Lab Validation

Report

Huawei Symantec S5600T

Easy to Manage, Highly Reliable, High Performance, Green Storage

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Introduction

The Oceanspace S5600T (S5600T), a member of the of Huawei Symantec (HS) T-series, offers a modular design, robust hardware, and SmartCache functionality to deliver an impressive combination of high performance, high availability, and advanced resource monitoring and management. Although designed for the midmarket, the S5600T has the functionality and capability needed to meet enterprises business requirements.
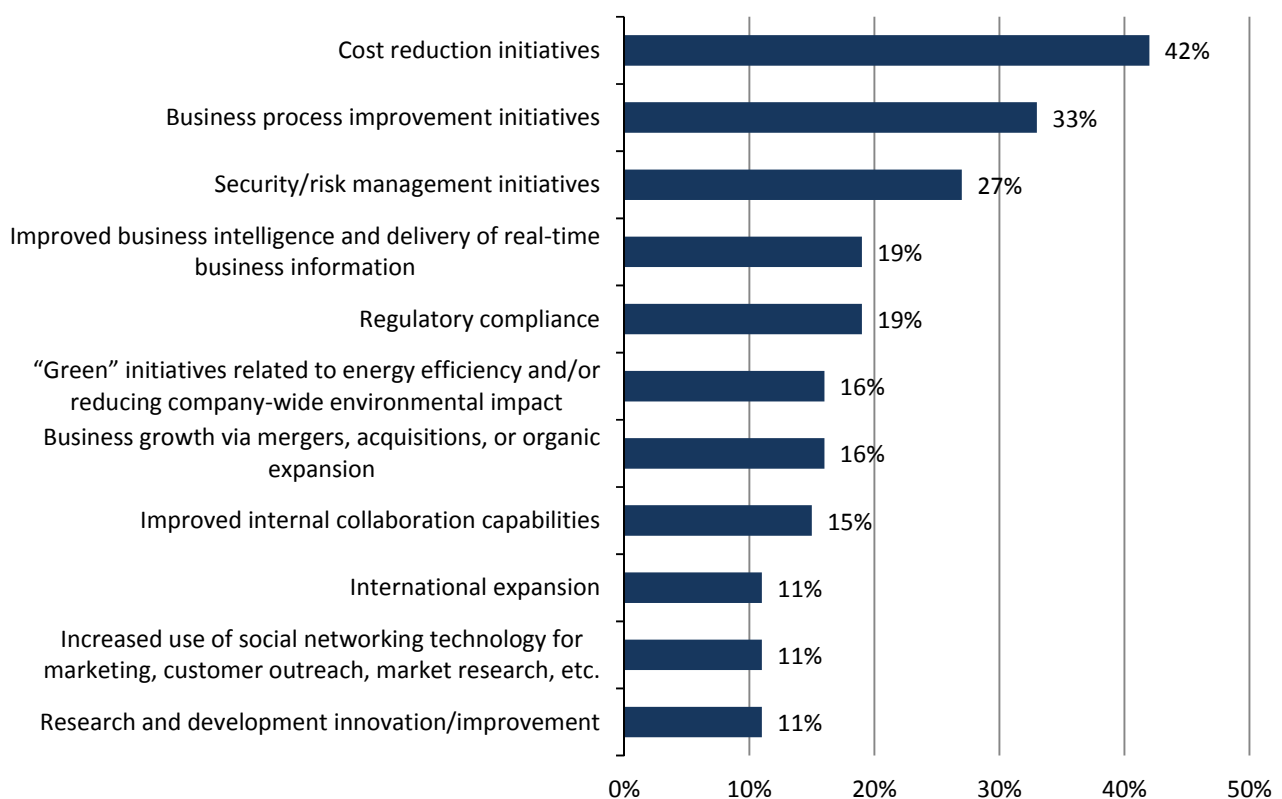
SINO-BRIDGES Lab tested the S5600T with focus on ease of deployment and management, intuitive customer interfaces, easy firmware upgrades, high availability, unified FC/iSCSI storage networking, high performance, SmartCache functionality, and green storage features.

Background

SINO-BRIDGES research indicates that reductions in IT operational costs, improved business processes, increased IT management intelligence levels, and improved utilization of physical data center space are top IT investment concerns for 2011 (see Figure 1).[1] In addition, power and cooling reduction and "green initiatives" are also important when making purchasing decisions: compared to three years ago, 68% of respondents are significantly more aware of energy consumption and cooling requirements.

Figure 1. 2011 Business Initiatives with the Greatest Impact on IT Spending Decisions

Which of the following business initiatives do you believe will have the greatest impact on your organization's IT spending decisions over the next 12-18 months? (Percent of respondents, N=611, three responses accepted)

Initiative	Percent
Cost reduction initiatives	42%
Business process improvement initiatives	33%
Security/risk management initiatives	27%
Improved business intelligence and delivery of real-time business information	19%
Regulatory compliance	19%
"Green" initiatives related to energy efficiency and/or reducing company-wide environmental impact	16%
Business growth via mergers, acquisitions, or organic expansion	16%
Improved internal collaboration capabilities	15%
International expansion	11%
Increased use of social networking technology for marketing, customer outreach, market research, etc.	11%
Research and development innovation/improvement	11%

Source: Enterprise Strategy Group, 2011.

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[1] Source: SINO-BRIDGES Research Report, *2011 IT Spending Intentions Survey*, January 2011.

When compared to their enterprise brethren, midmarket organizations are more constrained in terms of their IT budgets and focus more on how to achieve more (support and manage more data, more storage, and more applications) with less (less operational expenditures, less IT management resources) and optimize utilization to improve business processes and technology ROI. Meanwhile, as businesses grow, midmarket customers are requiring enterprise-class storage capacity, performance, and scalability. These organizations are looking for modular, cost effective storage solutions that are energy efficient, are easy to use and manage, and are reliable with high performance and scalability.

Huawei Symantec Oceanspace S5600T

This SINO-BRIDGES Lab Validation report documents testing of the Oceanspace S5600T, part of the Huawei Symantec T-series product line, which was designed for use in the midmarket and the enterprise. The S5600T offers robust hardware and a high density modular design with TurboModule hot swappable IO modules, TurboCooling energy efficient features, TurboBoost performance boosters, and advanced data protection technologies. In addition, its SmartCache leverages SSD's high performance, which, combined with intelligent of hot data monitoring, will enable users to immediately allocate resources to dramatically increase performance for mission-critical applications experiencing unexpected spikes in performance requirements.

Figure 2. The Huawei Symantec Oceanspace Product Line

SINO-BRIDGES Lab Validation

SINO-BRIDGES Lab conducted hands-on product testing of S5600T at Huawei Symantec's Chengdu test center. Testing focused on assessing ease of use and management, high availability, unified FC/iSCSI function, high performance, and energy efficient features.

The SINO-BRIDGES Lab test bed, shown in Figure 3, consisted of an S5600T connected to servers via a pair of 8 Gb QLogic SANbox 9000 FC switches.
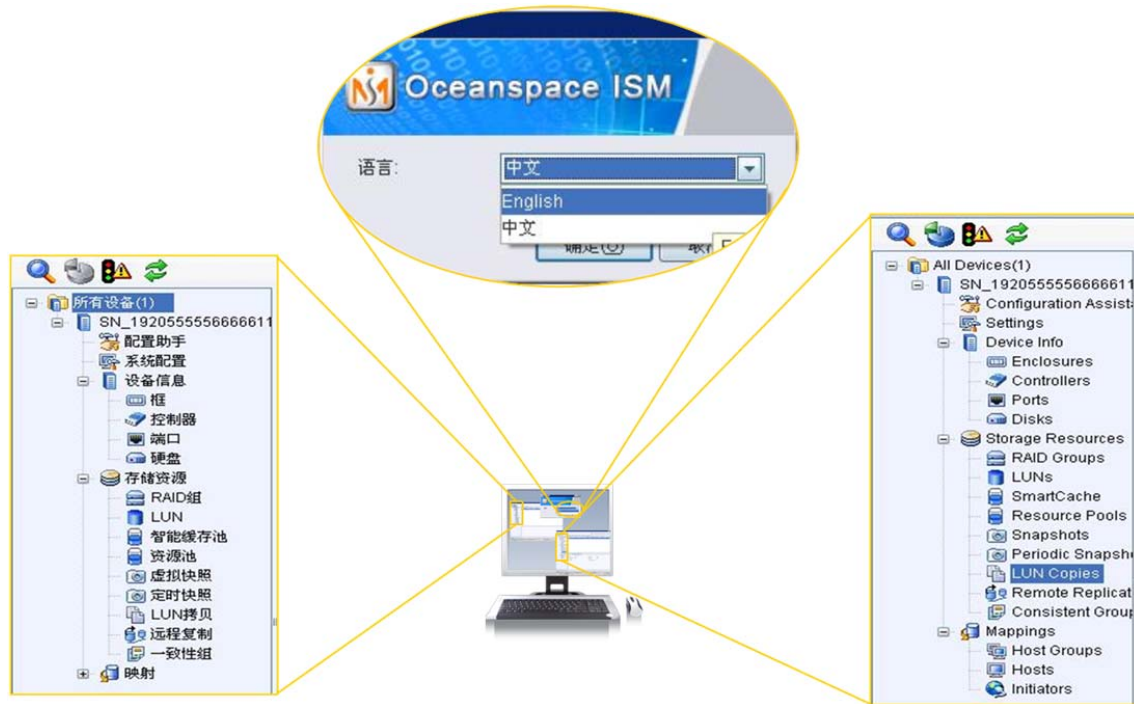
Figure 3. The SINO-BRIDGES Lab Test Bed
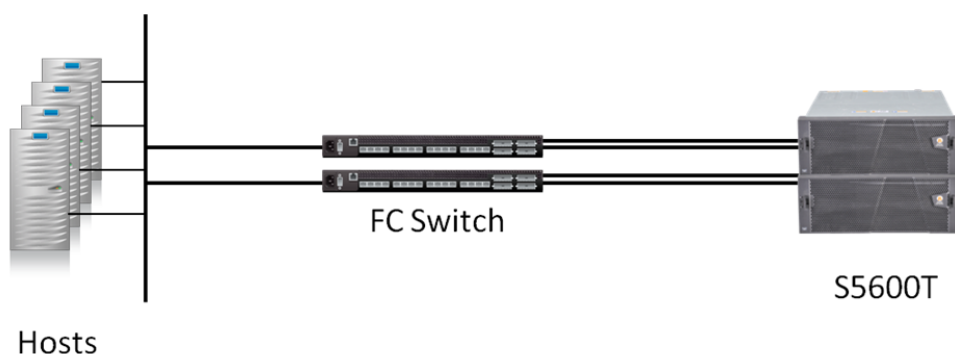
Ease of Use and Management

As shown in Figure 4, the S5600T management interface can accommodate English and Chinese speakers. The Configuration Assistant and Wizard both include detailed instructions in both languages. For the purposes of SINO-BRIDGES Lab configuration and testing, the English management console was used.

