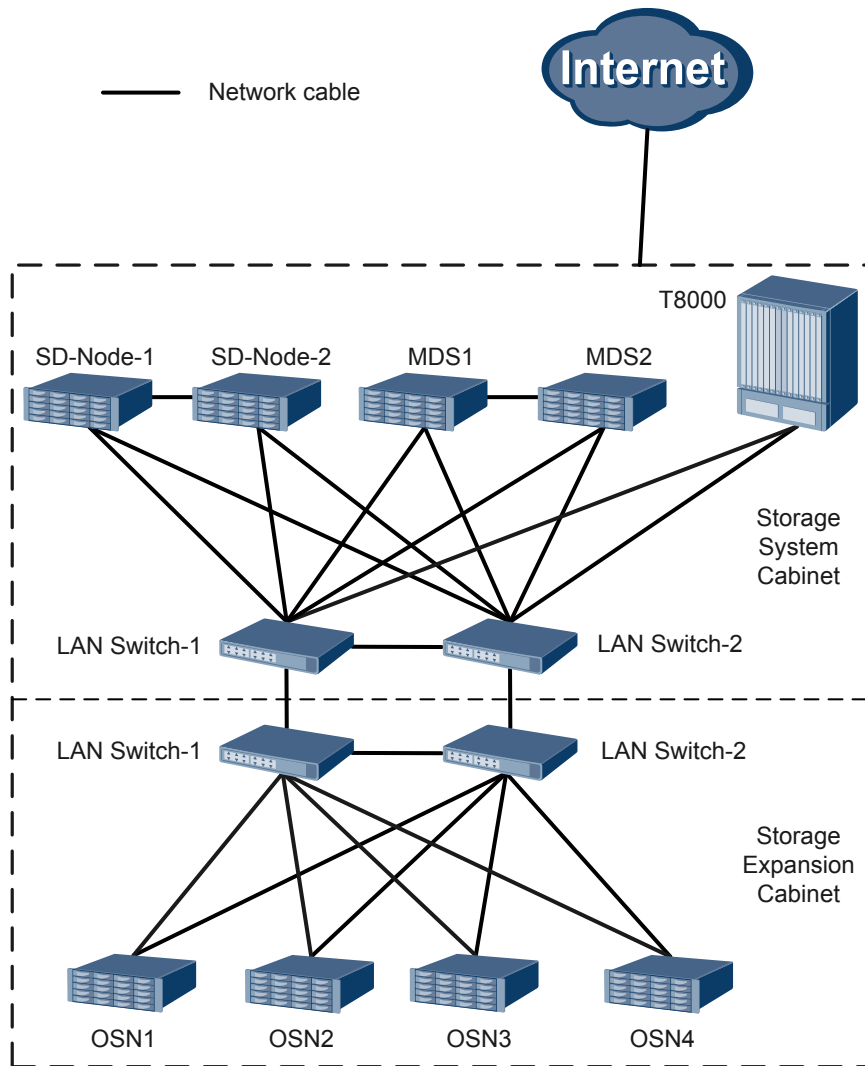
### 1.3.2 Networking of the CSE in the Standard Configuration

This section describes the networking of the CSE in the standard configuration.

The CSE in the standard configuration consists of one T8000, two system data nodes (SD-Nodes), four switches, and a CSS. The CSS contains two MDSs and four OSNs.

**Figure 1-9** shows the networking of the CSE in the standard configuration.

**Figure 1-9** Networking of the CSE in the standard configuration



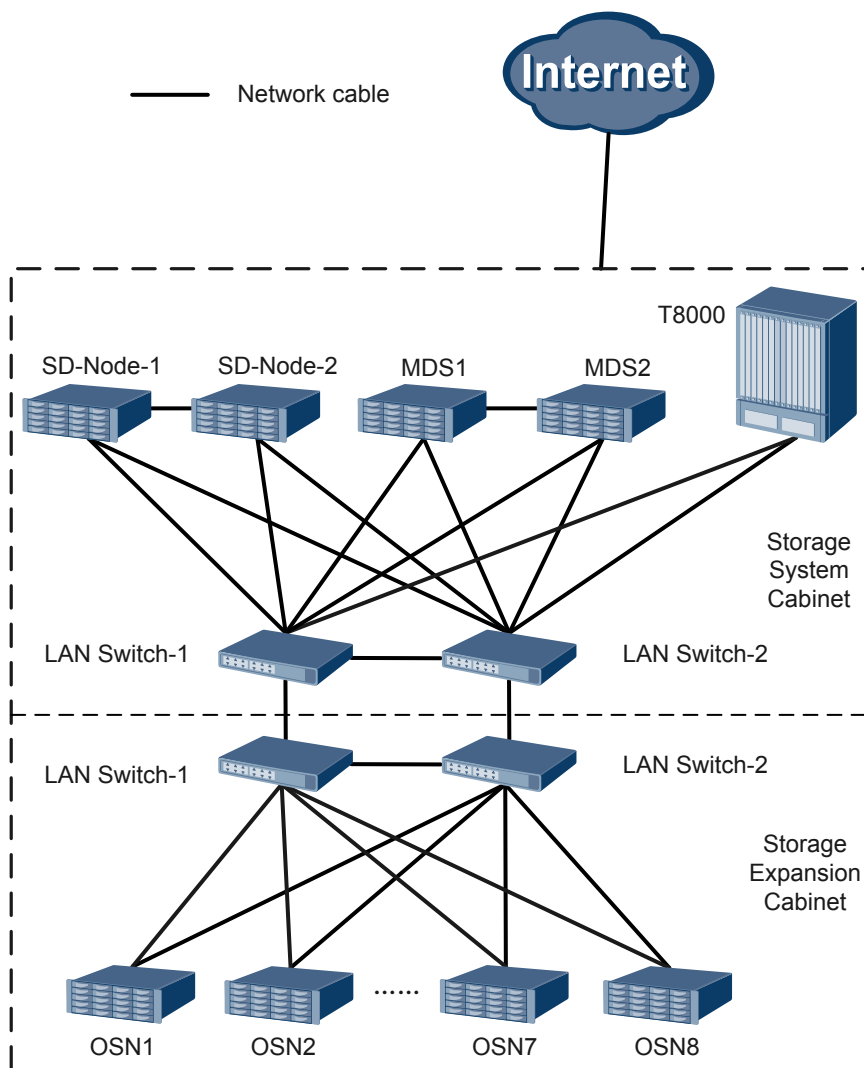
### 1.3.3 Networking of the CSE in the Advanced Configuration

This section describes the networking of the CSE in the advanced configuration.

The CSE in the standard configuration consists of one T8000, two system data nodes (SD-Nodes), four switches, and a CSS. The CSS contains two MDSs and eight OSNs.

**Figure 1-10** shows the networking of the CSE in the advanced configuration.

**Figure 1-10** Networking of the CSE in the advanced configuration



## 1.4 Typical Applications

This section describes two typical application scenarios of the CSE.

### 1.4.1 Oriented Towards the Operation of Storage Applications

This section describes the characteristics and application scenarios of the CSE oriented towards the operation of storage applications.

### 1.4.2 Oriented Towards Storage and Protection of Enterprise Data

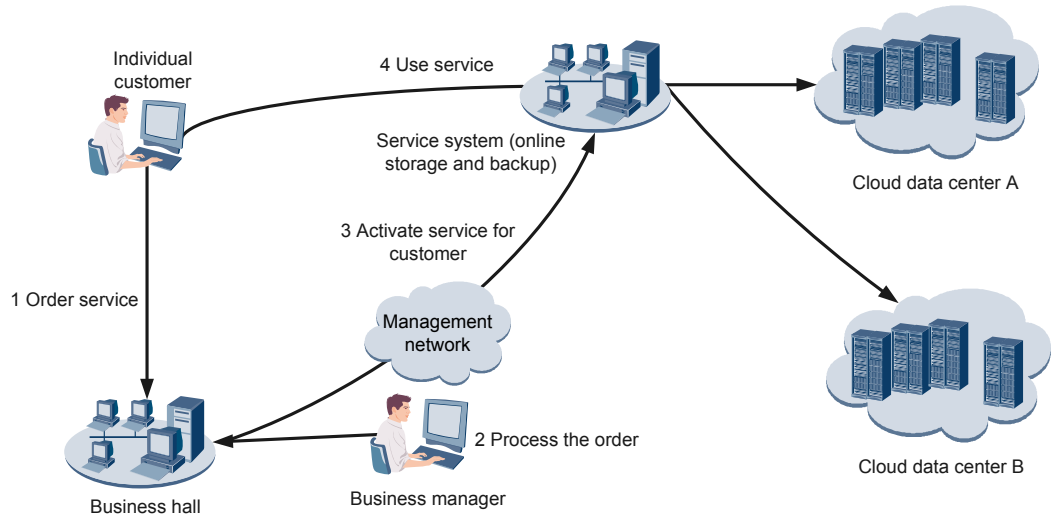
This section describes the characteristics and application scenarios of the CSE oriented towards storage and protection of enterprise data.

### 1.4.1 Oriented Towards the Operation of Storage Applications

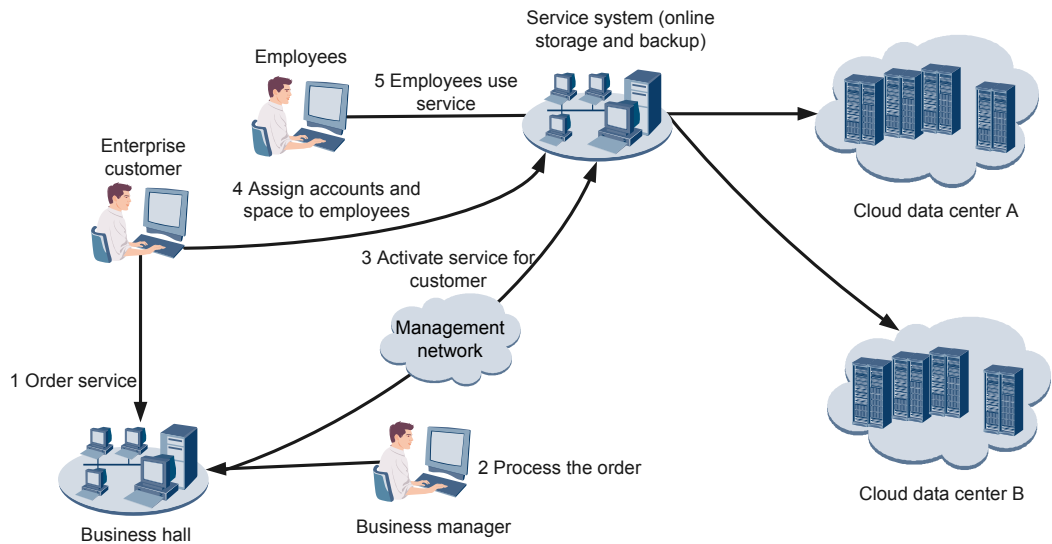
This section describes the characteristics and application scenarios of the CSE oriented towards the operation of storage applications.

