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# Introduction

*Analyze and evaluate conditions of the customer's live network in three sections. You can combine or delete some of the sections based on actual requirements.*

## Background

*Introduce the project background.*

*Example*

With the service development, XXX (customer name) now has xx IT application systems and xx TB of data, which are still increasing rapidly. As IT systems become more and more complex in structure, the existing IT system of XXX cannot cope well with the service development and XXX is in urgent need of higher system efficiency.

In the existing IT system, data of application systems is stored in local server disks and different types of legacy disk arrays. Such an IT system cannot meet service requirements on performance, capacity, reliability, maintainability, and manageability. Therefore, a centralized storage system is required that can deliver high performance, large capacity, flexible scalability, robust reliability, easy management, dynamic optimization, and centralized resource management. Centralized storage enables data sharing, smashes the bottleneck of local capacity expansion, dramatically improves service system performance, and ensures service data security.

## Live Network Status

*Provide a topology figure when describing the live network structure. Describe the number and types of existing devices on the network.*

*Example*

This project involves more than 10 service systems including CRM and ERP, multiple operating systems including Windows, Linux, and UNIX, as well as databases including Oracle and SQL. Currently, data of some service systems is stored in local server disks and different types of legacy disk arrays. This solution aims to store the data of all service systems to the OceanStor 5300 V5/5500 V5/5600 V5/5800 V5 and back up the data of critical service systems.

To meet the increasingly demanding requirements of XXX departments for the IT system, we must provide:

A large and quick-responding storage capacity to store more data and provide higher system performance.

Online and easy adjustment of storage system configurations, such as space and performance, to reduce new service rollout's impact on existing services.

Reasonable space planning that balances data surge and capital investment to avoid budget overruns and unnecessary investments.

I/O-specific response mechanism to ensure quick response to critical services.

## Scale and Objectives

*Describe requirements for the new network.*

*Example*

According to XXX's storage requirements, an analysis is made as follows:

Employ network storage and deploy a disk array in the data center to store the data of all service systems. Such a high-performance, scalable, and highly reliable centralized storage platform simplifies the overall planning, management, and maintenance of storage resources.

Use disk-to-disk (or VTL) to back up the data of critical service systems.

Support thin provisioning to allocate storage space for service systems on demand. Thin provisioning helps XXX adapt to service demand changes or avoid excessive initial investment and improve storage resource utilization.

Provide on-demand capacity expansion and data re-distribution in disks to balance access I/Os and improve system performance.

Support dynamic storage tiering (DST) to provide rapid hotspot disk response to access requests and automatically balance the performance, capacities, and costs of SSDs, SAS, and NL SAS disks. DST helps to achieve the maximum performance at the minimum cost.

Support quality of service (QoS) control to prevent I/Os of different service systems from interfering with each other and ensure quick response and service quality for critical service systems such as ERP and CRM.

Introduce cache partitioning to prioritize critical services. Meanwhile, maximize the partition utilization based on concurrent host requests in the system to differentiate critical and non-critical services.

Provide convenient data backup and disaster recovery to improve data security.

# Design Basis and Principles

*Briefly explain the design basis and principles of the solution. You can combine some of the sections based on actual requirements.*

## Design Basis

*Describe the design basis.*

*Example*

The *XXX Bidding Specifications* is used as the design basis.

## Design Principles

*Describe the design principles.*

*Example*

The solution must be advanced, scalable, reliable, high-performance, mature, and manageable.

Based on the demands and the XXXX system's application characteristics, XXX is advised to observe the following principles when building the storage system:

**Secure and reliable**

* The storage system supports active/active or more controllers for a robust reliability.
* System components are capable of working continuously for 24/7 hours under heavy loads.
* The system has sufficient redundancy and fault-tolerance capabilities.
* It is protected by advanced technologies and mechanisms to ensure data reliability.
* It is capable of working in adverse environments.
* It is provided with security measures for logins and access requests and against attacks.
* It does not lose any data when experiencing unexpected power loss and restarts and reconnects automatically when the power recovers.

**Advanced**

* The system complies with international and Chinese standards.
* It is in line with the development of storage technologies and the IT industry. All models employed are produced in large volumes.
* It adopts cutting-edge technologies and will not lag behind in a considerable period of time.
* It has industry-leading processing capability and is provided with allowance for future upgrades.
* It supports latest storage technologies such as DST, thin provisioning, QoS, cache partitioning, multi-tenancy, data destruction, LUN migration, and heterogeneous virtualization.

**Open**

* The system supports international standard network storage protocols and open application protocols.
* It is compatible with mainstream servers, operating systems, volume management software, and applications.
* It provides customized management and maintenance through integration with third-party management platforms.
* It is fully scalable for future expansion.
* It accepts disks made by mainstream vendors.