*Figure 4. Support Chinese and English Management Interface*

Ease of Configuration and Management

SINO-BRIDGES Lab testing began with a hands-on evaluation of the user interface and preparation time as well as ease of configuration, system monitoring, and management. To test ease of use and management, SINO-BRIDGES Lab first created a RAID Group, a LUN, a HOST GROUP, and a HOST and then ran the configure initiator and tested the firmware upgrade function.

The S5600T offers automatic and manual RAID groups; SINO-BRIDGES Lab used the manual configuration option for testing. Clicking on the RAID Groups resource panel accesses the configuration panel shown in Figure 5. After filling in some necessary information, such as RAID name, RAID level, and disk type (pull down selection manual), SINO-BRIDGES Lab selected four SAS disks to create a RAID 5 group named "RAID001."

Figure 5. Create RAID Group
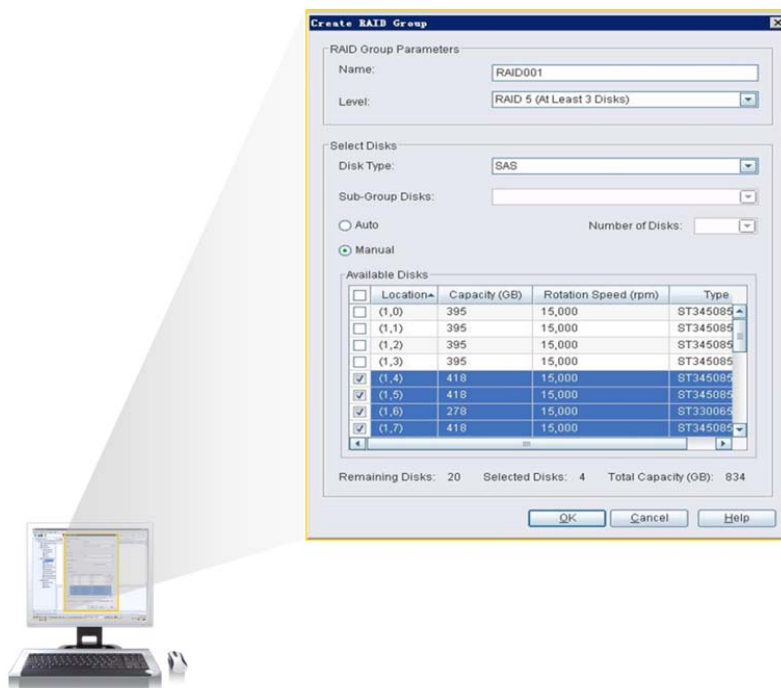
Next, SINO-BRIDGES Lab created the LUNs: as shown in Figure 6, the LUN resource panel was used to create a 1 GB LUN with a stripe depth of 64 KB that was then assigned to controller A.

Figure 6. Create LUNs
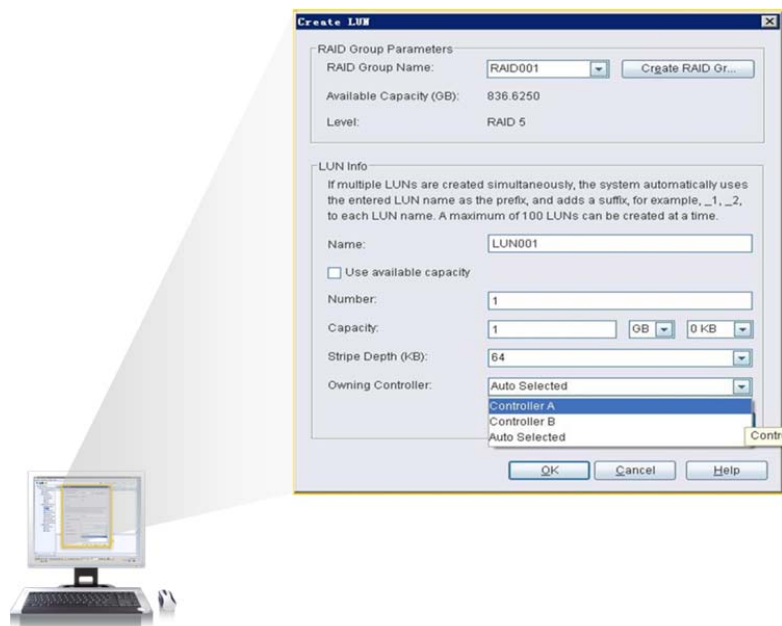
SINO-BRIDGES noted that the HOST GROUP supports Linux, Windows, Solaris, HP-UX, AIX, and XenServer. A Windows OS was selected for the test as shown in Figure 7.
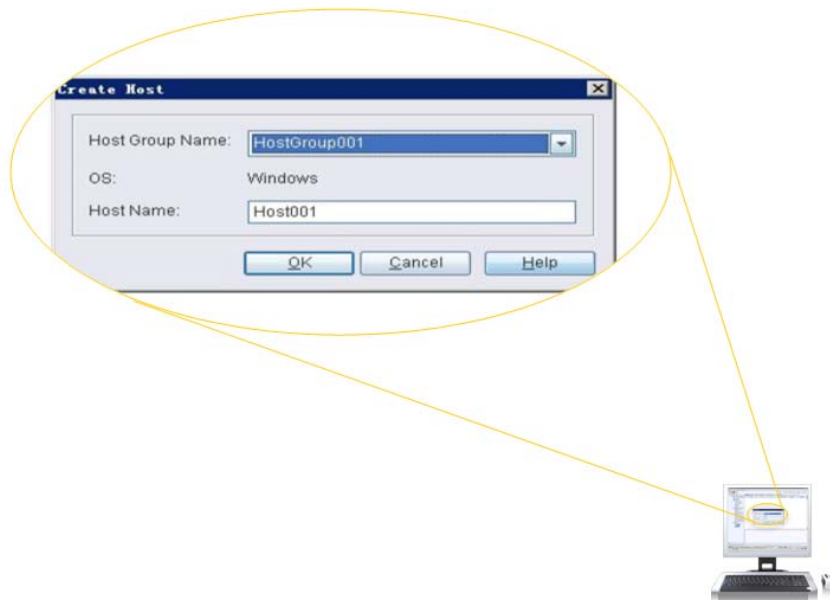
Figure 7. Create Host Group
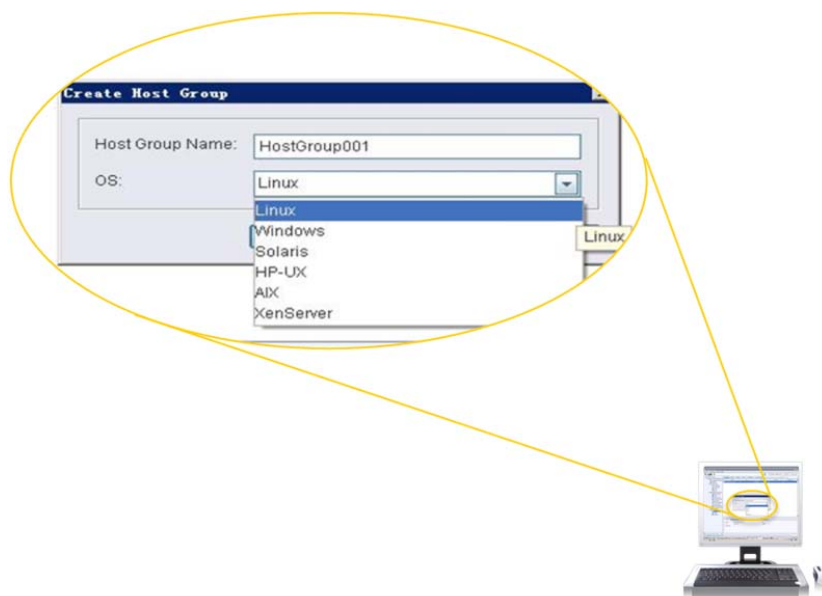
Next, SINO-BRIDGES Lab Created Host001 (Window OS) under HostGroup001 (see Figure 8).

Figure 8. Create Host

The last step in the configuration process is to map the new volume to the server. As shown in Figure 9, clicking on "Config Initiator" mapped the host to a FC initiator address presented by the HBA in the Windows server.

Figure 9. Configure Initiator
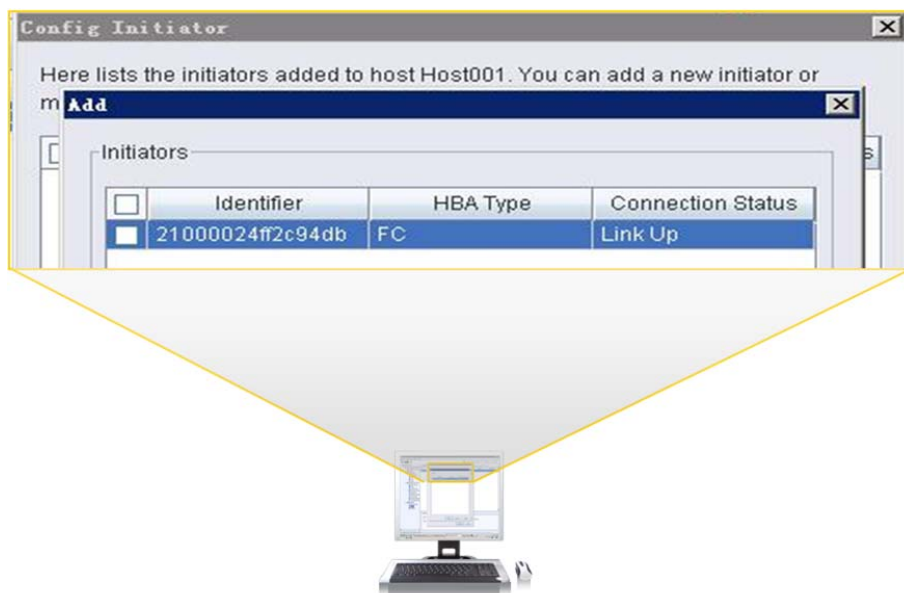
The new volume was discovered by the Windows Disk Management Interface shown in Figure 10. The whole configuration process took consisted of five intuitive steps.