The CSE provides operable online storage and online backup services for operators. With the online storage service, an operator can provide online storage and management of data for individual customers, or provide online storage of and remote access to data for enterprise customers. The online storage service supports data sharing among an enterprise customer's employees. **Figure 1-11** and **Figure 1-12** show the application scenarios of the online storage service.

**Figure 1-11** Cloud storage operation oriented towards individual customers



**Figure 1-12** Cloud storage operation oriented towards enterprise customers



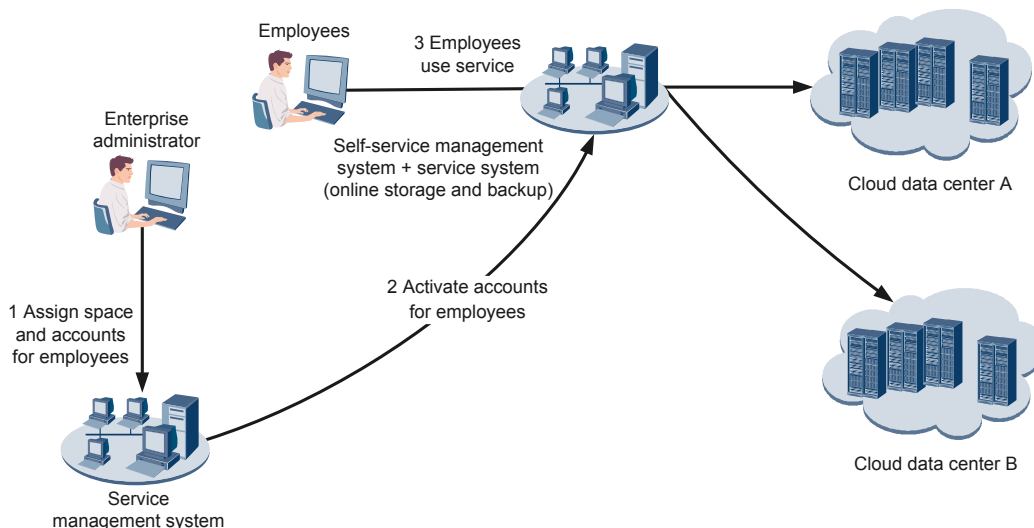
## 1.4.2 Oriented Towards Storage and Protection of Enterprise Data

This section describes the characteristics and application scenarios of the CSE oriented towards storage and protection of enterprise data.



The CSE provides the online storage and online backup services for enterprise customers. With the online storage service, an enterprise can set up a shared library accessible to authorized employees so that these employees can store and share data. With the online backup service, an enterprise can back up the database and the data on file servers. **Figure 1-13** shows the application scenario.

**Figure 1-13** Storage and protection of enterprise data





# 2 Functions

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## About This Chapter

The CSE performs the functions of online storage, online backup, system configuration, and system management. The CSE performs the following functions: 1) provides comprehensive security mechanisms to safeguard information operations; 2) installs and configures the software through the automatic deployment capability.

### [2.1 Online Data Storage](#)

The online storage system of the CSE enables storage, management, and sharing of data. In addition, this system can work as a shared library accessible to an enterprise's employees. Online data storage includes storing data using the virtual disk, Web disk, and online storage service client.

### [2.2 Online Data Backup](#)

The online data backup function protects the data on the local computer and application servers and transfers the backup data into the remote cloud storage space.

### [2.3 Security Mechanisms](#)

This section describes the security mechanisms of the CSE. These security mechanisms include access control, data isolation, information encryption, transfer encryption, and storage security.

### [2.4 Automatic Deployment](#)

The CSE supports the automatic deployment of software, increasing the efficiencies of installation and configuration.

## 2.1 Online Data Storage

The online storage system of the CSE enables storage, management, and sharing of data. In addition, this system can work as a shared library accessible to an enterprise's employees. Online data storage includes storing data using the virtual disk, Web disk, and online storage service client.

### 2.1.1 Virtual Disk

The CSE provides the virtual disk function. You can operate the virtual disk in the similar way for a local disk, for example, create, modify, and delete a file or folder on the virtual disk.

### 2.1.2 Web Disk

The CSE provides a Web disk that users can access through a Web browser to manage data. The Web disk applies to the scenario where the user's client and position change frequently or where the user's data needs to be cited by other Internet users.

### 2.1.3 Online Storage Service Client

The CSE provides online storage service client, which enables users to store the local files or folders into the CSE in the similar way as using an File Transfer Protocol (FTP) server. Users can add, modify, and delete the files or folder stored in the CSE.

### 2.1.4 Data Synchronization

The CSE provides the data synchronization function to protect files on the local computer. This function applies to remote office and multi-user collaboration that require high security of local data.

### 2.1.5 Shared Library

The CSE provides a shared library for data sharing among an enterprise, department, or workgroup.

## 2.1.1 Virtual Disk

The CSE provides the virtual disk function. You can operate the virtual disk in the similar way for a local disk, for example, create, modify, and delete a file or folder on the virtual disk.

The environment requirements for running a virtual disk are as follows:

- Windows XP 32 bit SP2
- Windows XP 32 bit SP3
- Windows 7

The virtual disk provides such functions as triggered batch download, hotspot caching, resumable transfer, and supports online editing of Microsoft Office and .txt files. The virtual disk also allows uploading two files at the same time, and a maximum of 10,000 files can be in the transfer queue. You can use the virtual disk to upload, download, delete, and modify files or folders, achieving data consistency between the virtual disk and the CSE.

The virtual disk supports hotspot caching, reducing requirements for the local disk space.

## 2.1.2 Web Disk

The CSE provides a Web disk that users can access through a Web browser to manage data. The Web disk applies to the scenario where the user's client and position change frequently or where the user's data needs to be cited by other Internet users.

The Web disk is unrestricted from time and position, and can be accessed any time and anywhere through an Internet client. For example, a user can employ a common client to access the Web disk on a business travel.

The Web disk supports the ability to upload a maximum of 5 files at a time (smaller than 2 GB in total).

**Table 2-1** shows the environment requirements for running a Web disk.

**Table 2-1** Environment requirements for running a Web disk

Parameter	Descriptions
Operating system	<ul style="list-style-type: none"> <li>● Windows XP 32 bit SP2</li> <li>● Windows XP 32 bit SP3</li> </ul>
Browser	<ul style="list-style-type: none"> <li>● Internet Explore 6.0</li> <li>● Internet Explore 7.0</li> <li>● Internet Explore 8.0</li> </ul>
Online edit tool	<ul style="list-style-type: none"> <li>● Standard Office 2003</li> <li>● Standard Office 2007</li> </ul>
Adobe PDF reader	<ul style="list-style-type: none"> <li>● Adobe Reader 6.0</li> <li>● Adobe Reader 8.0</li> <li>● Adobe Reader 9.0</li> </ul>
Media Player	<ul style="list-style-type: none"> <li>● Windows Media Player 9.0</li> <li>● Windows Media Player 10.0</li> <li>● Windows Media Player 11.0</li> </ul>

## 2.1.3 Online Storage Service Client

The CSE provides online storage service client, which enables users to store the local files or folders into the CSE in the similar way as using an File Transfer Protocol (FTP) server. Users can add, modify, and delete the files or folder stored in the CSE.

The online storage service client supports encrypted batch upload and resumable transfer. A maximum of 10,000 files can be uploaded at one time, and each single file of the uploaded files can be up to 5 GB.

The environment requirements for running the online storage service client are as follows:

- Windows XP 32 bit SP2
- Windows XP 32 bit SP3

## 2.1.4 Data Synchronization

The CSE provides the data synchronization function to protect files on the local computer. This function applies to remote office and multi-user collaboration that require high security of local data.

With the data synchronization function, you can synchronize a local file directory to the specified directory of the remote cloud storage space according to a self-defined synchronization policy. The data synchronization function can be used together with the Web disk function.

## 2.1.5 Shared Library

The CSE provides a shared library for data sharing among an enterprise, department, or workgroup.

The access right to a file in the shared library is set by the file owner. A user can save a directory or file into the shared library that this user is authorized to access. Only the enterprise administrator can create, modify, authorize, and delete the shared library.

## 2.2 Online Data Backup

The online data backup function protects the data on the local computer and application servers and transfers the backup data into the remote cloud storage space.

When needing to recover data, you can download the backup data of some time point from the remote cloud storage space onto the local computer.

In the lowest configuration, the online data backup client support 20 users to backup files. The backup space of each user is the total cloud storage space. When the backup space is insufficient, a prompt will be displayed.

## 2.3 Security Mechanisms

This section describes the security mechanisms of the CSE. These security mechanisms include access control, data isolation, information encryption, transfer encryption, and storage security.

### 2.3.1 Access Control

The CSE carries resources of multiple services and users. The access to each resource must be strictly controlled.

### 2.3.2 Data Isolation

The data isolation function protects data against unauthorized access.

### 2.3.3 Information Encryption

The information encryption function prevents data interception.

### 2.3.4 Transfer Encryption

The transfer encryption function safeguards data during data transfer.