**Easy to maintain**

* The system provides comprehensive permission, log, and fault management and is capable of automatic fault warning.
* It is easy to install and use and requires no maintenance expertise.
* It can be expanded and upgraded in service.
* It supports web-based or centralized management.

**Scalable**

* The system is easy to expand and the new space can be easily added to the existing space.
* It uses standardized components for convenient replacement and expansion.
* Its design complies with related rules and regulations.

**Cost efficient**

XXX is advised to compare storage systems available in the market to achieve the best price-performance ratio for the system.

**Green**

* The system is environment friendly and energy saving. It is low in noise emission and energy consumption and is pollution free.
* It uses unleaded components and employs energy-saving technologies.
* It has environment management certificates and uses recyclable packaging materials.

# Design Scheme

*Describe the design scheme in detail. You can combine or delete some of the sections based on actual requirements.*

*Example*

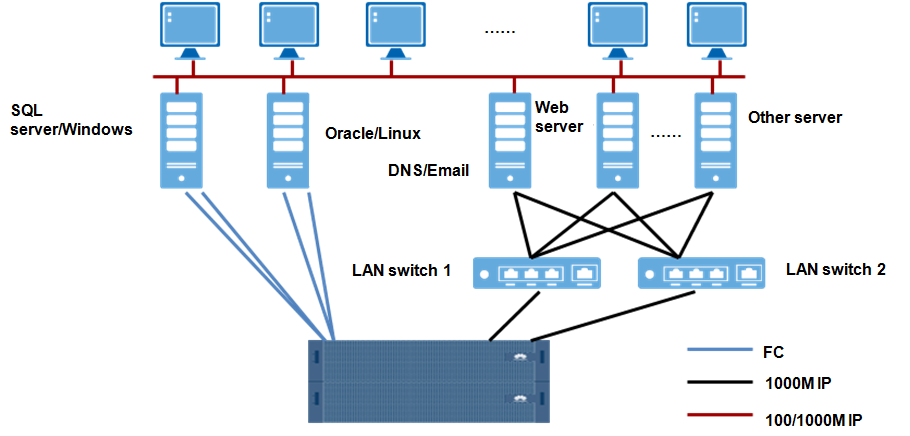
## Topology

*Introduce the network topology.*

*[Example is omitted.]*

Figure 3-1shows the network topology.

XXX centralized storage topology



The network topology has the following configuration characteristics:

* Centralized storage of all service data and converged SAN and NAS storage
* Support for Fibre Channel and IP networks
* Support for 16 Gbit/s Fibre Channel front-end interface module and 12 Gbit/s SAS back-end high-speed disk interface
* Mixed use of SSDs, SAS, and NL SAS disks
* Advanced disk spin-down technology
* Disk virtualization technology based on RAID 2.0+
* Support for 4U 75-disk high-density enclosures
* Support for data protection functions such as snapshot, replication, and remote mirroring
* Support for advanced management functions such as DST, thin provisioning, QoS, cache partitioning, multi-tenancy, data destruction, LUN migration, and heterogeneous virtualization

## Software and Hardware Configurations

*Provide the number of devices to be configured and describe the interfaces and software.*

*[Example is omitted.]*

| Location | Device Name | Specification and Model | Quantity | Remarks |
| --- | --- | --- | --- | --- |
| XXX central equipment room | OceanStor 5300 V5/5500 V5/5600 V5/5800 V5 controller enclosure | Double or more controllers (4/6/8), xxx GB memory | 1 |  |
|  | OceanStor 5300 V5/5500 V5/5600 V5/5800 V5 disk enclosure |  |  |  |
|  | UltraPath |  |  |  |
|  | SmartTier |  |  |  |
|  | SmartThin |  |  |  |
|  | SmartMotion |  |  |  |
|  | SmartQoS |  |  |  |
|  | SmartPartition |  |  |  |
|  | SmartMulti-Tenant |  |  |  |
|  | SmartVirtualization |  |  |  |
|  | SmartErase |  |  |  |
|  | SmartMigration |  |  |  |
|  | 960 GB SSD |  |  |  |
|  |  |  |  |  |
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# Highlights

## Converged

### Unified Management of Storage Resources

The OceanStor V5 converged storage systems employ Huawei proprietary RAID 2.0+ technology, based on the OceanStor OS, to offer a virtualized architecture. RAID 2.0+ eliminates the demerits on traditional RAID. Instead of a traditional storage resource management method, it uses a two-layer virtualization management mechanism: block-level virtualization (virtual for disks) in the bottom layer and resource virtualization (virtual for pools) in the upper layer.