*Figure 10. Windows Disk Management Interface*
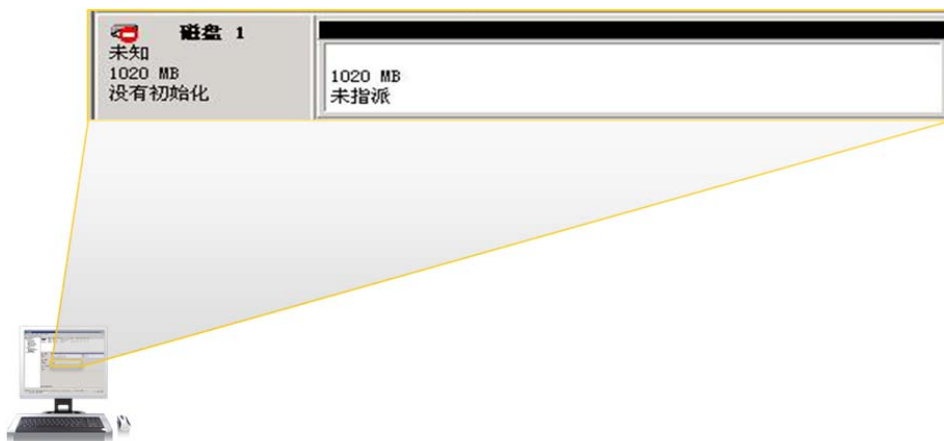
User-friendly Management Interface

SINO-BRIDGES Lab found that the S5600T provided user-friendly system status and resource management interfaces in both English and Chinese.

System Overview: A system overview, displayed in Figure 11, shows overall storage array health as well as detailed HOST and storage resource hardware statistics and visual representations of storage resource utilization. Fault statistics are listed on the right top corner of the management view—categorized as "Critical", "Major" or "Warning"—to guide administrator action based on alert level. Wizards are available for physical or virtual disk and volume set up and main functions are listed in a familiar directory style on the left.

Figure 11. System Overview
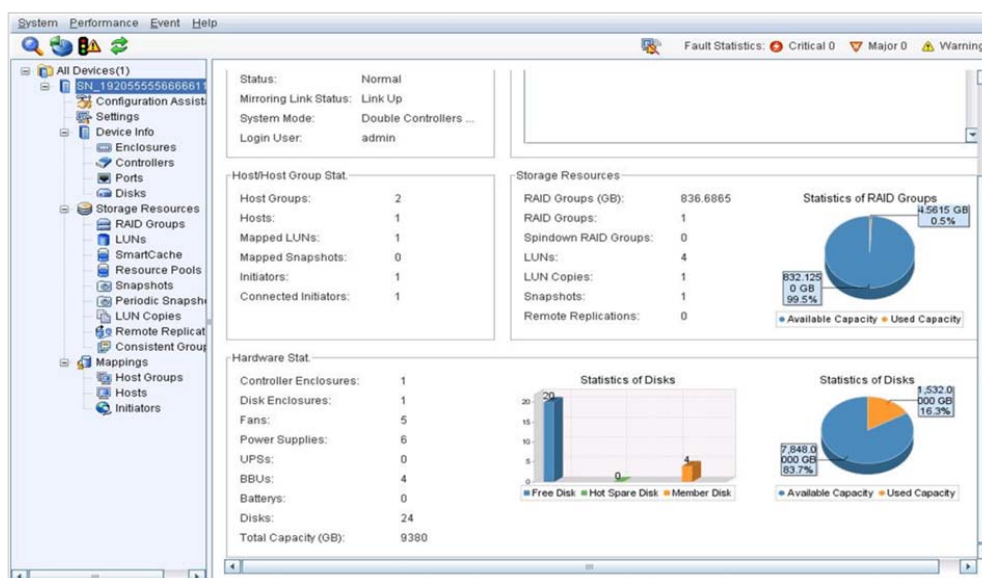
Configuration Assistant: The S5600T also provides an easy-to-use assistant to further simplify the configuration process. The Configuration Assistant assists with initial configuration, initiator management, LUN mirroring, LUN creation and scale, virtual snapshot creation, and LUN copy creation, as well as remote replication functions. It also provides brief descriptions for each of those functions to help inexperienced users better utilize the tool.

Figure 12. S5600T Configuration Assistant & Settings Interface
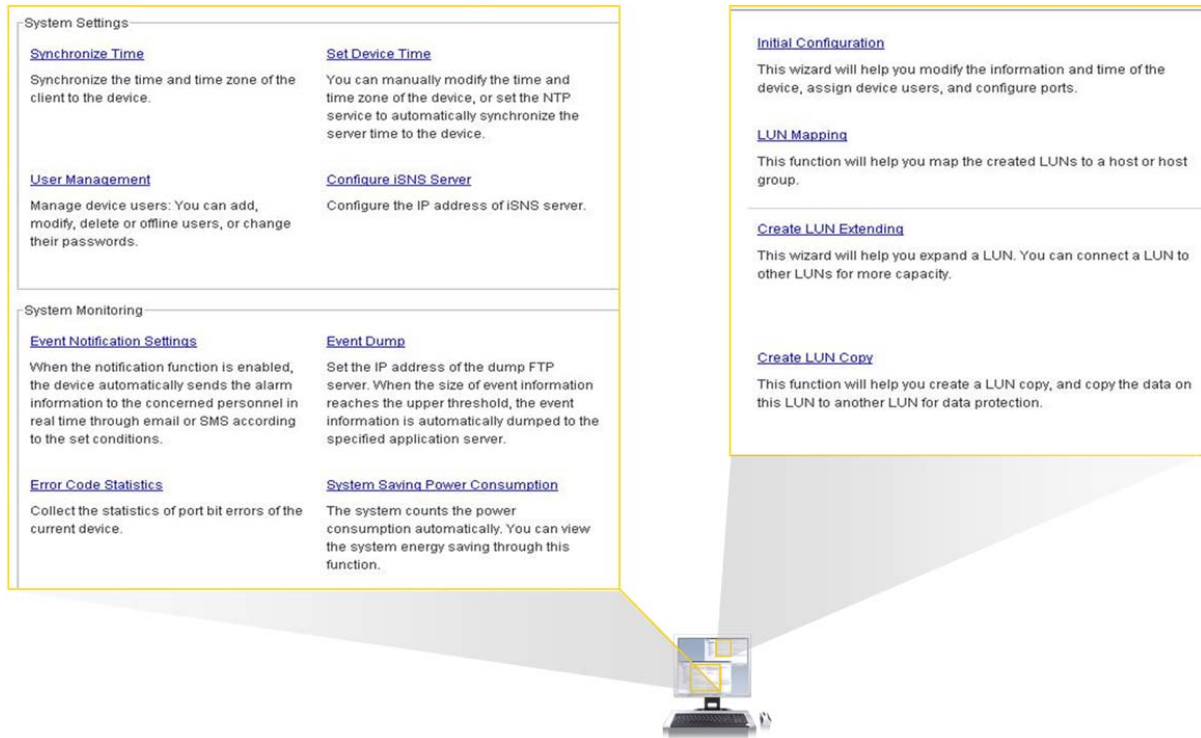
For IT administrators who are less experienced in storage configuration and management, the S5600T also provides easy set up operation selection with two operational categories: system set up and monitoring. System set up has five options: synchronize set up, system time set up, change iSCSI equipment name, user management, and configure iSNS server. System monitoring provides options such as time alert set up, IP address management, error code statistics, and system energy efficient set up. Each function is explained in the tool to help users.

System Information: Clicking on System Information displays four options: controller, ports, disk, and other components. The right side of the window display the S5600T view with each port graphically represented. System health status is color coded: Red indicates failures, yellow indicates alerts, and grey is for offline ports (see Figure 13).

Figure 13. System Information Management View
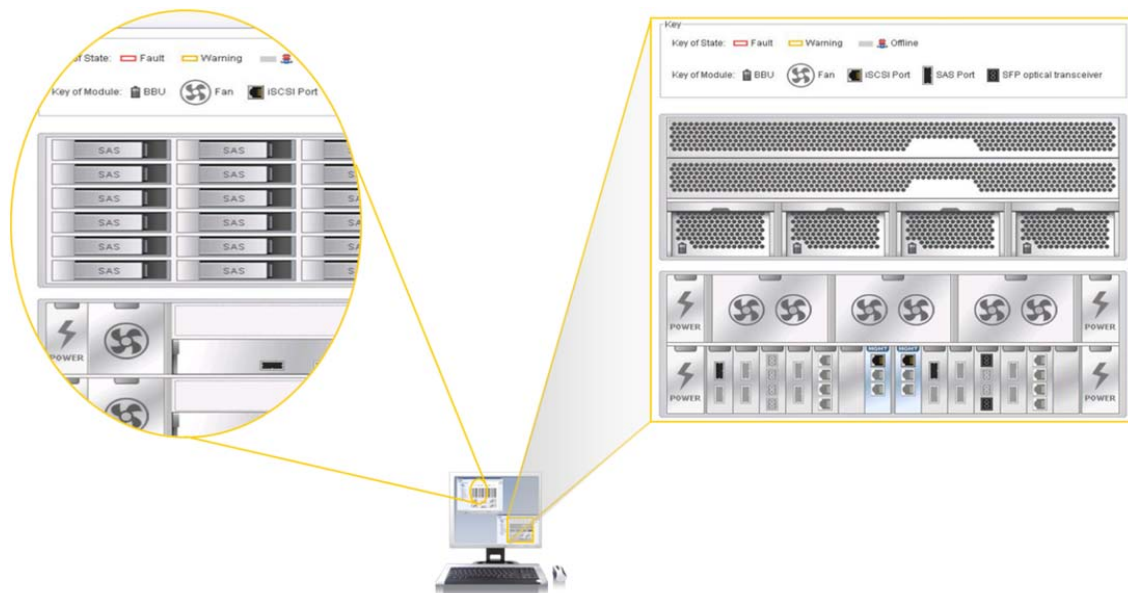
Actual operation status of all components included in the array, such as real time monitoring of disks, fan, power, and port operational status was monitored using this intuitive interface.