### 2.3.5 Storage Security

The CSE provides effective protection of disk data. Even when a disk is lost, illegal users cannot obtain the data on the disk.

## 2.3.1 Access Control

The CSE carries resources of multiple services and users. The access to each resource must be strictly controlled.

In the CSE, users or services can access only the shared resources. In addition, the authorized users and services are regulated by the specific access control method.

User-level access control: Storage service users and system administrators must be authorized with their operations. In this way, different levels of users have different operation rights.

- Enterprise customer  
The administrator of an enterprise customer must authorize the sub-accounts to the corresponding services.
- Administrators of an operator  
All operations of the CSE can be considered as resources, which should be authorized to administrators of an operator.
- Share users  
The data of each user is isolated from one another. Only the authorized users or user groups can access the data of a user.

## 2.3.2 Data Isolation

The data isolation function protects data against unauthorized access.

The CSE realizes data isolation by combining physical isolation and access control.

- Method 1: user-specific data isolation  
The service system of the CSE creates an independent storage space for each user. The service system controls the access to this independent storage space according to user IDs and user rights, preventing unauthorized access to data.
- Method 2: application-specific data isolation  
The CSE assigns each application with an independent right for accessing data in the CSE, preventing unauthorized access to data.

## 2.3.3 Information Encryption

The information encryption function prevents data interception.

The critical user information, such as the password and access records, is encrypted for storage and transfer.

- Method 1: HTTPS or HTTP authentication upon registration and login  
When a user registers itself or logs in to the system, the CSE automatically performs HTTPS or HTTP authentication to prevent malware attacks.
- Method 2: encrypted storage of the critical user information on the service client  
The CSE encrypts the critical user information before storing it into the database. After that, even the database administrator cannot obtain the encrypted user information.

## 2.3.4 Transfer Encryption

The transfer encryption function safeguards data during data transfer.

Transfer encryption can be realized through the settings of the cloud storage client software. You can choose the encrypted channel to transfer data. After the system restarts, the CSE transfers data through the HTTPS channel.

## 2.3.5 Storage Security

The CSE provides effective protection of disk data. Even when a disk is lost, illegal users cannot obtain the data on the disk.

The CSE protects the data on a disk by the following methods:

- **Method 1: encrypted data storage on the access client**  
Users can enable data encryption on the cloud storage access client. The access client automatically encrypts data when uploading data. The online backup system automatically decrypts the data after receiving it, whereas the online storage system requires users to manually decrypt the data.
- **Method 2: segmented data storage on the disk**  
Users can segment a piece of data and save the segments on multiple cloud storage nodes and disks. As a result, data cannot be recovered through only one disk. Free of data leakage risks, users can discard a disk without clearing the data on it.

## 2.4 Automatic Deployment

The CSE supports the automatic deployment of software, increasing the efficiencies of installation and configuration.

### **NOTE**

Before starting an automatic deployment, plan the system and networking according to the actual application scenario.

The CSE is already installed with a necessary operating system that enables the automatic deployment tool to automatically install the software. After the automatic deployment is complete, the CSE can provide external services.

The automatic deployment occurs simultaneously across multiple nodes and quickens the deployment process.



# 3 Product Features

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## About This Chapter

This chapter describes features of the CSE, such as usability, scalability, high reliability, optimized performance, ease of management, and energy saving.

### [3.1 Usability](#)

The CSE provides a PC client tool and management interface to facilitate the operation for all types of users.

### [3.2 Scalability](#)

The CSE supports the ability to expand the capacity and grow the maximum number of concurrent access streams.

### [3.3 High Reliability](#)

To avoid single points of failure, the CSE employs redundancy for critical hardware components, including service nodes, computation nodes, system data nodes, switches, and power supplies.

### [3.4 Optimized Performance](#)

The CSE is superior to traditional storage systems in the performance, especially in the concurrent access capability and throughput capability.

### [3.5 Ease of Management](#)

The CSE supports privilege-based management and unified management, simplifying the management.

### [3.6 Energy Saving](#)

The CSE supports CPU frequency conversion and intelligent fan speed control to realize the energy saving.

## 3.1 Usability

The CSE provides a PC client tool and management interface to facilitate the operation for all types of users.

### PC Client Tool

The PC client tool can be integrated with the resource management system. You can use the online storage client tool to upload and synchronize data, and use the online backup client to set data synchronization and upload data. Data synchronization is performed in the background.

### Friendly Management Interface

The friendly management interface has comprehensive prompts that ensure you to perform operations correctly and quickly, such as help document, simple explanations for each button or link, warnings for irrevocable operations, and so on.

### Customized Operation Methods

The CSE considers the diverse operation roles and provides different interface patterns and operation methods for different users.

- For enterprise employees or other individuals, specific prompts and Help information are offered. The CSE provides an operation pattern similar to the Windows Computer Management utility. Without needing to be trained, you can perform operations on the management interface easily.
- For the administrators from operators, a compact interface is offered so that the administrators can perform as many operations as possible on the same interface. The result is management simplicity.

## 3.2 Scalability

The CSE supports the ability to expand the capacity and grow the maximum number of concurrent access streams.

### 3.2.1 Linear Expansion of Concurrent Access Streams

The distributed design provides the CSE with a desirable online expansion capability.

### 3.2.2 Expansion of the Storage Capacity

The CSE adopting distributed file system has sound online storage scalability.

### 3.2.1 Linear Expansion of Concurrent Access Streams

The distributed design provides the CSE with a desirable online expansion capability.

The CSE enables the in-service addition of computation nodes or service nodes to linearly increase the concurrent access performance.

- Method 1: improvement of concurrent access performance by the addition of computation nodes

When the performance of computation nodes degrades due to too many access requirements, you can add more computation nodes to increase the concurrent access performance.

This method applies to the application scenarios where video and picture files need to be accessed by a large number of users.

- Method 2: improvement of concurrent access performance by the addition of service nodes  
When the performance of service nodes degrades due to too many storage requirements or content management requests, you can add more service nodes to increase the concurrent access performance.

This method applies to the application scenarios where content management needs to be implemented frequently and large amounts of data needs to be uploaded.

## 3.2.2 Expansion of the Storage Capacity

The CSE adopting distributed file system has sound online storage scalability.

Without interrupting services, the capacity of the CSE can scale out in cloud storage node massively.

- When the storage capacity becomes insufficient, you can expand the capacity by adding cloud storage nodes.

The CSE automatically identifies the ID and disk space of a storage node.

- The system supports deleting a node when the storage capacity is too large.

## 3.3 High Reliability

To avoid single points of failure, the CSE employs redundancy for critical hardware components, including service nodes, computation nodes, system data nodes, switches, and power supplies.

To avoid single points of failure in the software layer, the CSE has the system software and service software deployed in clustered mode or distributed mode.

### 3.3.1 Reliability of Service Nodes

The CSE uses clustered service nodes. When a service node fails, the data requests and user requests originally sent to this node are redirected to a normal service node.

### 3.3.2 Reliability of Computation Nodes

The CSE uses distributed computation nodes. When a computation node fails, the data requests and user requests originally sent to this node are redirected to a normal computation node.

### 3.3.3 Reliability of System Data Nodes

The CSE has clusters in active-standby mode to ensure the reliability of system data nodes.

### 3.3.4 MDS Reliability

To ensure the reliability of the metadata server, the CSS provides the MDS cluster scheme.

### 3.3.5 OSN Reliability

The more storage nodes there are in the system, the higher the possibility of node faults in the system is. To ensure data reliability, the CSS supports RAID 1 between nodes.

### 3.3.6 Disk Reliability

To ensure data reliability between disks, the CSE provides two disk-level data redundancy schemes:

### 3.3.7 Switch Reliability

The CSE is configured with redundant switches. One domain is configured with two identical switches to eliminate the impact of a switch single point of failure.

### 3.3.1 Reliability of Service Nodes

The CSE uses clustered service nodes. When a service node fails, the data requests and user requests originally sent to this node are redirected to a normal service node.

The CSE supports the ability to monitor the service processes, network status, and space occupation of service nodes. Once a service node is faulty, an alarm is generated. If the fault is a logical one, the monitor utility restarts the service processes on the service node to remove the fault.

### 3.3.2 Reliability of Computation Nodes

The CSE uses distributed computation nodes. When a computation node fails, the data requests and user requests originally sent to this node are redirected to a normal computation node.

- The CSE compares the status and performance of each computation node and distributes the access requests to the status-optimal computation node.
- The CSE supports the ability to monitor the service processes, network status, and space occupation of computation nodes.

Once a computation node is faulty, an alarm is generated. If the fault is a logical one, the monitor utility restarts the service processes on the computation node to remove the fault.

### 3.3.3 Reliability of System Data Nodes

The CSE has clusters in active-standby mode to ensure the reliability of system data nodes.

- RAID 1 and RAID 10  
The system disks use RAID 1, and the data disks use RAID 10, preventing service disruption due to the failure of a disk.
- Database cluster in active-standby mode  
The system data nodes use a database to store service data in active-standby mode.
  - In normal circumstances, the active system data node processes read and write requests, whereas the standby system data node processes only write requests. Data is synchronized between the active and standby system data nodes through the heartbeat cable.
  - When the clustering software detects a fault on the active system data node, the system performs switchover between the active and standby system data nodes.
  - If the standby system data node is faulty, the system does not read data from the active node.
  - When a fault occurs, the system sends alarm information.
- Fault monitoring  
The CSE supports the ability to monitor the system disk status, remaining disk capacity, RAID status, and database cluster status. When a fault occurs, and the fault is a logical one, the monitor utility restarts the database to remove this fault.

### 3.3.4 MDS Reliability

To ensure the reliability of the metadata server, the CSS provides the MDS cluster scheme.

The system has two MDSs. One serves as the active MDS, and the other serves as the standby MDS. Normally, the active MDS works and communicates with service users. The standby MDS stays in the standby state. It monitors the status of the active MDS through a heartbeat cable, and carries out data synchronization. When the active MDS is faulty, an active-standby switchover is performed immediately. The standby MDS takes over the work of the active MDS.