With RAID 2.0+, each single disk space in the system is divided into small data blocks, and RAID groups are built based on those data blocks. In this way, data is evenly distributed to disks in pools and the granularity of data blocks improves storage management efficiency.

* **Virtual pools to simplify storage planning and management**

Nowadays, mainstream storage systems typically contain hundreds or even thousands of different disks. If traditional RAID is employed, the administrator has to manage a large number of RAID groups and plan the performance and capacity for each of them accurately. However, in today's fast changing era, it is almost impossible to precisely forecast the service development and data increase in the lifecycle of an IT system. As a result, the administrator will be constantly faced with challenges such as uneven allocation of storage resources and management becomes complicated.

With advanced virtualization technologies, the OceanStor V5 converged storage systems pool storage resources. The administrator only needs to manage a few pools and all RAID groups will be automatically configured upon the creation of pools. Meanwhile, the system will intelligently manage and dispatch resources as predefined, making planning and management simpler.

* **More disks covered by a LUN to improve its performance**

Increasing server computing capability and host applications (such as databases and virtual machines) impose higher storage performance, capacity, and flexibility requirements. Limited by the number of disks, capacity, and performance, traditional RIAD groups can no longer satisfy service requirements. For example, when a host accesses a LUN intensively, only a limited number of disks can be accessed, creating access bottlenecks and hotspots.

RAID 2.0+ supports a large storage pool comprising scores of or more than a hundred disks. LUNs are created based on storage pools and are no longer limited by the number of disks. By wide striping, LUN data is distributed into multiple disks, avoiding disk hotspots and significantly increasing the performance and capacity of a single LUN. If the current capacity is insufficient, a user can dynamically expand the capacity of storage pools and LUNs simply by adding disks to a disk domain. This approach improves disk capacity utilization.

* **Dynamic space distribution to flexibly adapt to service changes**

RAID 2.0+ is based on industry-leading block virtualization. Data and service loads in a volume are automatically and evenly distributed to all physical disks in a storage pool. With the SmartX series software, the OceanStor V5 converged storage systems automatically balance resources in the background based on factors such as service-required performance, capacity, as well as hot and cold data. In this way, the system adapts agilely to rapid service changes.

### SAN and NAS Convergence

The OceanStor V5 converged storage systems employ a converged platform architecture, that is, SAN and NAS can co-exist in the architecture. Such architecture provides elastic storage, simplified service deployment, and improved resource utilization and lowers total cost of ownership (TCO). With a first-in-its-kind parallel SAN/NAS architecture, the OceanStor V5 converged storage systems shorten access paths to storage resources and ensure high SAN storage performance and powerful NAS storage file sharing.

To achieve NAS functions, EMC's unified storage system VNX employs a more complicated architecture. X-Blade (NAS gateway) is required to enable file sharing and the file system and block services operate on two different platforms. NetApp's FAS series systems also have a complicated software architecture. Though the unified storage operates on one platform, block services are based on a Write Anywhere File Layout (WAFL) file system.

In comparison, the OceanStor V5 converged storage systems are established not on file systems, but on RAID 2.0+ block virtualized storage pools. The simpler architecture brings increased storage efficiency over traditional storage architecture. In the advanced architecture, LUNs and file systems work independently and do not affect each other.

### Heterogeneous Resource Management

The OceanStor V5 converged storage systems provide heterogeneous devices with SmartVirtualization feature, which incorporates rich heterogeneous virtualization functions. For example, the heterogeneous takeover function reduces complexity for managing heterogeneous arrays and improves LUN performance. The heterogeneous online LUN migration function allows smooth data migration between heterogeneous LUNs without interrupting services. With the heterogeneous remote replication function, a user can perform disaster recovery for heterogeneous LUNs. Through the heterogeneous snapshot function, you can back up heterogeneous LUNs rapidly.

SmartVirtualization applies to:

* **Heterogeneous array takeover**

A data center may contain storage arrays developed by different vendors as services develop. Managing those heterogeneous arrays well and utilizing them fully pose a great challenge for the storage administrator, which the heterogeneous array takeover function can help overcome. The administrator can easily manage all heterogeneous arrays by managing Huawei arrays. Therefore, the scenario of SmartVirtualization here is simplifying disk array management.

* **Heterogeneous data migration**

A data center may also contain a large number of heterogeneous devices, some of which will be out of warranty soon or can no longer meet service requirements. Consequently, after purchasing a HUAWEI OceanStor V5 converged storage system, a customer may hope to migrate service data from existing LUNs to new arrays. To do this without interrupting host services, the customer can use the online heterogeneous migration after the LUNs are taken over. Therefore, the scenario of SmartVirtualization here is heterogeneous data migration without interrupting host services.