Storage Resource Management: Selecting Storage Resource in the navigation list (see Figure 14) shows detailed information and statistical analysis of the S5600T's RAID GROUP code, RAID, LUN, and capacity for disk resource consumption and configuration management.

Figure 14. Storage Resource Management Interface
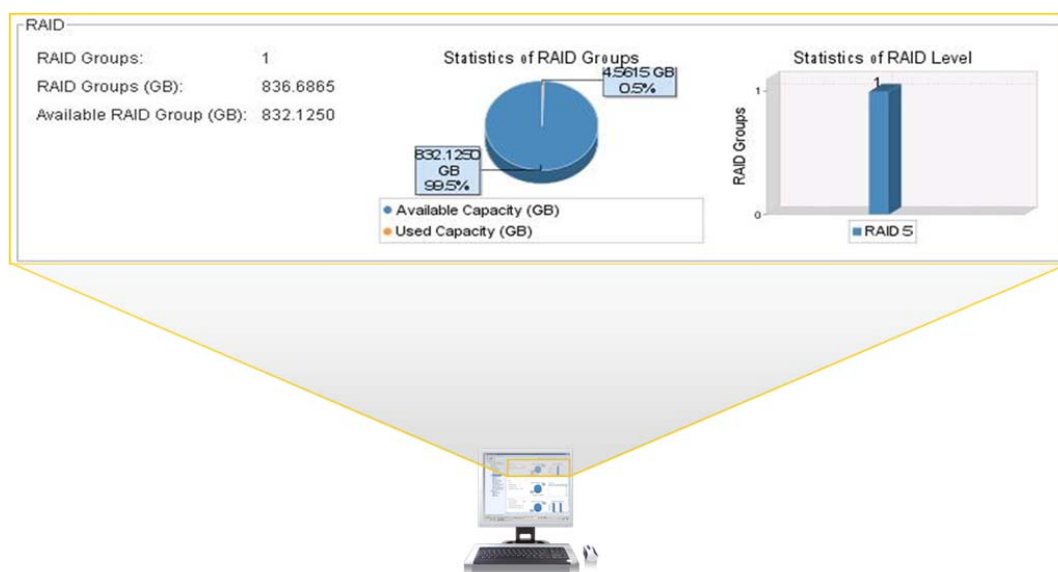
Performance Monitoring: Individual pieces of equipment can be selected and monitored. SINO-BRIDGES selected "LUN" as monitoring target and then chose a specific LUN. SINO-BRIDGES Lab selected LUN010 which, as shown in Figure 15, maintained a steady bandwidth of 750MB/S.

Figure 15. Performance Monitoring View
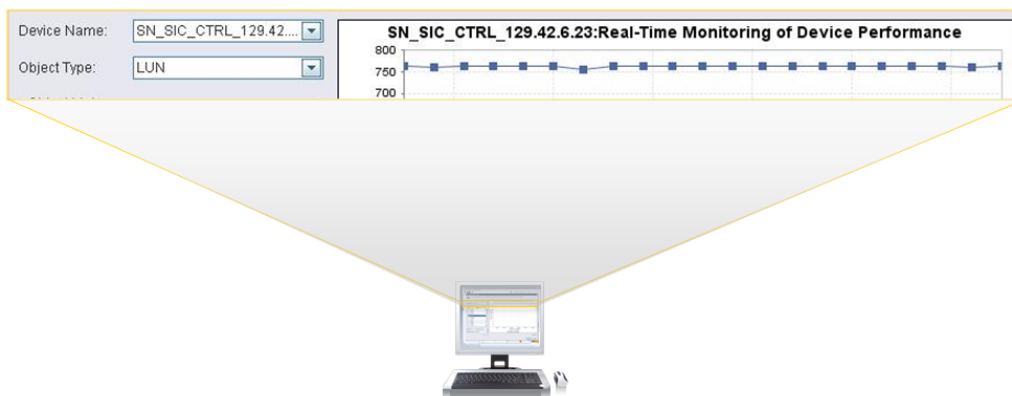
Meanwhile, SINO-BRIDGES Lab reviewed S5600T embedded Assistant System, which provides comprehensive and detailed information on each function and configuration.

Figure 16. Embedded Assistance Interface
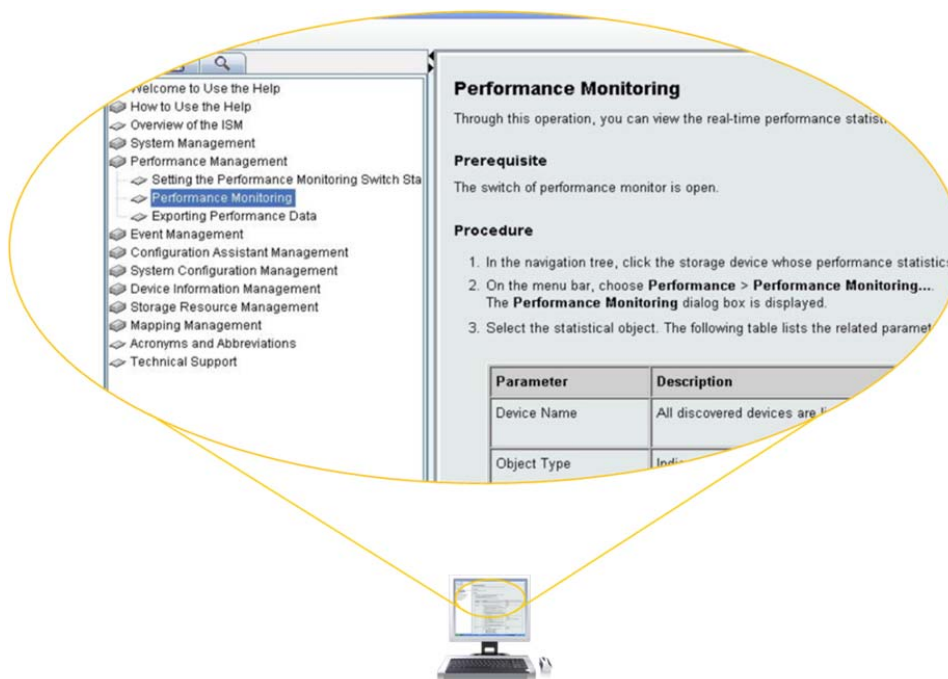
Firmware Upgrade

SINO-BRIDGES tested the S5600T's easy firmware upgrade function, which can be completed online without interrupting operation. The industry standard IOmeter utility was used to generate a high level of IO activity before, during, and after the upgrade.

The intuitive, five-panel management wizard used for the upgrade is shown in Figure . After getting started, the firmware upgrade completed with no interruption to host IO activity within a few minutes.

Figure 17. Simple Firmware Upgrade
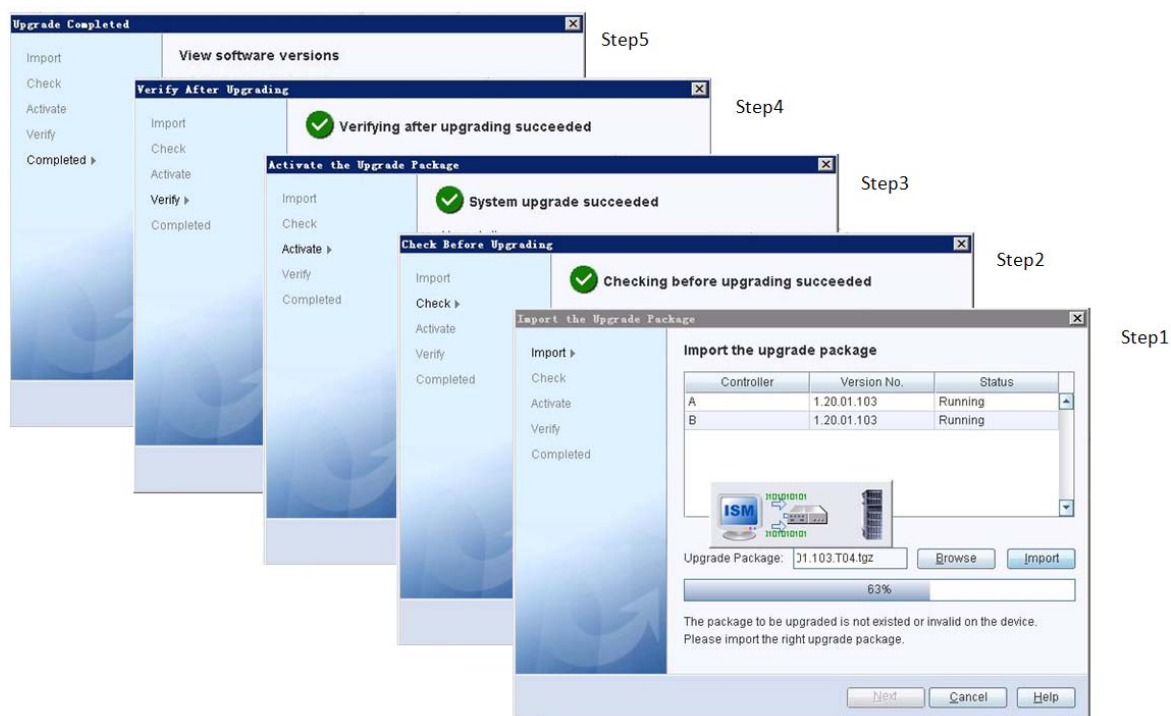
Why This Matters

A recent SINO-BRIDGES survey of 510 IT professionals found that almost half (47%) of respondents believed they had a shortage of storage management skills and more than half (54%) reported system implementation cycles in excess of six months. For midmarket IT managers, ease of deployment and management with comprehensive monitoring and online, easy upgrades not only save IT administration time and money, but are critical to maintain high data availability and enable rapid response to new application deployment.