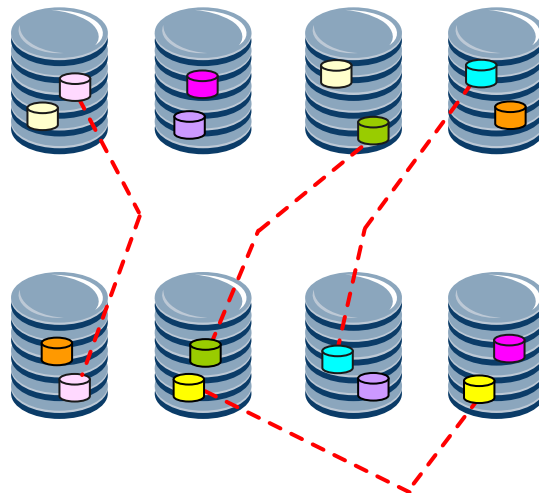
### 3.3.5 OSN Reliability

The more storage nodes there are in the system, the higher the possibility of node faults in the system is. To ensure data reliability, the CSS supports RAID 1 between nodes.

The CSS writes an object in two copies, which are written to different storage nodes, and then the MDS records the layout information about each copy. When one copy is faulty, the system uses the other copy for external services.

**Figure 3-1** shows the node-level data reliability.

**Figure 3-1** Node-level data reliability



Each polygonal line in **Figure 3-1** indicates that one piece of data is stored in two storage nodes simultaneously.

### 3.3.6 Disk Reliability

To ensure data reliability between disks, the CSE provides two disk-level data redundancy schemes:

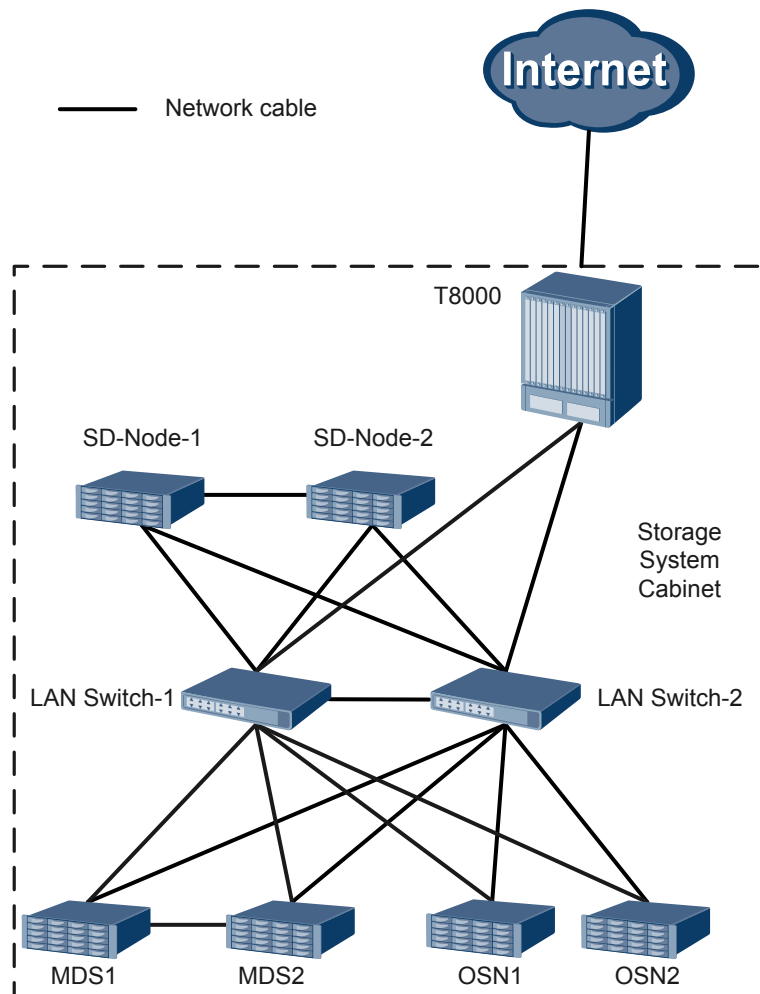
- RAID card  
If there is critical data, the OSN must be configured with a RAID card. In this case, the CSE supports RAID 1 and RAID 5 between disks.
- Soft RAID  
In a scenario with average hardware configuration but very critical data, you can configure the OSN with a soft RAID module. The distributed file system supports RAID 0, RAID 1, and RAID 5 between disks.

### 3.3.7 Switch Reliability

The CSE is configured with redundant switches. One domain is configured with two identical switches to eliminate the impact of a switch single point of failure.

[Figure 3-2](#) shows the redundant switch configuration.

**Figure 3-2** Redundant switch configuration



## 3.4 Optimized Performance

The CSE is superior to traditional storage systems in the performance, especially in the concurrent access capability and throughput capability.

### 3.4.1 Concurrent Access Ability

The CSE delivers a high concurrent access ability that allows the CSE to process a large number of concurrent access requests.

### 3.4.2 Throughput Ability

The throughput ability of the CSE is subject to the outbound bandwidth, computation nodes, and OSNs. The larger the outbound bandwidth is, the more the data to be processed is and the greater the number of required computation nodes and OSNs is.

### 3.4.1 Concurrent Access Ability

The CSE delivers a high concurrent access ability that allows the CSE to process a large number of concurrent access requests.

The concurrent access performance of the CSE increases linearly as the system scales up. The addition of one computation node allows the CSE to process 400 more concurrent data access requests; the addition of one service node allows the CSE to process 400 more concurrent service operations.

In standard configuration (three service nodes, four computation nodes, two system data nodes, two MDSs, four OSNs), the CSE delivers a concurrent access ability as listed in [Table 3-1](#).

**Table 3-1** Concurrent access ability indexes of the CSE in the standard configuration

Item	Index
Maximum number of concurrent	1,600
Latency	< 5 s

### 3.4.2 Throughput Ability

The throughput ability of the CSE is subject to the outbound bandwidth, computation nodes, and OSNs. The larger the outbound bandwidth is, the more the data to be processed is and the greater the number of required computation nodes and OSNs is.

In standard configuration, the CSE delivers the ethernet outbound bandwidth is 4 Gbit/s.

## 3.5 Ease of Management

The CSE supports privilege-based management and unified management, simplifying the management.

#### 3.5.1 Privilege-specific Management

The CSE supports the privilege-specific management. Each user has the specified privilege and a user has no permission to unauthorized operations.

#### 3.5.2 Unified Storage Management

This section describes the unified storage management of the CSE, including user management, device and resource management, performance statistics, and remote maintenance.

### 3.5.1 Privilege-specific Management

The CSE supports the privilege-specific management. Each user has the specified privilege and a user has no permission to unauthorized operations.

The CSE supports multiple management sub-accounts and super administrators. Each management role can have multiple management sub-accounts. A super administrator assigns

privileges to each management sub-account or management role. The management roles and sub-accounts can only manage their objects.

## 3.5.2 Unified Storage Management

This section describes the unified storage management of the CSE, including user management, device and resource management, performance statistics, and remote maintenance.

### User Management

According to the actual applications and requirements, the user can plan the user management to realize the following functions:

- Adding a user
- Deleting a user
- Modifying the user description
- Changing the user password
- Initializing the user password
- Changing the user level
- Querying the user information
- Logging in
- Logging out

The system authenticates various user operations. Only authorized users can use functions of the storage system. The authentication prevents unauthorized users from logging in to the system or prevents authorized users from performing unauthorized operations, thus ensuring the security of the CSE.

### Device and Resource Management

- Device management  
By querying information about disks, CPUs, memory, power supplies, fans, and network ports of all devices in the domain, the user can learn the running information and the running status of devices in the domain so as to operate the devices, and can learn abnormalities of devices so as to take proper measures to ensure the normal running of devices.
- Resource management  
By querying information about services of various nodes in the system, including the active/standby status of the MDSs, capacities and performance of MDSs/OSNs (read IOPS, write IOPS, read traffic, and write traffic), the user can learn the information and running status of resources in the domain so as to operate the resources, and can learn abnormalities of resources so as to take proper measures to ensure the normal running of resources.

### Performance Statistics

The performance statistics function monitors the system running status and carries out digital statistics by collecting various data.

This function displays the statistics in graphics on the ISM. Users carries out performance statistics through graphic operations.



## Remote Maintenance

A user can access the ISM of the CSE management server from any available position to accurately, quickly, and remotely maintain and manage the CSE.

Remote maintenance covers the following functions: device maintenance, resource maintenance, online upgrade, offline upgrade, information collection, and preventive maintenance. All the previous functions can be realized on the ISM.

## 3.6 Energy Saving

The CSE supports CPU frequency conversion and intelligent fan speed control to realize the energy saving.

- CPU frequency conversion

The CSE supports two energy-consumption work modes: open power saving mode and close power saving mode. When open power saving mode is selected, the CSE automatically takes measures to lower the CPU frequency according the current and history CPU usage to save energy.

- Intelligent fan speed control

The system monitors the ambient temperature and system temperature and adjusts the fan rotational speed automatically to reduce the power consumption.



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# 4 Hardware Structure

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## About This Chapter

This chapter describes the hardware structure of the CSE, and the appearance, functions, and specifications of the components.

### [4.1 Overall Hardware Structure](#)

This section describes the hardware composition of the CSE.

### [4.2 N610E-22 Cabinet](#)

This section describes the appearance and specifications of the N610E-22 cabinet.

### [4.3 T8000 Server](#)

This section describes the appearance, functions, and specifications of the T8000 server.

### [4.4 BH23C Server Blade](#)

This section describes the appearance, functions, and specifications of the BH23C server blade.

### [4.5 T3200 Cloud Storage Node](#)

This section describes the functions and features, appearance, hardware composition, and hardware configuration of the T3200 applied to the CSE.

### [4.6 T3500 G2 Cloud Storage Node](#)

This section describes the functions and features, appearance, hardware composition, and hardware configuration of the T3500 G2 applied to the CSE.

### [4.7 S5352C-SI Switch](#)

This section describes the model, appearance, functions, features, and specifications of the S5352C-SI switch.