* **Heterogeneous disaster recovery**

If service data is scattered at different sites but services are required to be constant, service sites need to serve as backup to each other with service switchovers between them. When a disaster occurs, a functional site takes over services from the failed site and recovers the data. However, backup operations cannot be completed possibly because those sites use arrays from different vendors. The synchronous and asynchronous replication functions of SmartVirtualization enable heterogeneous arrays to back up LUN data for each other. Inter-site disaster recovery is then achieved.

* **Heterogeneous data protection**

Data on LUNs of heterogeneous arrays may be attacked by viruses or damaged because of other problems. SmartVirtualization provides heterogeneous snapshot function that backs up snapshots rapidly. Whenever data is damaged, you can recover it quickly by rolling back to the time the snapshot was taken.

## Reliable

### Reduced Failures

* **Automatic load balancing for a lower failure rate**

A traditional RAID-based storage system typically contains multiple RAID groups, each of which contains several to more than 10 disks. Difference in load intensity of RAID groups leads to unbalanced load distribution and hotspots. According to the Storage Networking Industry Association (SNIA), hotspot disks have a higher failure rate.

The OceanStor V5 converged storage systems' RAID 2.0+ implements block virtualization to evenly distribute data to the disks in a storage pool, avoiding uneven load distribution and lowering the overall failure rate of the system. See Figure 4-1.

Data distribution in RAID 2.0+



* **Patented design for enhanced adaptability**

The OceanStor V5 converged storage systems adopt state-of-the-art shockproof design for components including disks, fan modules, chassis, and guide rails. The system obtained a certificate for resistance against 9-intensity earthquakes from China Earthquake Resistance Performance Quality Inspection and Testing Center for MII Communication Equipment. It is also the only professional storage system that meets the highest anti-earthquake requirements of the *Specification for Seismic Test of Telecommunication Equipment* (YD5083).

In addition, Huawei works with suppliers to ensure that the OceanStor V5 converged storage system modules are protected with advanced anti-corrosion techniques. The system is capable of working normally under DC G1 to DC GX air pollution conditions.

### Quick Self-Healing

* **Auto-detection and self-healing to maintain system reliability**

The OceanStor V5 converged storage systems employ a multi-level error tolerance design for disks. Disk reliability is maintained by many technologies, including online disk diagnosis, disk health analyzer (DHA), as well as bad sector scanning and repair in the background. Moreover, when detecting an uncorrectable media error in a part of a disk or a failure of the entire disk, the system reconstructs the affected data block to the hot spare space of another disk and self-heals rapidly. Such a hot spare space is reserved by RAID 2.0+ automatically based on the hot spare policy.

* **Fast thin reconstruction to mitigate dual-disk failure**

Large-capacity disks are easily available in the consumer and enterprise markets nowadays. As disk capacities grow, a challenge reveals itself: reconstructing a disk now takes nearly or even more than one day. As a consequence, a disk fault will place the storage system in the degraded state without error tolerance for a long time, during which data is exposed to great loss risks. Data loss happens a lot during reconstruction because the system is under great pressure brought by services and the reconstruction itself.

RAID 2.0+ smashes the performance bottlenecks on target disks (hot spare disks) experienced in RAID reconstruction. No longer limited by the write bandwidth, reconstruction is accelerated with less dual-disk failures, improving the system reliability.

The fined-grained and efficient fault handling of RAID 2.0+ also contributes to the accelerated reconstruction. In addition to bad sector repair and disk reconstruction, granularity-based bad block repair is added to limit reconstruction only to the allocated and used space. After efficiently identifying the used space, RAID 2.0+ implements thin reconstruction to further shorten the reconstruction time and mitigate data loss risks.

Incomparable advantages of RAID 2.0+ in data reconstruction enable the OceanStor V5 converged storage systems to outperform any traditional array. Figure 4-2 compares the time required by traditional RAID and RAID2.0+ when reconstructing 1 TB data in a large-capacity NL SAS disk environment.

Reconstruction time required by traditional RAID and RAID 2.0+



### Second-Level Disaster Recovery

The OceanStor V5 converged storage systems employ a ground-breaking multi-timestamp caching technology for asynchronous remote replication. During replication and synchronization, the system directly copies data of a timestamp from the primary LUN cache to a secondary LUN. This lowers the latency and mitigates the performance impact compared with traditional asynchronous remote replication and snapshots. Therefore, synchronization can be completed within seconds.

Asynchronous remote replication does not synchronize data in real time. Consequently, the RPO is the user-defined synchronization period (down to seconds).