SINO-BRIDGES Lab has confirmed that the Huawei Symantec S5600T is easy to configure and manage. Its Configuration Assistant, with detailed explanation guides, enables IT administrators with limited storage experience to comfortably complete configuration. In just five steps, SINO-BRIDGES Lab completed an initial system configuration and was accessing storage from an attached server. The S5600T's full English/Chinese management interface with advanced resource and operation monitoring functions provides intuitive hardware status to enable customers to take preventative action to assure high data availability and provide applications with required performance. Its online one-key firmware upgrades dramatically reduce storage maintenance time and cost. All of these features, taken together, show that the S5600T can enable midmarket users to reduce TCO while improving service levels—in effect, to do more with less.

High Availability (HA)

The S5600T disk array was designed with fault tolerance and high availability in mind. SINO-BRIDGES Lab tested its ability to transparently survive a number of hardware issues including controller, disk drive, SAS connector, power supply, network interface, cable, and fan failures.

A standard methodology was used to test the ability to survive failure of controller, disk, and IO module:

- Confirm that the array has normal operation status
- Use IOmeter to generate an IO workload emulating common business applications
- Inject an error (for example, hot swap I/O module, controller, power module, disk and cable, etc) Use the management interface to confirm that the failure was properly handled
- Check on business operations, looking for disruptions to operations
- Confirm that business operation has not been disrupted
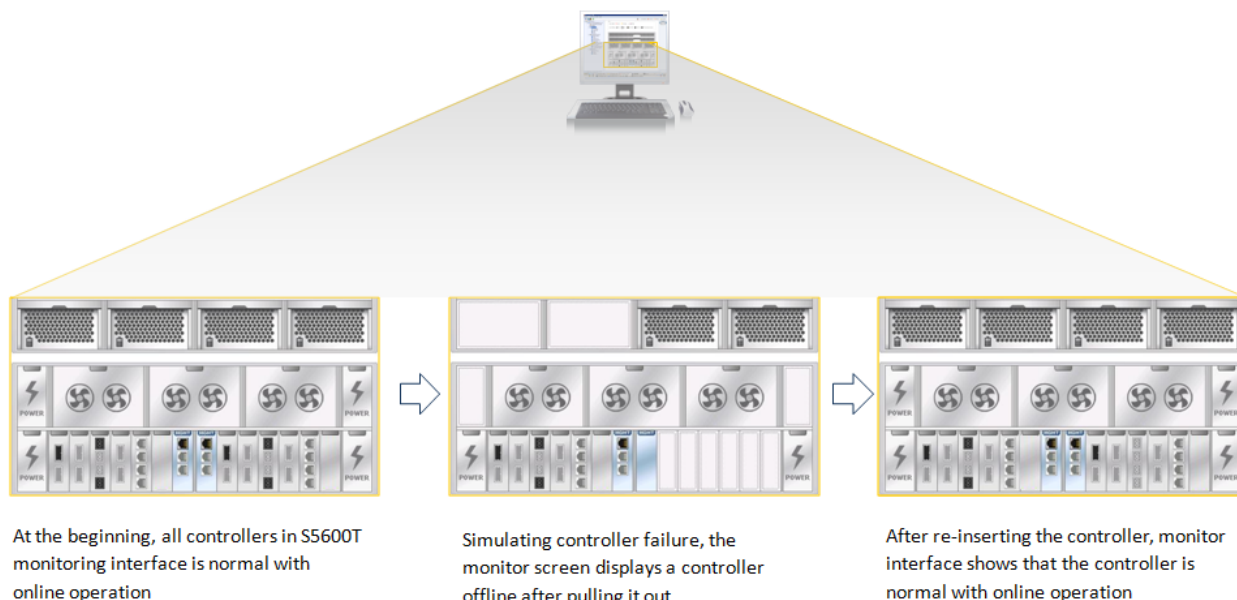- Restore the equipment to normal operations before injecting the next fault

Controller HA

As shown in Figure , initially, all components of the S5600T are operating normally, as is the controller.

To inject a controller failure, SINO-BRIDGES Lab pulled an active controller from an active system. From the System Information console, the pulled controller view on management interface turned grey, as did the port at left side, indicating they are offline and can't be used. Meanwhile, the system monitoring window showed a hardware operation status of "Warning" on the component associated with the pulled controller.

SINO-BRIDGES Lab them reinserted the controller; the Management Console "Warning" disappeared, and the system went back to normal. The reinserted controller, as well as the associated port, also exhibited normal operation.

Figure 18. Controller High Availability Test Process

At the beginning, all controllers in S5600T monitoring interface is normal with online operation

Simulating controller failure, the monitor screen displays a controller offline after pulling it out

After re-inserting the controller, monitor interface shows that the controller is normal with online operation

During the controller failure simulation process, IOmeter remained without any problems. As shown in Figure , when the live controller was pulled out of the system, IOmeter keep running without error during failover.

Figure 19. IOmeter Test Results
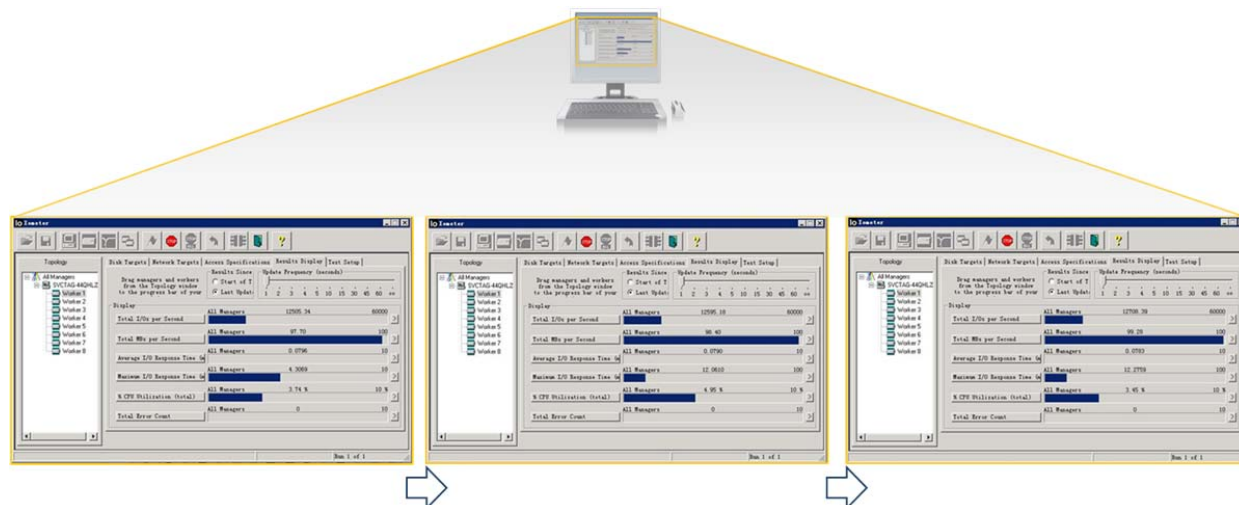
Disk HA

SINO-BRIDGES Lab tested the S6500T's HA capabilities with a simulated disk failure; an active SAS disk drive was pulled from a live system

After the SAS disk was pulled, the System Information console was refreshed. The SAS disk cage position was highlighted in yellow, indicating that the disk was offline and couldn't be used.

Figure 20. Disk High Availability Test Process
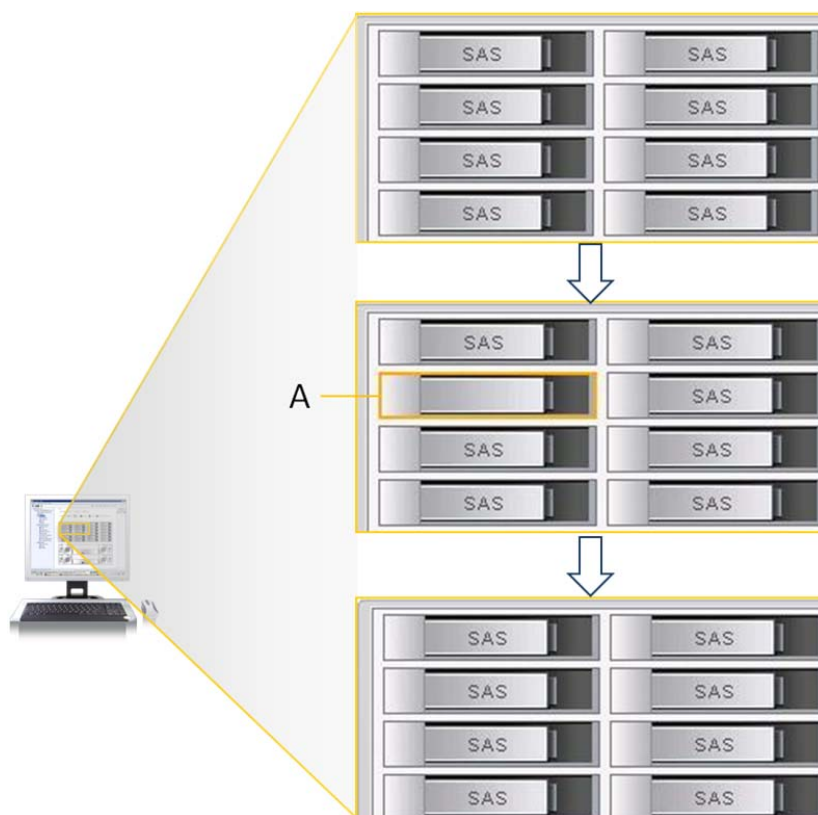
After the disk was pulled, IO operation is continued without disruption. The disk monitoring console showed that the "HotSpare Disk" was being used. The SAS disk was then reinserted into the system. The Management Console was refreshed with all components showing normal operational statuses. SINO-BRIDGES Lab validated that the S5600T's HA function works as advertised: when a disk was pulled from the system, operations continues without disruption.