### [4.8 KVM](#)

This section describes the appearance, functions, features, and specifications of the 8-way KVM of the CSE.

### [4.9 Cables](#)

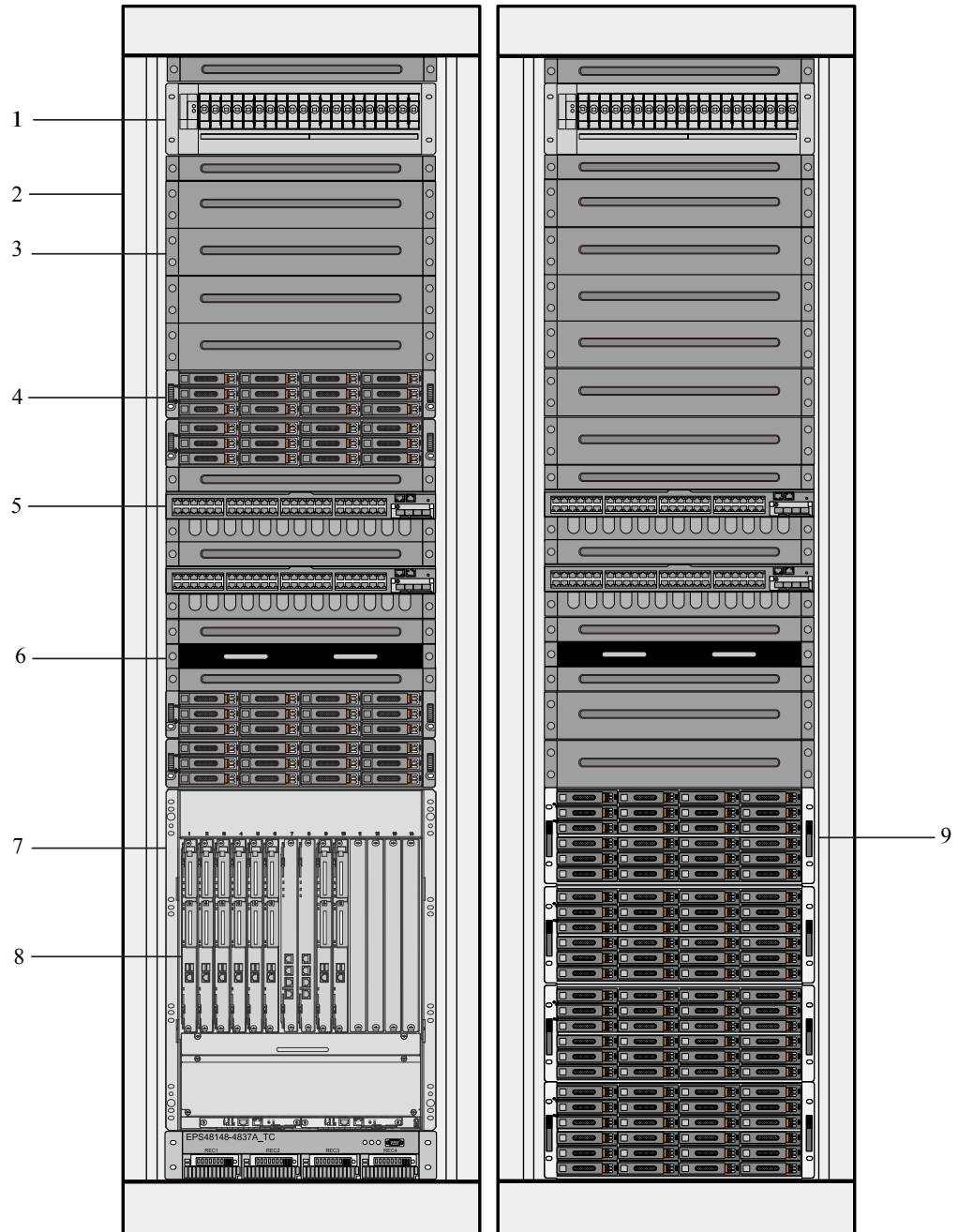
This section describes the cables of the CSE.

## 4.1 Overall Hardware Structure

This section describes the hardware composition of the CSE.

**Figure 4-1** shows the CSE (for example, standard configuration) hardware structure.

**Figure 4-1** Hardware structure of the CSE standard configuration



- |   |                       |   |         |
|---|-----------------------|---|---------|
| 1 | AC power distribution | 2 | Cabinet |
| 3 | Filler panel          | 4 | T3200   |

5	S5352C-SI	6	KVM
7	T8000	8	BH23C
9	T3500 G2		

The specifications of the hardware are as follows:

**Table 4-1** The specifications of the hardware

Name	Specification
Cabinet	N610E-22
Server	T8000
Server board	BH23C
Storage node	T3200 T3500 G2
Switch	S5352C-SI
KVM	8-way KVM

## 4.2 N610E-22 Cabinet

This section describes the appearance and specifications of the N610E-22 cabinet.

**Figure 4-2** shows the appearance of the N610E-22 cabinet.

**Figure 4-2** Appearance of the N610E-22 cabinet



**Table 4-2** lists the technical specifications of the N610E-22 cabinet.

**Table 4-2** N610E-22 cabinet technical specifications

Specification	Description
Height	46U
Dimensions (height x width x depth)	2200 mm × 600 mm × 1000 mm
Weight	130kg
Color	NC purple gray
Standard	19-inch international standard
Functions and features	Standard cabinet dedicated to low-density servers and network applications; comparatively narrow width; saving space in the data center; a height of 46 U; easy to pass the door and roll into the equipment room.
Standard compliance	IEC 60297

## 4.3 T8000 Server

This section describes the appearance, functions, and specifications of the T8000 server.

The CSE uses the T8000s for computation nodes, management nodes, and service nodes. Each T8000 has the functions of power supplying, heat dissipation, and hardware management.

**Figure 4-3** and **Figure 4-4** show the appearance of the T8000.

**Figure 4-3** Front view of the T8000



**Figure 4-4** Rear view of the T8000

The T8000 consists of server blades, fan enclosures, shelf management modules (SMMs), interface cards, cable troughs, and power distribution modules (PDUs).

The T8000 has 14 blade slots in the front and 14 interface card slots in the rear. The blade slots house BH23C server blades and NX20 switch blades. The interface card slots house BR26 server interface cards and NR10 switch blade interface cards.

**Table 4-3** lists the technical specifications of the T8000.

**Table 4-3** Technical specifications of the T8000

Item	Sub-item	Value
Dimensions	Height x Width x Depth	619.5 mm (14U) x 436 mm (main body)/482.6 mm (including installation angles) x 450 mm (excluding the cable trough)
	Weight	105 kg (in full configuration)
	Empty shelf	30 kg (without server blades, switch blades, and interface cards)



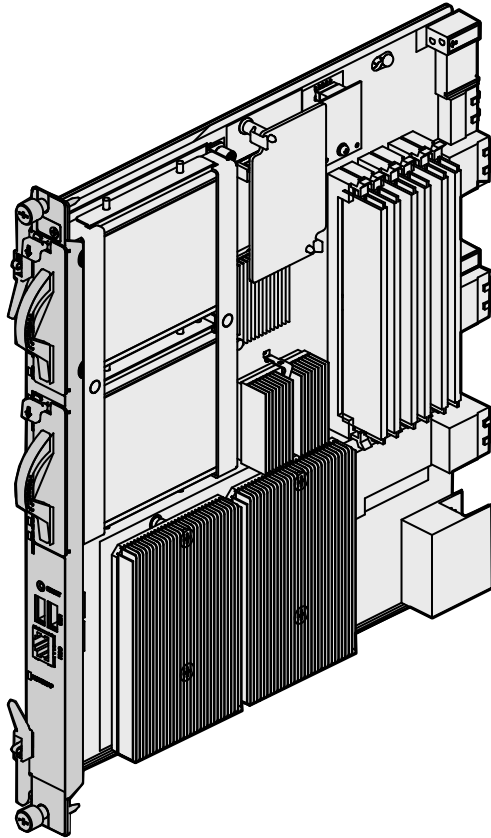
Item	Sub-item	Value
Power consumption	Maximum system power consumption	4000 W
DC power	Rated input voltage	-48 V/ -60 V DC
	Maximum current	50 A
Environment temperature	Long operating temperature	5°C to 40°C (C level standard for the equipment room with deviations)
	Long operating humidity	5% RH to 85% RH (non-condensing)

## 4.4 BH23C Server Blade

This section describes the appearance, functions, and specifications of the BH23C server blade.

The BH23Cs sit inside the T8000 shelf (slots 1 to 6 or slots 9 to 14) and are managed by the SMM.

The CSE uses the BH23Cs for management nodes, computation nodes, and service nodes. The BH23C server blade is used together with the BR26 server interface card to deliver high-speed computing and mass data processing capabilities for the CSE. [Figure 4-5](#) shows the appearance of the BH23C.

**Figure 4-5** Appearance of the BH23C server blade

**Table 4-4** lists the technical specifications of the BH23C.

**Table 4-4** Technical specifications of the BH23C

Item	Sub-item	Value
Dimensions	Height x Width x Depth	29 mm x 280 mm x 322.3 mm
Weight	Maximum weight	4.1 kg
Power consumption	Maximum power consumption	170 W
Power	DC power	1+1 lines of -48 V DC power (outputted by the backplane)
Environment temperature	Operating temperature	5°C to 40°C
	Operating humidity	5% RH to 85% RH

## 4.5 T3200 Cloud Storage Node

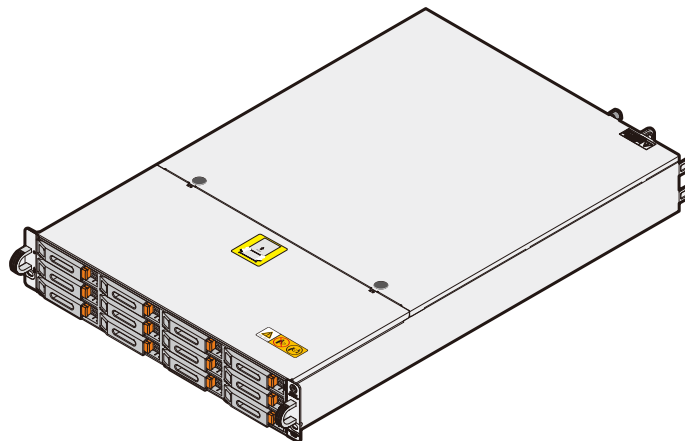
This section describes the functions and features, appearance, hardware composition, and hardware configuration of the T3200 applied to the CSE.