## Intelligent

### SmartTier

The OceanStor V5 converged storage systems support Huawei's self-developed DST feature, SmartTier. Simply put, SmartTier stores the right data to the right position at the right time. It improves the storage system performance and saves costs to meet the customer's performance and capacity requirements. By preventing historical data from occupying expensive storage media, SmartTier not only ensures effective investment and eliminates consumptions brought by useless capacities, but also reduces TCO and improves cost-effectiveness.

SmartTier intelligently manages data storage on a per LUN basis. To do this, it first collects and analyzes the LUN data activity information in the unit of extents. It then dynamically matches data at different activities with different storage media. After that, it migrates "busy" data to media with higher performance (such as SSDs) and "idle" data to inexpensive media with larger capacities (such as NL SAS disks). A SmartTier process comprises three stages: performance information collection, performance analysis, and data migration, as shown in Figure 4-3:

Three stages of a SmartTier process



### SmartThin

The OceanStor V5 converged storage systems support Huawei's self-developed thin provisioning feature, SmartThin. The feature allows users to allocate a small initial storage space to the LUN when creating a LUN. If the initial storage space is about to use up, users can add another space to the LUN on demand. Such on-demand capacity allocation improves storage resource utilization to better support service growth. SmartThin does not pre-allocate storage space. Rather, it presents a virtual storage space larger than the physical to users so that they see larger space than as allocated by the system. SmartThin provides the space to users on demand, that is, it provides only the used space. If the storage space is insufficient, users can expand the capacity by expanding the back-end storage unit. The expansion process is transparent to users with zero system downtime.

If the actual amount of data is larger than expected, LUN space can be adjusted dynamically and free space can be allocated to any LUN in need of space. Allocation in such a manner improves utilization and reduces energy consumption because no space is claimed but unused. In addition, LUN space can be adjusted online without affecting services.

### Online Data Deduplication

The OceanStor V5 converged storage systems provide data deduplication and compression to remove data repetition. Improving data storage efficiency, the deduplication function has been employed in the primary storage instead of only in backup. The function is important especially for SSD-based storage tiering and flash arrays because it not only saves space but also reduces TCO in enterprise IT architecture.

The deduplication and compression function is launched with the OceanStor V5 converged storage systems. It achieves deduplication with a hardware acceleration card. It uses SSDs to accelerate metadata deduplication so that the overall deduplication performance is enhanced.

The OceanStor V5 converged storage systems enable to activate deduplication so that online deduplication is achieved. In addition, the system supports data encryption to secure data.

### Data Migration

The OceanStor V5 converged storage systems employ an intelligent data migration feature, SmartMigration. SmartMigration allows full service migration from a source LUN to a target LUN without interrupting ongoing services. In addition to service migration within one storage system, LUN migration also supports migration between a Huawei storage system and a compatible heterogeneous storage system.

SmartMigration achieves full replication of data from the source LUN to the target LUN. After the replication, the target LUN replaces the source LUN by taking over all services.

SmartMigration applies to:

* **Storage system upgrade**

SmartMigration works with SmartVirtualization to migrate data from legacy storage systems (from Huawei or other vendors) to new Huawei arrays to improve service performance and data reliability.

* **Service performance tuning**

SmartMigration can be used to increase or decrease the service performance. It can be used either between two LUNs with different performances within one storage system or between two storage systems with different configurations.

Service migration within one storage system

When the performance of a LUN carrying services is unsatisfactory, you can migrate the services to a LUN that provides higher performance in the same storage system to boost the service performance. For example, if you require quick read/write capability, you can migrate the service from a LUN created on a low-speed storage medium to a LUN created on a high-speed one. Conversely, if a service becomes lower in priority, you can migrate it to a low-performance LUN to release storage resources for other services to improve storage system serviceability.

Service migration between storage systems

If an existing storage system fails to meet service requirements, you can migrate services to another system providing higher performance. Conversely, if services require lower performance, you can migrate them to a low-performance storage system. For example, cold data can be migrated to an entry-level storage system to reduce operating costs without interrupting host services.

* **Service reliability adjustment**

SmartMigration can be used to adjust service reliability in the following ways to adjust the resources of a storage system:

Migrate services to a LUN with a higher RAID level from one with a lower RAID level to improve service reliability. On the contrary, you can migrate services to a low-reliability LUN if they do not require high reliability.

Migrate services between different storage media of the same RAID level because different media offer varied reliabilities. For example, with the same RAID level, SAS disks provide higher reliability than NL SAS disks and are more suitable for important services.

* **LUN type change**

Thin LUNs and thick LUNs can be converted without interrupting host services to change configurations freely.