IO Module HA

Based on its TurboModule, the S5600T has a hot swappable IO module to provide IO HA. For consolidated data centers and virtualization environment, IO HA is critical for whole system availability, virtualization, and steady application performance.

Why This Matters

High availability is critical to business continuity. Disk drives are the components with the highest failure rates: hot swappable disks with automatic RAID rebuilds will enable users to replace a failed disk without disrupting operations and prevent system or application downtime. Online hot pluggable drives also enable IT administrators to add disk resources online to address data growth.

 SINO-BRIDGES Lab has confirmed that the Huawei Symantec S5600T has excellent high availability functionality for controllers, IO modules, disk drives, power cables, and fans. SINO-BRIDGES Lab also tested HA of S5600T controllers, IO modules, and disks, which can be swapped or added while the system remains online and available.

Unified I/O Module

Huawei Symantec uses TurboModule, a high density, hot swappable IO module for the T-series. The S5600T's IO Modules are hot-swappable and customer installable, supporting mixed FC and iSCSI connectivity. Each module has a base configuration that includes Fibre Channel and iSCSI in the same system with additional IO ports for new connectivity technology or more ports. The S5600T's flexible architecture supports a mix of Fibre channel and iSCSI modules in the same system.

Figure is a rear view of the S5600T controller with 8 Gb Fibre Channel and 10 Gb Ethernet iSCSI modules installed. Spare IO slots can be used to support connectivity upgrades or emerging technology to maximize flexibility and investment protection.
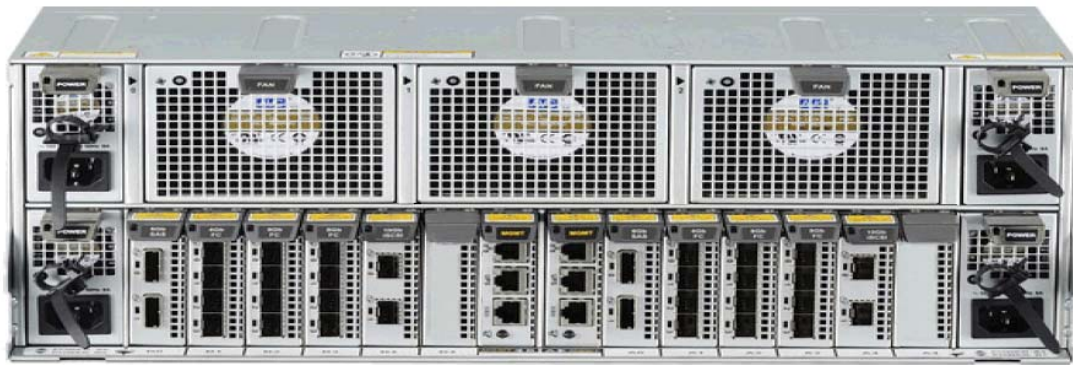
Figure 21. S5600T Rear View

Figure shows the mixed network test bed: four hosts connected to the S5600T through two of QLogic FC switches and a Huawei Ethernet switch. SINO-BRIDGES Lab then added an iSCSI module to the system and tested the mixed network. In addition, SINO-BRIDGES Lab replaced an FC module with an iSCSI module, online, to test its hot swap functionality as well as flexible configuration.

Figure 22. Test Bed of Mixed Network Testing
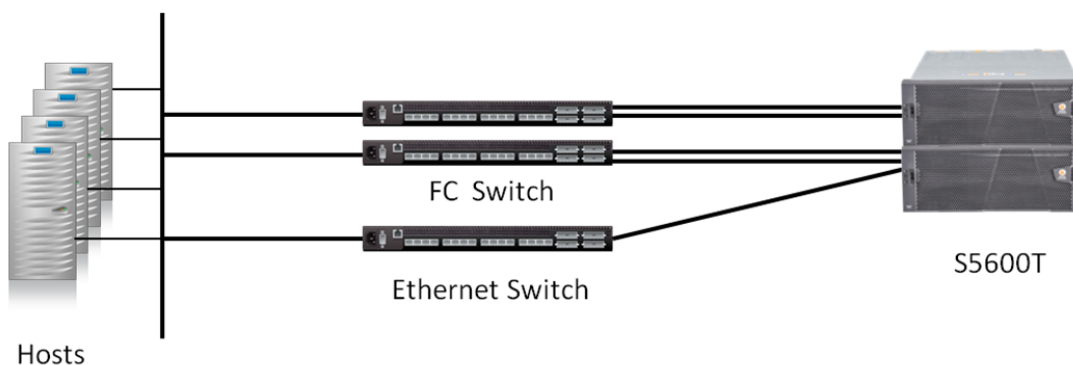
Adding on iSCSI Module in FC Environment Online

As shown in Figure , SINO-BRIDGES Lab used IOmeter to simulate business operations. Hot swappable capabilities of the S5600T, first connected with FC, were tested by pulling one FC module and adding iSCSI module into the system while remaining online and available. SINO-BRIDGES Lab then tested the IO module's flexible configuration by switching from the FC IO module to iSCSI IO modular, also while online. The System Management interface confirmed that business operations remained online during network module switching.

Figure 23. Add iSCSI Module Online

A: FC I/O module   B: iSCSI I/O module
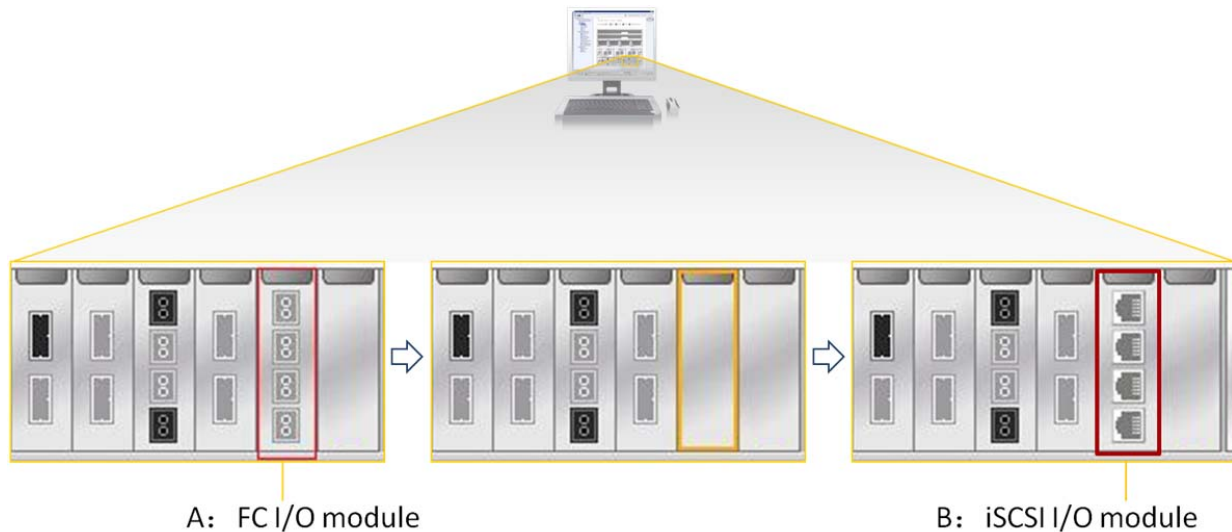
SINO-BRIDGES Lab confirmed that the S5600T supports hot swapping, keeping the system online and available without interrupting business operations.

Convergent Network Test

SINO-BRIDGES Lab tested the S5600T with both FC and iSCSI connections to confirm convergent network functionality. SINO-BRIDGES Lab created 2 RAID groups, and created one LUN from each RAID group. Then assign one LUN to FC and another to iSCSI. .
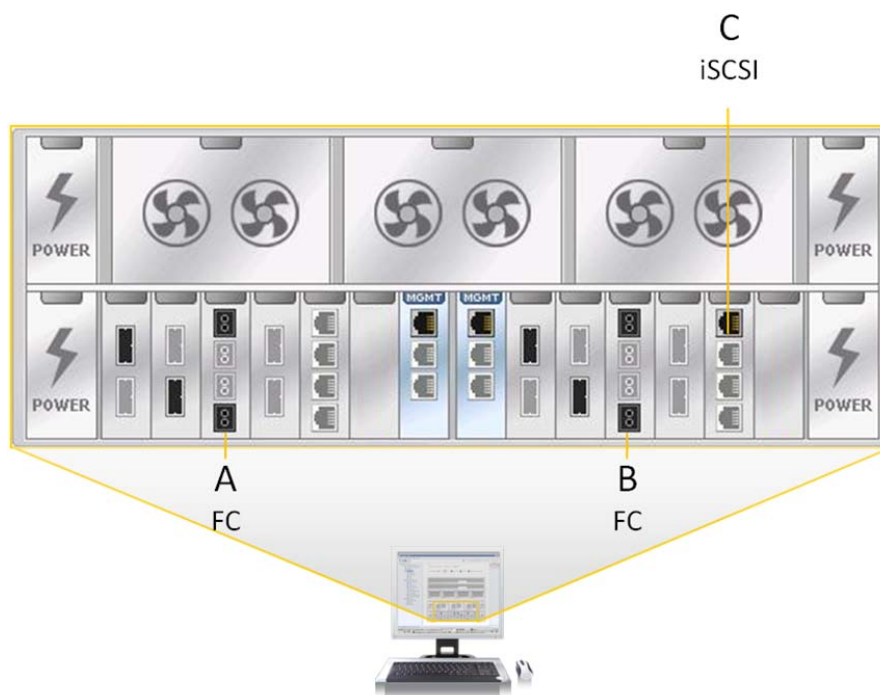
Figure 24. FC/iSCSI Mix

Figure25. Two Types of Connectivity in a RAID Group

Name	ID	RAID Level	Type	Health Status	Running Status	Free Capacity (...	Disk Type
RAID001	0	RAID 5	RAID	Normal	Online	829.8750	SAS
RAID002	1	RAID 5	RAID	Normal	Online	1,673.2500	SAS

Two LUNs were assigned to two Window machines and IOmeter was run on two hosts. Both hosts remained healthy.