The T3200 is a high-density and high-performance cloud storage node with the height of 2U. Open and energy-efficient, the T3200 is tailored for distributed storage systems and cloud storage services. The product can simplify system management and integrate ideally with a distributed storage system to significantly reduce operating costs within the system life cycle, thus helping customers minimize total cost of ownership (TCO).

The CSE adopts T3200 as system data node and MDS node, which supply the database information and metadata management functions.

**Figure 4-6** shows the appearance of the T3200.

**Figure 4-6** T3200 appearance



**Table 4-5** shows the technical specifications of the T3200.

**Table 4-5** Technical specifications of the T3200

Category	Sub-category	Value
Dimensions	Height x Width x Depth	86.1 mm x 446 mm x 685 mm
Weight	Maximum weight	29 kg
	Empty shelf	14 kg
Power consumption	Maximum system power consumption	500 W
CPU	Type	Intel® 5504
	Number	2
Memory	Capacity of one memory bar	4 GB

Category	Sub-category	Value
	Number of memory bars	8
Disk	Type	SAS <sup>a</sup> disk with the capacity of 450 GB
	The system data nodes	<ul style="list-style-type: none"> <li>• Two SAS disks act as system disks on which RAID 1 is created.</li> <li>• Six SAS disks act as data disks on which RAID 10 is created.</li> <li>• Two SAS disks act as global hot-spare disk for the above two RAID groups.</li> </ul>
	The MDS nodes	Three SAS disks act as system disks.
NIC <sup>b</sup>	Type	Two-port GE NIC
	Number	2
RAID card	Type of the RAID card in the MDS nodes	SAS RAID card
	Number	1
	Type of the RAID card in the system data nodes	LSI RAID card
	Number	1
Environment temperature	Operating temperature	5°C to 32°C
	Operating humidity	10% RH to 85% RH

 **NOTE**

a: SAS (Serial Attached SCSI)

b: The T3200 can provide six external network ports, four provided by two-port GE NICs inserted inside the T3200 and two by the T3200 itself.

## 4.6 T3500 G2 Cloud Storage Node

This section describes the functions and features, appearance, hardware composition, and hardware configuration of the T3500 G2 applied to the CSE.

The T3500 G2 is also a high-density and high-performance cloud storage node with the height of 4U. Its functions and features are identical with that of the T3200.

The CSE adopts T3500 G2 as the OSN, supplying the storage space with the high capacity.

Figure 4-7 shows the appearance of the T3500 G2.

Figure 4-7 T3500 G2 appearance

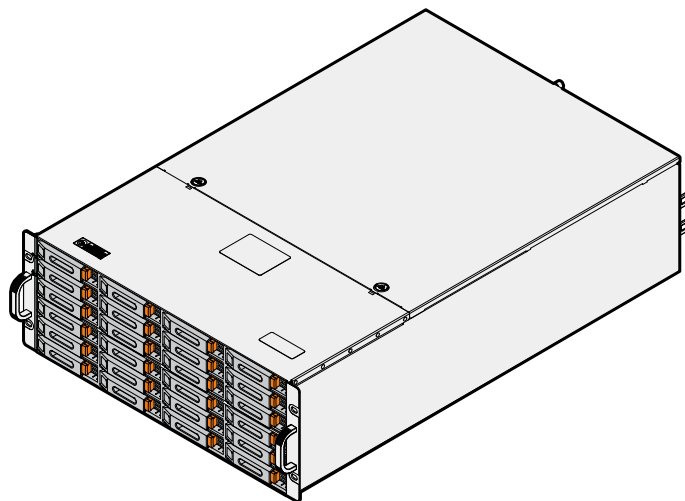


Table 4-6 shows the technical specifications of the T3500 G2.

Table 4-6 Technical specifications of the T3500 G2

Category	Sub-category	Value
Dimensions	Height x Width x Depth	175 mm x 446 mm x 685 mm
Weight	Maximum weight	47 kg
	Empty shelf	19 kg
Power consumption	Maximum system power consumption	700 W
CPU	Type	Intel® 5504
	Number	2
Memory	Capacity of one memory bar	4GB
	Number of memory bars	8
Disk	Type	<ul style="list-style-type: none"> <li>● SATA disk with the capacity of 1TB</li> <li>● SAS disk with the capacity of 450GB</li> <li>● Diamond2-MLC SSD with the capacity of 200 GB</li> </ul>

Category	Sub-category	Value
	The metadata OSNs	<ul style="list-style-type: none"> <li>• Two SAS disks act as system disks on which RAID 1 is created.</li> <li>• Two SSDs act as system disks on which RAID 1 is created.</li> <li>• Twenty SATA disks act as data disks.</li> </ul>
	The OSNs	<ul style="list-style-type: none"> <li>• Two SAS disks act as system disks on which RAID 1 is created.</li> <li>• One SAS disk acts as hot-spare disk for the RAID 1.</li> <li>• Twenty-one SATA disks act as data disks.</li> </ul>
NIC <sup>a</sup>	Type	Two-port GE NIC
	Number	2
RAID card	Type	SAS RAID card
	Number	1
Environment temperature	Operating temperature	5°C to 35°C
	Operating humidity	10% RH to 85% RH

 **NOTE**

a: The T3200 can provide six external network ports, four provided by two-port GE NICs inserted inside the T3200 and two by the T3200 itself.

## 4.7 S5352C-SI Switch

This section describes the model, appearance, functions, features, and specifications of the S5352C-SI switch.

The CSE uses the QuidWay S5352C-SI (48 ports) switch. [Figure 4-8](#) shows the appearance of the S5328C-SI switch.

**Figure 4-8** Appearance of the QuidWay S5352C-SI switch



[Table 4-7](#) lists the typical configuration of the S5352C-SI switch.

**Table 4-7** Typical configuration of the switch

Item	Description
Dimensions (height x width x depth)	43.6 mm x 420.0 mm x 442.0 mm
Processor	Dominant frequency 800 MHz
Switch capacity	S5352: 136 Gbit/s
	S5352: 101.19 Mpps
Packet forwarding capability	S5352C-SI: 78 W
DDR memory	256 MB
Flash memory	32 MB
Weight	Full configuration $\leq$ 8.5 kg
	Empty chassis $\leq$ 5 kg
DC input voltage	Rated voltage: -48 V DC to -60 V DC
	Maximum voltage range: -36 V DC to -72 V DC
AC input voltage	Rated voltage: 100 V AC to 127 V AC or 200 V AC to 240 V AC
	Maximum voltage: 90 V to 264 V
Operating temperature	0°C to 50°C
Operating humidity	10% RH to 90% RH

## 4.8 KVM

This section describes the appearance, functions, features, and specifications of the 8-way KVM of the CSE.

**Figure 4-9** shows the appearance of the 8-way KVM of the CSE. The KVM provides a mouse, keyboard, and monitor.

**Figure 4-9** Appearance of the 8-way KVM

**Table 4-8** lists the technical specifications of the 8-way KVM.

**Table 4-8** Technical specifications of the 8-way KVM

Item	Description
Height	1U
Screen	17" LCD <sup>a</sup>
Power	90 V to 264 V AC
Type	Eight-way KVM switch (automatic)
Resolution	1,280 dpi x 1,024 dpi
Switching mode	Short-cut keys and so on
Operating temperature	0°C to 50°C
Operating humidity	0% RH to 90% RH
a: LCD (Liquid Crystal Display)	







## 4.9 Cables

This section describes the cables of the CSE.

**Table 4-9** lists the cables used for the CSE.



**Table 4-9** List of cables

Cable	Description
Grounding cable	
AC power cable	
DC power cable	
Network cable	
KVM cable	
Serial cable	



# 5 Software Structure

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## About This Chapter

This chapter describes the overall software structure and software deployment.

### [5.1 Overall Software Structure](#)

This section introduces the overall software structure of the CSE.

### [5.2 Software Deployment](#)

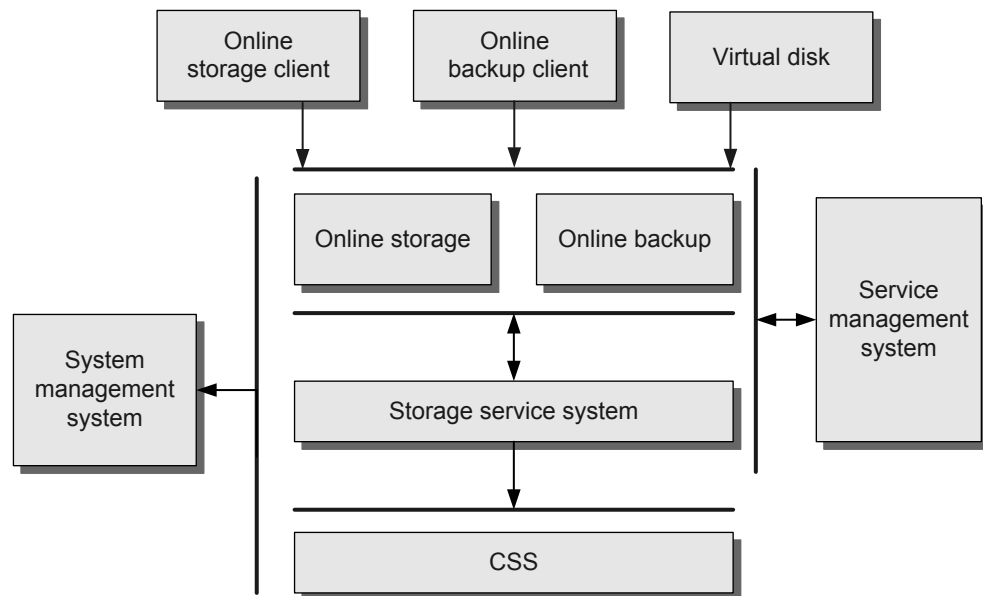
This section describes the software deployment of each system of the CSS.