## Efficient

### High-Density Disk Enclosure

The high-density disk enclosure of an OceanStor V5 converged storage system employs a dual-channel redundant architecture. The enclosure provides two expansion boards for upward redundancy, with each channel providing a 8 Gbit bandwidth. It also provides downward expansion. It has the following features and advantages:

* **High-density architecture**

The high-density disk enclosure is 4 U in height with vertical instead of horizontal disk slots. The expansion board is less than half the size of its counterpart in a conventional enclosure, saving room for disks.

* **Heat dissipation**

Higher density requires higher heat dissipation capability. Heat generated by 75 disks will soon raise the temperature and damage devices if not dissipated quickly enough. With a delicate air duct design, optimized fan speed adjustment policy, and enhanced fan employment, the high-density enclosure not only meets the heat dissipation challenge, but also emits low noise and consumes less power.

* **Disk density:** three times the disk density of a conventional disk enclosure.
* **Performance:** two times the performance per U of a conventional disk enclosure.
* **Operation cost:** 20% decrease in single-disk operation cost.
* **Power consumption:** 50% decrease in single-disk power consumption from a conventional enclosure.

### SmartQoS

The OceanStor V5 converged storage systems support Huawei's self-developed QoS feature, SmartQoS. Capable of intelligent allocation and adjustment of computing, cache, concurrent, and disk resources of a storage system, SmartQoS is used for the QoS of services with different priorities in one storage device.

SmartQoS uses the following technologies to ensure the quality of data services:

* **I/O priority scheduling**

Responses to services are prioritized based on service priorities. When allocating resources, the storage system gives priority to the request initiated by a service with a higher priority. If resources are insufficient, more resources are allocated to such a service to ensure its QoS. Currently, three priority levels are available: high, medium, and low.

* **I/O traffic control**

Based on the user-defined performance control goal (IOPS or bandwidth), a traditional token bucket mechanism is used to control traffic. I/O traffic control prevents a service from generating excessive traffic that affects other services.

* **I/O performance protection**

Based on traffic suppression, a user is allowed to specify the lowest performance goal (minimum IOPS/bandwidth or maximum latency) for a service with a high priority. If such a goal cannot be secured, the system gradually increases the I/O latency of lower-priority services to restrict their traffic and secure the goal.

### SmartPartition

The OceanStor V5 converged storage systems support Huawei's self-developed cache partitioning feature, SmartPartition. The core concept of SmartPartition is to ensure the performance of critical applications by partitioning core system resources.

An administrator can allocate a cache partition of a specific size to an application. The system reserves the cache exclusively for the application and dynamically adjusts the front- and back-end concurrent I/Os to ensure application performance. SmartPartition can be used with other QoS technologies (such as SmartQoS) to achieve better QoS.

Caches are classified into read caches and write caches. Read caches pre-fetch and retain data to improve the hit ratio of host read I/Os while write caches improve disk access performance by means of combination, hitting, and sequencing. Different services have varied read/write cache size requirements. Therefore, SmartPartition allows users to set read and write cache sizes for a partition to meet different service requirements.

### SmartMulti-Tenant

HUAWEI OceanStor V5 converged storage systems support SmartMulti-Tenant, a multi-tenancy feature based on manager approach isolation. It releases management and monitoring functions of some resources to tenants in order to lower resource management costs.

SmartMulti-Tenant is designed to cope with the following challenges facing customers:

* Tenant data separation: Resource data of tenants is managed based on domains.
* Tenant permission separation: Tenant administrators can only manage and view data in their own domains.
* Service function permission range: Service management functions open to tenants are restricted.

Simply put, SmartMulti-Tenant separates resource data of tenants based on rights and domains. It releases management and monitoring of some resources to tenants so tenant administrators manage the resources within the tenant. By doing this, the resource management efficiency is improved and storage administrators are freed from complex resource management.

Figure 4-4 shows the relationship between a storage administrator and tenant administrators.

Function division



A storage administrator manages all resources in an array, including all the tenants, but a tenant administrator can only manage resources in the domain.

When massive storage resources need to be managed, the storage administrator has to process a variety of tenant requests, which can be huge workloads and lead to problems because of misoperations. If some management functions are released to tenants, the burden of the storage administrator is lighter and the management cost is also lower. SmartMulti-Tenant enhances the multi-tenant management capability through right- and domain-based management and resource management.