Figure 26. IOmeter Monitoring for Convergent Network Test

iSCSI network
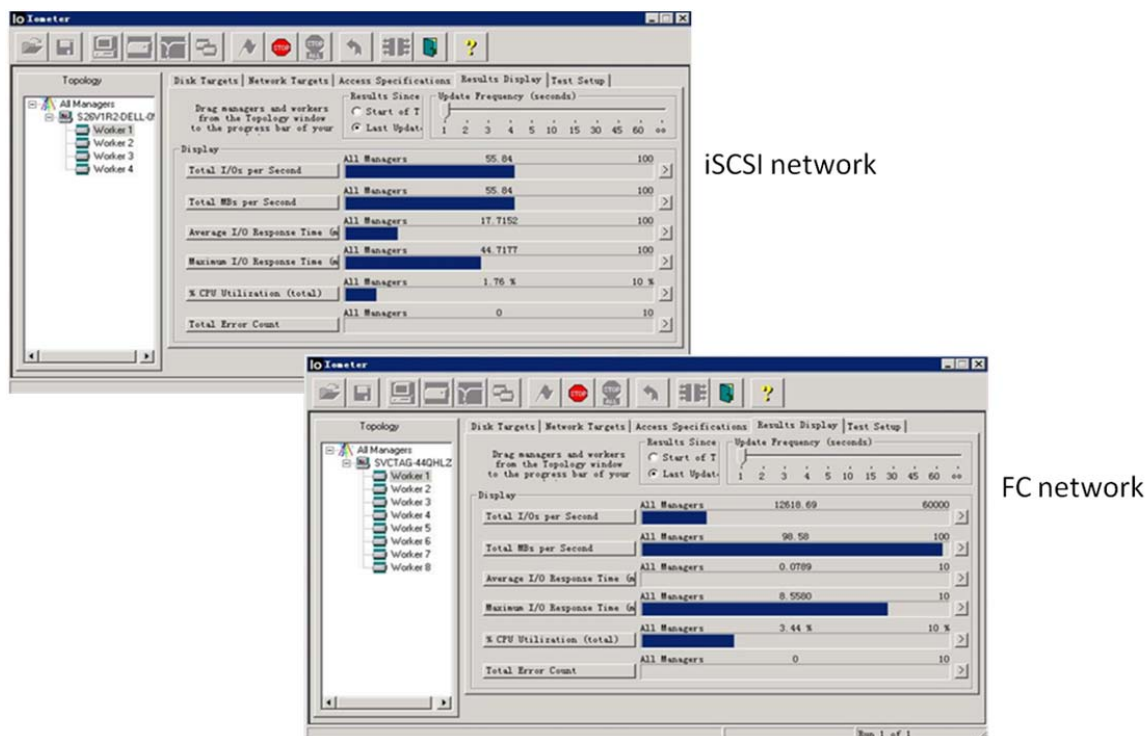
FC network

SINO-BRIDGES Lab testing confirms that the S5600T offers good storage network flexibility. More and more data centers are using mixed networks; the S5600T will enable customers to protect their storage investments.

Why This Matters

Data center related technologies are very dynamic. Customers are looking for a flexible modular architecture which will support emerging technologies to maximize storage investment protection. Meanwhile, customers are looking for the flexibility to tailor their solutions to best fit their budgets and application and business requirements. More and more data centers are using converged networks to reduce TCO and improve resource utilization.

SINO-BRIDGES Lab has confirmed that the S5600T's hot swappable, high-density TurboModule supports FC and iSCSI with good IO scalability and configuration flexibility. During the hot swap process, the system remained online and data remained available to applications. With the S5600T, organizations can leverage converged networks for maximum storage investment protection.

SmartCache

The ability to meet the performance requirement of business critical applications and improve hot data processing whenever needed has a direct impact on the business and on customer satisfaction. In addition, as virtualization becomes mainstream data center technology, virtual machines increase the need for better storage performance to assure applications availability. Dynamically, intelligently improving storage performance is critical.

HS SmartCache includes intelligent hot data monitoring technology and high performance SSD cache. It can intelligently monitor and identify hot data based on access frequency and move that data to SSD (in the form of high performance cache) in front of SAS or SATA volumes to immediately improve application performance on the fly.
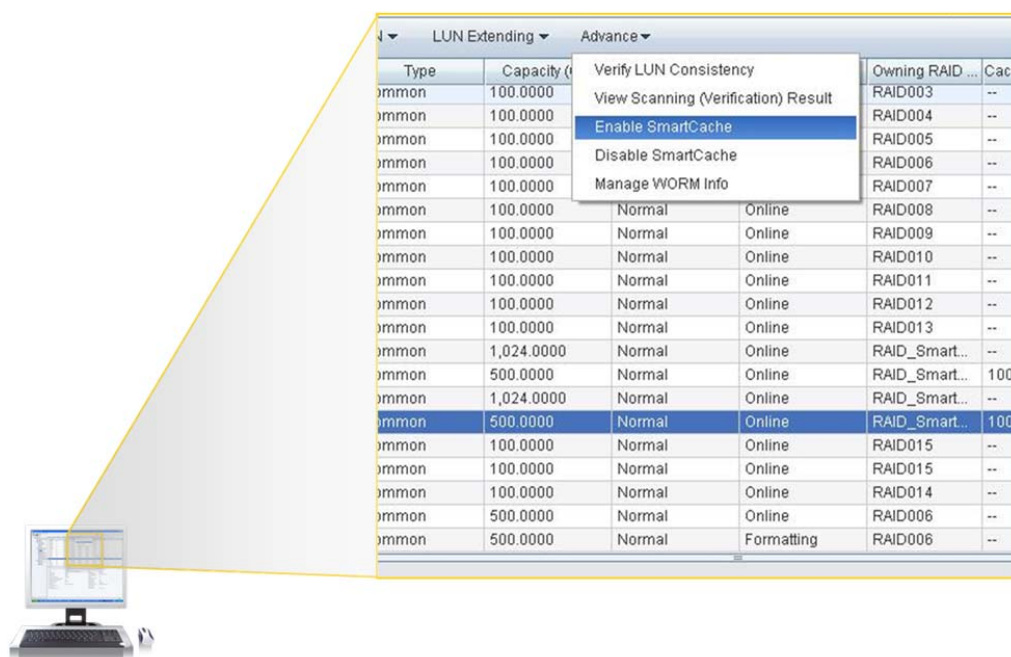
Figure 27. SmartCache
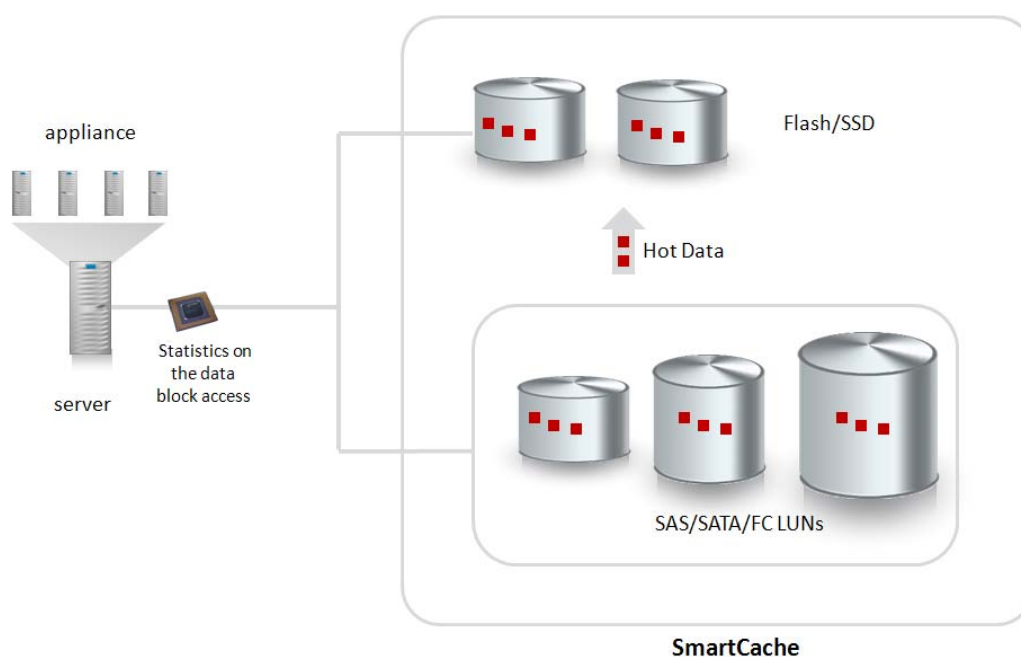
SINO-BRIDGES selected LUN001 for the SmartCache test, clicking "Enable SmartCache" to activate the functionality.

Figure 28. Enable SmartCache

Next, SINO-BRIDGES Lab selected SmartCache on the left side of the management window to enter the management interface. As shown in Figure , the management interface displayed current controller quantity as well as disk information under each controller. The management view provided more detailed information.