## 5.1 Overall Software Structure

This section introduces the overall software structure of the CSE.

The CSE consists of eight systems: online storage, online backup, storage service system, service management system, CSS, system management system, online storage client, online backup client and virtual disk. **Figure 5-1** shows the overall software structure of the CSE.

**Figure 5-1** Overall software structure of the CSE



Each of the eight systems has the following functions:

- **Online storage**  
 The online storage resides in the service layer of the CSE and presents users with the online storage and management functions. Users can operate the online storage system by using a Web browser or online storage client.
- **Online backup**  
 The online backup resides in the service layer of the CSE and presents users with the data backup function. The online backup works with the online backup client to perform data backup.
- **Storage service system**  
 The storage service system resides in the resource platform layer of the CSE and dispatches access requests to service applications or user data. The storage service system intelligently distributes access requests to the most appropriate computation node by comparing the processing capability of each computation node. The storage service system uses standard storage service interfaces to provide unified data storage and access services for upper-layer service systems.
- **Service management system**

The service management system includes portal sub system and operational support sub system, and resides in the service platform layer of the CSE and centrally manages the service operation. This system enables release, order, and verification of services.

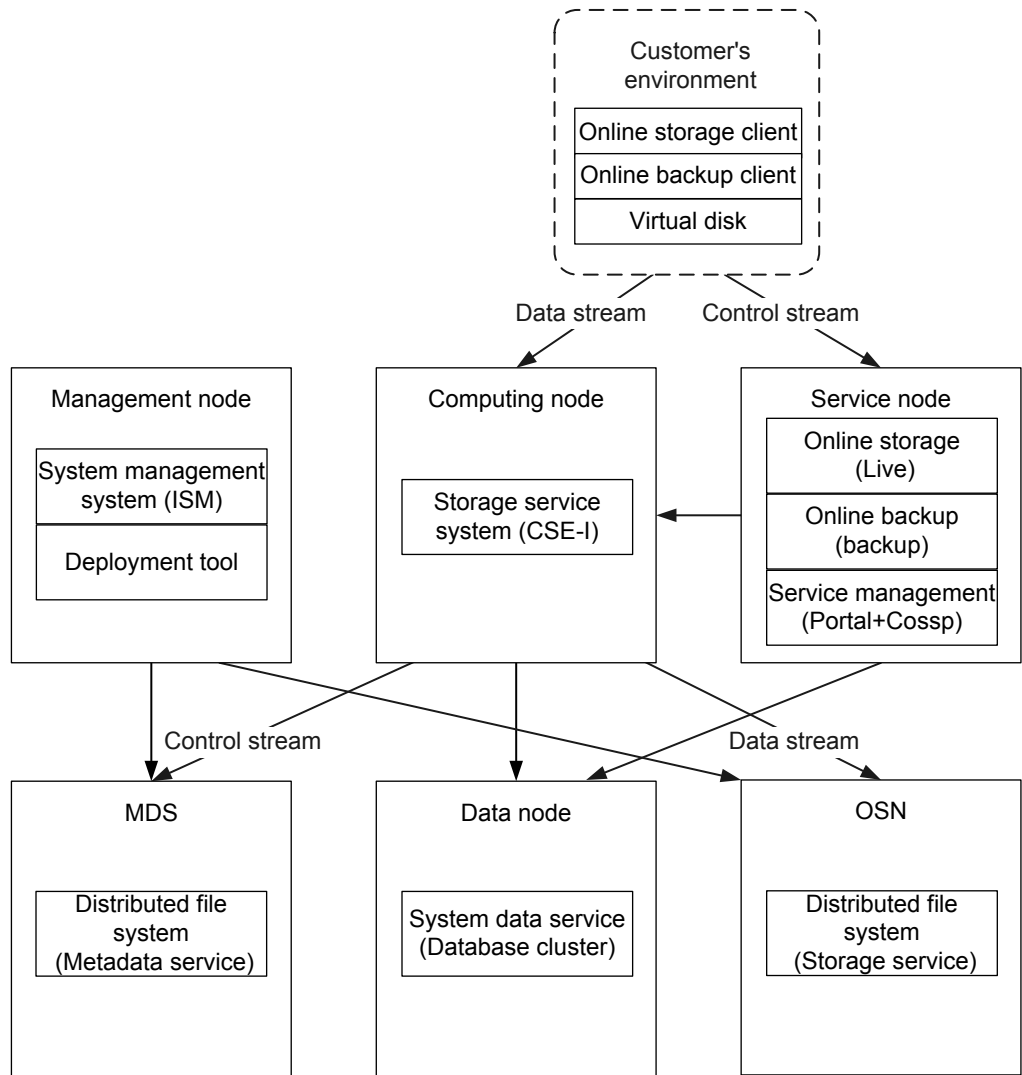
- CSS  
The CSS resides in the platform layer of the CSE and operates and manages the metadata and data. The CSS provides the following basic functions: operation and management of files and directories, data striping, layout arranging, load balancing, and data storage, synchronization, and recovery. The CSS supports the CIFS and NFS.
- System management system  
The CSE adopts ISM as the system management system. The ISM resides in the hardware platform layer of the CSE and monitors and manages storage devices and switches. The ISM allows users to manage, configure, and monitor devices, and view logs.
- Online storage client  
The online storage client resides in the service layers of the CSE and works with the online storage. The online storage client stores data for the local data and the server client data.
- Online backup client  
The online backup client resides in the service layers of the CSE and works with the online backup. The online backup client synchronizes, and backs up for the local data and the server client data.
- Virtual disk  
The virtual disk resides in the service layers of the CSE and works with the online storage. The virtual disk stores data for the local data and the server client data.

## 5.2 Software Deployment

This section describes the software deployment of each system of the CSS.

**Figure 5-2** shows the software deployment model of each system.

Figure 5-2 Software deployment model of the CSE



# 6 Technical Specifications

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## About This Chapter

This chapter describes the technical specifications, reliability specifications, and operating environment specifications of the CSE.

### [6.1 System Technical Specifications](#)

This section describes the technical specifications of the CSEs in the lowest configuration, standard configuration, and advanced configuration.

### [6.2 Reliability Specifications](#)

This section describes the reliability specifications of the CSE.

### [6.3 Operating Specifications](#)

This section describes the operating specifications of the CSE.

## 6.1 System Technical Specifications

This section describes the technical specifications of the CSEs in the lowest configuration, standard configuration, and advanced configuration.

### System Technical Specifications of the CSE in the Lowest Configuration

**Table 6-1** System technical specifications of the CSE in the lowest configuration

Item	Sub Item	Value
Power consumption	Maximum power in one cabinet	4940 W
Power parameters	Rated input current in one cabinet	22.45 A
	AC voltage range	The standard input voltage is 110V, the voltage range is from 100 V to 127 V. The standard input voltage is 220V, the voltage range is from 200 V to 240 V.
	AC frequency range	47 Hz to 63 Hz
Weight	-	585 kg
Dimensions	Height x Width x Depth	2,200 mm x 600 mm x 1,000 mm

### System Technical Specifications of the CSE in the Standard Configuration

**Table 6-2** System technical specifications of the CSE in the standard configuration

Item	Sub Item	Value
Power consumption	Maximum power in one cabinet	4130 W
Power parameters	Rated input current in one cabinet	18.77 A
	AC voltage range	The standard input voltage is 110V, the voltage range is from 100 V to 127 V. The standard input voltage is 220V, the voltage range is from 200 V to 240 V.
	AC frequency range	47 Hz to 63 Hz
Weight	Maximum weight in one cabinet	500 kg
Dimensions	Height x Width x Depth	2,200 mm x 600 mm x 1,000 mm



## System technical specifications of the CSE in the advanced configuration

**Table 6-3** System technical specifications of the CSE in the advanced configuration

Item	Sub Item	Value
Power consumption	Maximum power in one cabinet	5570 W
Power parameters	Rated input current in one cabinet	25.32 A
	AC voltage range	The standard input voltage is 110V, the voltage range is from 100 V to 127 V. The standard input voltage is 220V, the voltage range is from 200 V to 240 V.
	AC frequency range	47 Hz to 63 Hz
Weight	Maximum weight in one cabinet	700 kg
Dimensions	Height x Width x Depth	2,200 mm x 600 mm x 1,000 mm

## 6.2 Reliability Specifications

This section describes the reliability specifications of the CSE.

**Table 6-4** lists the reliability specifications of the CSE.

**Table 6-4** Reliability specifications of the CSE

Parameter	Value
System reliability	$\geq 99.999\%$
MTTR <sup>a</sup>	5 min to 50 min
MTBF	$>10^5$ h
a: MTTR (Mean Time To Repair)	

## 6.3 Operating Specifications

This section describes the operating specifications of the CSE.

**Table 6-5** lists the temperature and humidity requirements of the CSE.

**Table 6-5** Temperature and humidity requirements

Conditions	Parameter	Value
Temperature <sup>a</sup>	Operating temperature	5°C to 32°C
	Storage temperature	-40°C to 70°C
	Transport temperature	-40°C to 70°C
	Temperature gradient	10°C/h
Relative humidity	Operating humidity	10% RH to 85% RH
	Storage humidity	10% RH to 95% RH
	Transportation humidity	10% RH to 95% RH
<p>a: The operating temperature ranges from 5°C to 35°C when the CSE is located at an altitude between -60 m and 1800 m. The temperature falls by 0.6°C for every increase of 100 m when the CSE is located at an altitude between 1800 m and 3000 m.</p>		

# 7 Standards and Certifications

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## About This Chapter

This chapter describes the standards and certifications relating to the hardware components of CSE.