# Product Introduction

*This chapter describes related products.*

## Introduction to OceanStor 5300 V5/5500 V5/5600 V 3/5800 V5

HUAWEI OceanStor V5 converged storage systems (V5 converged storage systems) are next-generation storage systems designed for enterprise-level applications. V5 converged storage systems are built on a cloud-oriented architecture and have a powerful hardware platform as well as rich intelligent management software. They deliver industry-leading functions, performance, efficiency, reliability, and ease-of-use. Providing high data storage performance for applications such as large-database Online Transaction Processing (OLTP)/Online Analytical Processing (OLAP), file sharing, and cloud computing, they are widely applied to industries such as government, finance, telecommunication, energy, and media assets. Meanwhile, V5 converged storage systems provide a wide range of efficient and flexible backup and disaster recovery solutions to ensure service continuity and data security and deliver excellent storage services.

### Converged

* **Convergence of SAN and NAS**

Convergence of SAN and NAS storage allows elastic service development, simplifies service deployment, improves storage resource utilization, and cuts down TCO. With the innovative parallel architecture of SAN and NAS storage, V5 converged storage systems shorten access paths to storage resources and ensure high performance of SAN storage as well as powerful file sharing of NAS storage.

* **Convergence of heterogeneous systems**

Thanks to SmartVirtualization, V5 converged storage systems can efficiently take over mainstream storage arrays to create unified resource pools so that resources are allocated in a unified and flexible manner.

* **Convergence of high-end, mid-range, and entry-level storage systems**

V5 converged storage systems enable convergence of high-end, mid-range, and entry-level systems without any third-party system. This convergence allows free traffic among devices of different models.

* **Convergence of SSDs and HDDs**

V5 converged storage systems are designed for SSDs and compatible with HDDs. The parallel architecture gives full play to different storage media. By adjusting media proportions, the systems provide all-HDD, HDD+SSD, and all-SSD arrays to balance the performance and cost optimally.

* **Convergence of primary storage and backup**

The built-in backup function in V5 converged storage systems enables efficient data backup without additional backup software. This function simplifies backup solution management.

### Intelligent

* **Multiple tenancy and service levels**

V5 converged storage systems allow storage resources to be intelligently allocated in cloud computing environments based on customer requirements. Data isolation and a variety of data security policies such as data encryption and data destruction are employed to meet data security requirements of different users. The systems provide four service levels and allocate resources based on service priorities. High-priority services use resources first to ensure performance and response.

* **SmartX series software**

Advanced technologies such as SmartTier, SmartMotion, and SmartVirtualization are employed to achieve vertical, horizontal, and cross-system data traffic. Resource utilization can be improved by three times.

* **HyperX series software**

HyperX series software includes comprehensive data protection software such as remote replication, snapshot, and LUN copy. HyperX series software satisfies the local, remote, and multi-site data protection requirements of customers to ensure service continuity and data availability.

### Industry-Leading Hardware

* **Leading performance and specifications**

V5 converged storage systems are the first to adopt next-generation Intel multi-core Skylake processors. The systems support a variety of host ports such as 16 Gbit/s Fibre Channel, 10 Gbit FCoE, and 56 Gbit/s InfiniBand. With the next-generation PCIE 3.0 bus and 12 Gbit/s SAS interface, the systems are capable of providing up to a 40 Gbit/s bandwidth, which is sufficient for scenarios such as videos and large files. The systems offer million-level IOPS and support eight controllers, 1 TB cache, and 8 PB storage space maximum.

* **Smart I/O cards**

A single interface card supports 8 Gbit/s Fibre Channel, 16 Gbit/s Fibre Channel, 10 Gbit/s iSCSI, and 10 Gbit/s FCoE protocols.

* **Smart data co-processing cards**

Smart data co-processing cards are capable of lossless deduplication and compression, significantly reducing storage costs. They also support data encryption for data security.

### Unified Storage Management Software

* **Unified management**

One software suite can manage multiple product models and provides powerful functions such as global topology view, capacity analysis, performance analysis, fault diagnosis, and end-to-end service visualization.

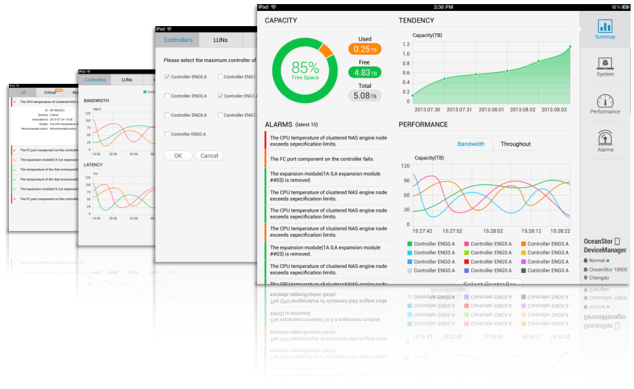
* **Mobile management**

Systems can be left unattended because users can use a tabloid or a smart phone to manage systems at any time with status information delivered automatically.

* **Easy management**

A V5 series storage system can be initially configured in five steps within 40 seconds and expanded in two steps within 15 seconds. See Figure 5-1.