### [7.1 Compliant Standards](#)

This section describes the protocol standards, safety and electromagnetic compatibility (EMC) standards, and industry standards that the 8223, BH23C, T3200 and T3500 G2 comply with.

### [7.2 Certifications](#)

This section describes the certifications that the T8000, BH23C, T3200, and T3500 G2 pass.

## 7.1 Compliant Standards

This section describes the protocol standards, safety and electromagnetic compatibility (EMC) standards, and industry standards that the 8223, BH23C, T3200 and T3500 G2 comply with.

### 7.1.1 Protocols and Standards

This section describes the protocols and standards followed by the T8000, T3200, and T3500 G2.

### 7.1.2 Safety and EMC Standards

This section describes the safety and EMC standards followed by the T8000, T3200, and T3500 G2.

### 7.1.3 Industrial Standards

This section describes the industrial standards followed by the T8000, T3200, and T3500 G2.

### 7.1.1 Protocols and Standards

This section describes the protocols and standards followed by the T8000, T3200, and T3500 G2.

**Table 7-1** lists the communications protocols followed by the T8000.

**Table 7-1** Communications protocols followed by the T8000

Protocol	Description
ARP	Address Resolution Protocol
FTP	File Transfer Protocol
GMRP	GARP Multicast Registration Protocol
GVRP	GARP VLAN Registration Protocol
HTTP	Hypertext Transfer Protocol
ICMP	Internet Control Message Protocol
IGMP	Internet Group Management Protocol
IP	Internet Protocol
MSTP	Multiple Spanning Tree Protocol
SNMP	Simple Network Management Protocol
TELNET	Remote terminal protocol
TFTP	Trivial File Transfer Protocol
VTP	VLAN Trunk Protocol

**Table 7-2** lists the standards followed by the T3200 and T3500 G2.

**Table 7-2** Standards followed by the T3200 and T3500 G2

Name	Standard No.
IPMI 2.0	Intelligent Platform Management Interface Specification Second Generation v2.0, Document Revision 1.0
SMBIOS	System Management BIOS (SMBIOS) Reference Specification, Version 2.5
SATA II	Serial ATA Working Group, Serial ATA II: Extensions to Serial ATA. Revision 1.0a
ACPI	Advanced Configuration and Power Interface Specification, Revision 3.0, September 2
IP	RFC0791: Internet Protocol

## 7.1.2 Safety and EMC Standards

This section describes the safety and EMC standards followed by the T8000, T3200, and T3500 G2.

**Table 7-3** lists the safety and EMC standards followed by the T8000.

**Table 7-3** Safety and EMC standards followed by the T8000

Name	Description
ETS 300 019	ETSI standard (environment)
ETS 300 753	ETSI standard (noise)
ETS 300 253	ETSI standard (grounding)
ETSI EN 300 489 series	European EMC standard
ETSI 300 609-1, ETSI 300 609-4	European EMC standard
FCC, 47 CFR Part 15, Subpart B	US EMC standard
IEC60950	IEC safety standards
IEC60825-1/2	IEC safety standards
ITU-T K series standard	ITU EMC standard
ITUT K.27	ITUT standard (grounding)
PICMG3.X	ICMG standard
SAF	SAF standard (middleware)
Telcordia GR-63	NEBS standard (physical protection)
Telcordia GR-1089	NEBS standard (electromagnetic compatibility and electrical safety)

Name	Description
UL 60950	North America compliance and safety standards

**Table 7-4** lists the standards followed by the T3200 and T3500 G2.

**Table 7-4** Safety and EMC standards followed by the T3200 and T3500 G2

Name	Standard No.
IT Equipment Safety Standard	GB4943-2001
IEC standard	IEC 60950-1
UL safety standard	UL 60950-1
US EMC standard	FCC, 47 CFR Part 15, Subpart B
European safety standard	EN 60950-1
European EMC directive	EMC Directive 2004/108/EC
European EMC standard	EN 55024: 1998+A1+A2
European safety directive	LVD Directive 2006/95/EC

### 7.1.3 Industrial Standards

This section describes the industrial standards followed by the T8000, T3200, and T3500 G2.

**Table 7-5** lists the industrial standards followed by the T8000.

**Table 7-5** Industrial standards followed by the T8000

Name	Description
IEC 812	Fault mode effect analysis
IEC 863	Presentation of reliability, maintainability and availability predictions
IEEE 802.1P	QoS
IEEE 802.1Q	VLAN
IEEE 802.1D	Bridge/Spanning Tree
IEEE 802.3	Ethernet
IEEE 802.3u	Fast Ethernet
IEEE 802.3x	Traffic Control

Name	Description
IEEE 802.3z	Gigabit Ethernet
IEEE 1149.1-2001	IEEE standard test access port and boundary-scan interface
IPMI1.5	IPMI specification

**Table 7-6** lists the industrial standards followed by the T3200 and T3500 G2.

**Table 7-6** Industry standards followed by the T3200 and T3500 G2

Name	Standard No.
Ethernet-based standard	IEEE 802.3
Standard for fast Ethernet	IEEE 802.3u
Standard for GB Ethernet	IEEE 802.3z
IEEE standard test interface and boundary scan structure	IEEE 1149.1-2001
Fault mode effect analysis (FMEA)	IEC 812
Standard for reliability, maintainability and availability	IEC 863
Environmental protection	ECMA TR/70

## 7.2 Certifications

This section describes the certifications that the T8000, BH23C, T3200, and T3500 G2 pass.

**Table 7-7** lists the certifications that the T8000 passes.

**Table 7-7** Certifications that the T8000 passes

Name	Description
CB	The IECEE CB Scheme is the world's first truly international system for mutual acceptance of test reports and certificates dealing with the safety of electrical and electronic components, equipment and products. It is a multilateral agreement among participating countries and certification organizations.
CE	Conformite Europeenne (CE) refers to the certification required for products to be sold in Europe. The products marked CE comply with the electromagnetic compatibility regulations (2004/108/EC) and low voltage regulations (2006/95/EC) released by the European Commission.

Name	Description
RoHS	Restriction of the Use of Certain Hazardous Substances (RoHS): Published by EU in 2003. It applies to the management of environmental impact created by electric and electronic products when produced and scrapped. RoHS stipulates the maximum amount of hazardous substances arising from production.
UL	Underwriters Laboratories (UL): The UL is a non-profit agency engaged in product safety testing.

**Table 7-8** lists the certifications that the BH23C passes.

**Table 7-8** Certifications that the BH23C passes

Name	Description
CE	CE refers to the certification required for products to be sold in Europe. The products marked CE comply with the electromagnetic compatibility (EMC) regulations (2004/108/EC) and low voltage regulations (2006/95/EC) released by the European Commission.
C-TICK	In Australia, EMC is monitored by the Australian Communications Authority (ACA). In Australian EMC system, products are divided into three classes. The providers must register in the ACA and apply for a C-TICK label before they sell Class B or Class C products.
FCC	Federal Communications Commission (FCC): Article 15 of the FCC rules. Products marked with FCC are tested and compliant with restrictions on grade-A digital devices.
UL	The UL is a non-profit agency engaged in product safety testing.

**Table 7-9** lists the certifications that the T3200 and T3500 G2 pass.

**Table 7-9** Certifications that the T3200 and T3500 G2 pass

Name	Description
CCC	China Compulsory Certification (CCC): Enforces compulsory certification on products relating to human health, animal life and health, environmental protection and public safety.
CE	CE refers to the certification required for products to be sold in Europe. The products marked CE comply with the electromagnetic compatibility (EMC) regulations (2004/108/EC) and low voltage regulations (2006/95/EC) released by the European Commission.
FCC	FCC: Article 15 of the FCC rules. Products marked with FCC are tested and compliant with restrictions on grade-A digital devices.



Name	Description
REACH	REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) is a compellent management rule to manage all the chemicals entering into European market preventively.
RoHS	Restriction of the Use of Certain Hazardous Substances (RoHS): Published by EU in 2003. It applies to the management of environmental impact created by electric and electronic products when produced and scrapped. RoHS stipulates the maximum amount of hazardous substances arising from production.
UL	The UL is a non-profit agency engaged in product safety testing.



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# A Abbreviations and Acronyms

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This section describes acronyms and abbreviations referred to in this document.

## A

<b>ACA</b>	Australian Communications Authority
<b>ACL</b>	Access Control List

## B

<b>BIOS</b>	Basic Input/Output System
-------------	---------------------------

## C

<b>CA</b>	Client Agent
<b>CCC</b>	China Compulsory Certification
<b>CE</b>	Conformite Europeenne
<b>CM</b>	Cluster Management
<b>CPU</b>	Central Processing Unit
<b>CSE</b>	Cloud Storage service Engine
<b>CSS</b>	Cloud Storage System

## D

<b>DIMM</b>	Dual Inline Memory Module
<b>DHCP</b>	Dynamic Host Configuration Protocol

## E

<b>EMC</b>	Electromagnetic Compatibility
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**F****FCC** Federal Communications Commission**I****IEC** International Electrotechnical Commission**IOAT** Input/Output Acceleration Technology**IPMI** Intelligent Platform Management Interface**ISM** Integrated Storage Manager**K****KVM** Keyboard Video Mouse**L****LCD** Liquid Crystal Display**M****MDS** MetaData Server**MTBF** Mean Time Between Failures**MTTR** Mean Time To Repair**O****OMS** Object Management System**OSN** Object Storage Node**P****PCI-E** Peripheral Component Interconnect Express**R****RAID** Redundant Array of Independent Disks**REACH** Registration, Evaluation, Authorization and Restriction of Chemicals**RoHS** Restriction of the Use of Certain Hazardous Substances

**S**

<b>SAS</b>	Serial Attached SCSI
<b>SATA</b>	Serial ATA
<b>SMM</b>	Shelf Management Module
<b>SNMP</b>	Simple Network Management Protocol
<b>SOAP</b>	Simple Object Access Protocol
<b>SSD</b>	Solid State Drive

**U**

<b>UL</b>	Underwriters Laboratories
<b>URI</b>	Uniform Resource Identifier
<b>UUID</b>	Universally Unique Identifier