Easy management



## Specifications of OceanStor 5300 V5/5500 V5/5600 V 3/5800 V5

| Model | | 5300 V5 | | 5500 V5 | 5600 V5 | 5800 V5 |
| --- | --- | --- | --- | --- | --- | --- |
| Storage processor | | Multi-core processor set | | | | |
| Cache (upgradable) | | 32 GB to  512 GB | | 64 GB to  1024 GB | 128 GB to  2048 GB | 256 GB to  4096 GB |
| Max. number of controllers | | 8 | | 8 | 8 | 8 |
| Supported protocols | | Fibre Channel, FCoE, iSCSI, InfiniBand, NFS, CIFS, HTTP, and FTP | | | | |
| Front-end ports | | 1 Gbit/s Ethernet, 10 Gbit/s FCoE, 10 Gbit/s TOE, 16 Gbit/s FC, and 56 Gbit/s InfiniBand | | | | |
| Back-end ports | | SAS 3.0 (single port 4 x 12 Gbit/s) | | | | |
| Max. number of I/O modules | | 2 | | 2 | 8 | 8 |
| (per controller) | |
| Max. number of front-end host ports (per controller) | | 12 | | 12 | 28 | 28 |
| Max. number of disk slots | | 500 | | 750 | 1200 | 1500 |
| Disk type | | SAS, SSD, and NL SAS | | | | |
| RAID levels | | 0, 1, 5, 6, 10, and 50 | | | | |
| Max. number of snapshots (LUN) | |  | | 1024 | 2048 | 2048 |
| Max. number of LUNs | |  | | 4096 | 4096 | 8192 |
| Max. number of snapshots per file system | | 2048 | | | | |
| Max. capacity for each file | | 256 TB | | | | |
| SmartX series software | | SmartThin (intelligent thin provisioning)  SmartQoS (intelligent service quality control)  SmartTier (dynamic storage tiering)  SmartMotion (intelligent data migration)  SmartPartition (intelligent cache partitioning)  SmartCache (intelligent SSD caching)  SmartMulti-Tenant (multi-tenancy)  SmartVirtualization (intelligent heterogeneous virtualization)  SmartMigration (LUN migration)  SmartCompression (online compression)  SmartDedupe (online deduplication)  SmartQuota (quota management)  SmartErase (data destruction) | | | | |
| HyperX series software | | HyperSnap (snapshot)  HyperCopy (LUN copy)  HyperClone (clone)  HyperReplication (remote replication)  HyperLock (WORM)  HyperMetro (A-A)  HyperMirror(volume mirroring) | | | | |
| Host software | | UltraPath (multipathing software)  BCManager (disaster recovery management) | | | | |
|  | **Virtual Environment Features** | | | | | |
| Supported virtual machines | | VMware, Citrix, Hyper-V, and FusionSphere | | | | |
|  | **Physical Features** | | | | | |
| Power supply | | AC: 100 V to 127 V or 200 V to 240 V  DC: 192 V to 288 V or –48 V to –60 V | | | | |
| Dimensions (H x W x D) | | 2 U controller enclosure: | | | 3 U controller enclosure: 130.5 mm x 447 mm x 750 mm | |
| 86.1mm×447mmx488mm | 86.1 mm x 447 mm x 750 mm | |
| 2 U disk enclosure: 86.1 mm x 447 mm x 490 mm  4 U disk enclosure: 175 mm x 447 mm x 490 mm  4 U high-density disk enclosure: 175 mm x 447 mm x 790 mm | | | | |
| Weight | | 2 U controller enclosure ≤ 23.4Kg | 2 U controller enclosure ≤ 37 kg | | 3 U controller enclosure: ≤ 50 kg | |
| 2 U disk enclosure: ≤ 20 kg  4 U disk enclosure: ≤ 40 kg  4 U high-density disk enclosure: ≤ 91 kg | | | 2 U disk enclosure: ≤ 20 kg | |
| 4 U disk enclosure: ≤ 40 kg | |
| 4 U high-density disk enclosure: ≤ 91 kg | |
| Environment temperature | | 5°C to 40°C at an altitude below 1800 m; 5°C to 30°C at an altitude between 1800 m and 3000 m. | | | | |
| Environment humidity (relative humidity) | | 5% to 95% | | | | |

# Acronyms and Abbreviations

*List the acronyms and abbreviations used in this document.*

*Example*

|  |  |
| --- | --- |
| Acronym and Abbreviation | Full Spelling |
| SAN | Storage Area Network |
| NAS | Network Attached Storage |
| CLI | Command-Line Interface |
| LUN | Logical Unit Number |
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