Figure 29. SmartCache in Detail
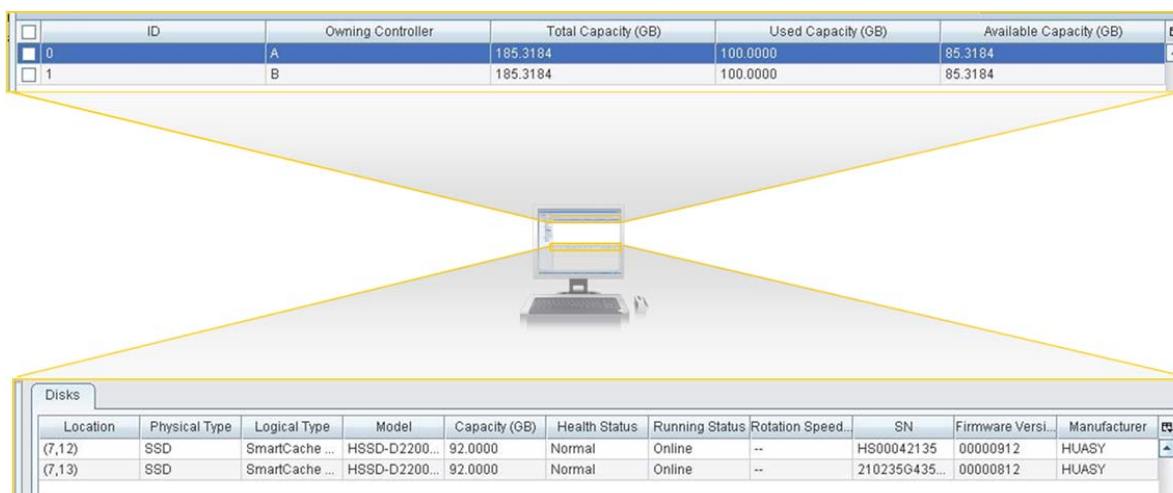
Click "Disk Management" on the main window, disk management dialogue window will be prompted. To select the drives which will be applied SmartCache, and add those disks to "Available Disks" to complete SmartCache configuration.

*Figure 30. SmartCache Disk Management*
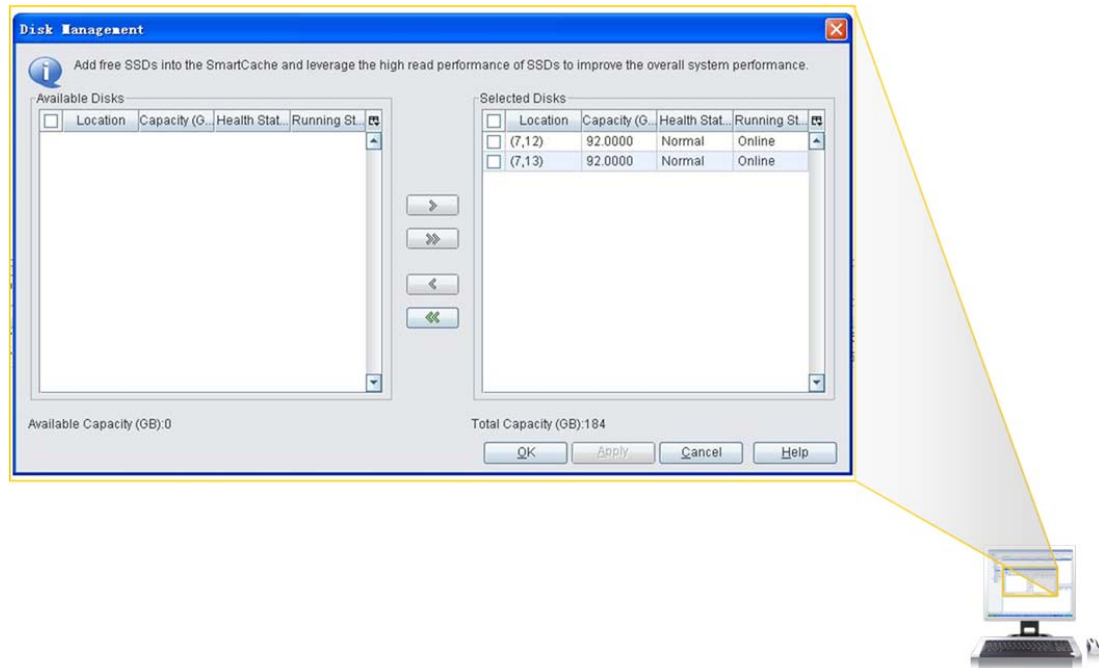
SINO-BRIDGES Lab set up the SmartCache test bed (Simulating Website operations). For the purposes of this test, SmartCache SSD capacity was 100 GB. Before SmartCache was applied, SATA IOPS were 894 and SAS IOPS were 4194. After SmartCache was applied, performance increased dramatically, with both SATA and SAS capable of achieving performance of 25572 IOPS.

Figure 31. SmartCache IOPS Performance Comparison
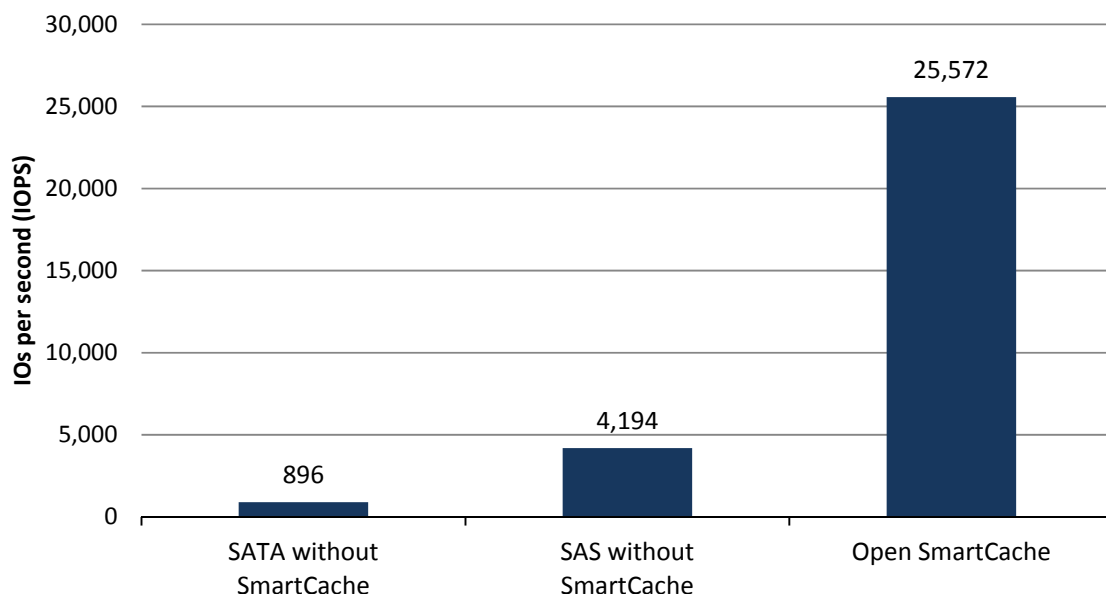
SINO-BRIDGES Lab's test results show that SmartCache can dramatically increase system performance whenever it is applied.

Why This Matters

Disk drives are the slowest components in the compute chain. In the past, IT managers used expensive high performance drives to solve the problem, but the costs (capital and operation cost) of deploying high performance drives can be very high. SSD cache can be used as a dynamic resource to improve overall system performance based on business need, dynamically and economically.

SINO-BRIDGES Lab has confirmed that SmartCache can provide immediate performance improvement. Often, OLTP database applications tend to be mission-critical with stringent IO needs. With SmartCache, users can allocate resources to increase IO performance by 5 to 30 times, in seconds, to support mission critical applications—it's an "always-on" performance booster. SmartCache dynamically adjusts performance for maximum business agility and cost-effective efficiency. It also optimizes overall system performance and resource utilization.

High Performance

Storage performance has a direct impact on the efficiency of business processes. SINO-BRIDGES Lab tested the S5600T's performance and linear scalability in a physical environment as well as mixed workload performance and load balancing in a virtual environment.

Performance Testing in a Physical Environment

SINO-BRIDGES Lab's physical performance test bed for the S5600T is shown in Figure . An S5600T was connected to three Dell 2950 servers (Intel Xeon process with 4 GB memory and Windows 2003 Enterprises Server installed) through a single QLogic 8Gb FC switch. SINO-BRIDGES Lab tested performance scalability by simply adding more disks.

Figure 32. S5600T Performance Test of Physical Environment
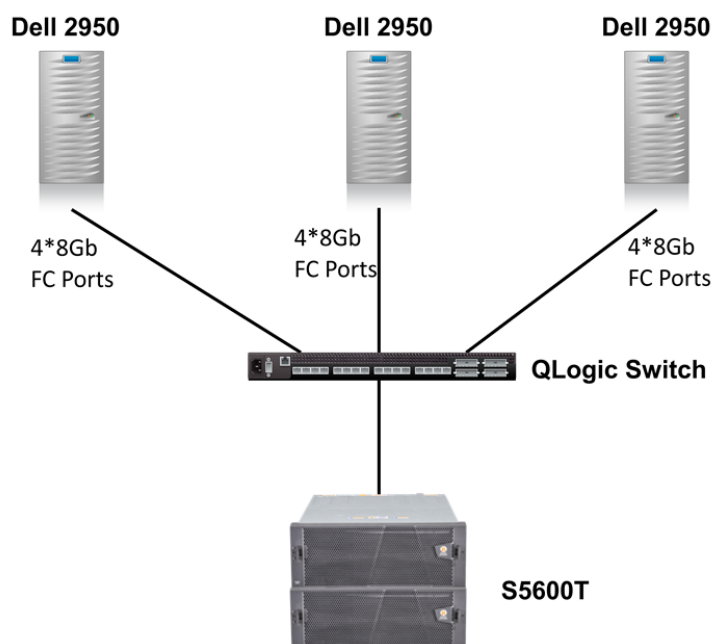
IOmeter and Oracle Orion were used to simulate production applications and SINO-BRIDGES Lab recorded the IOPS and MBPS for different workloads. IOPS is used to evaluate how many applications and end-users that a storage system can support. MBPS is used to evaluate storage throughput. Large throughput indicates better performance to handle large files such as Video On Demand. The purpose of SINO-BRIDGES Lab testing, however, was not to measure maximum IOPS and MBPS, but to evaluate linear scalability.

As shown in the test results in 错误!未找到引用源。 and Figure , as more disks were added into S5600T, performance increased in a linear fashion. In a RAID 10 simulation of 8KB of random data (80% of read and 20% of write), as more disks were added—going from 16 disks to 96—IOPS increased from 3383 to 18726 and MBPS increased from 845 to 4681, which, when plotted, displayed linear growth.

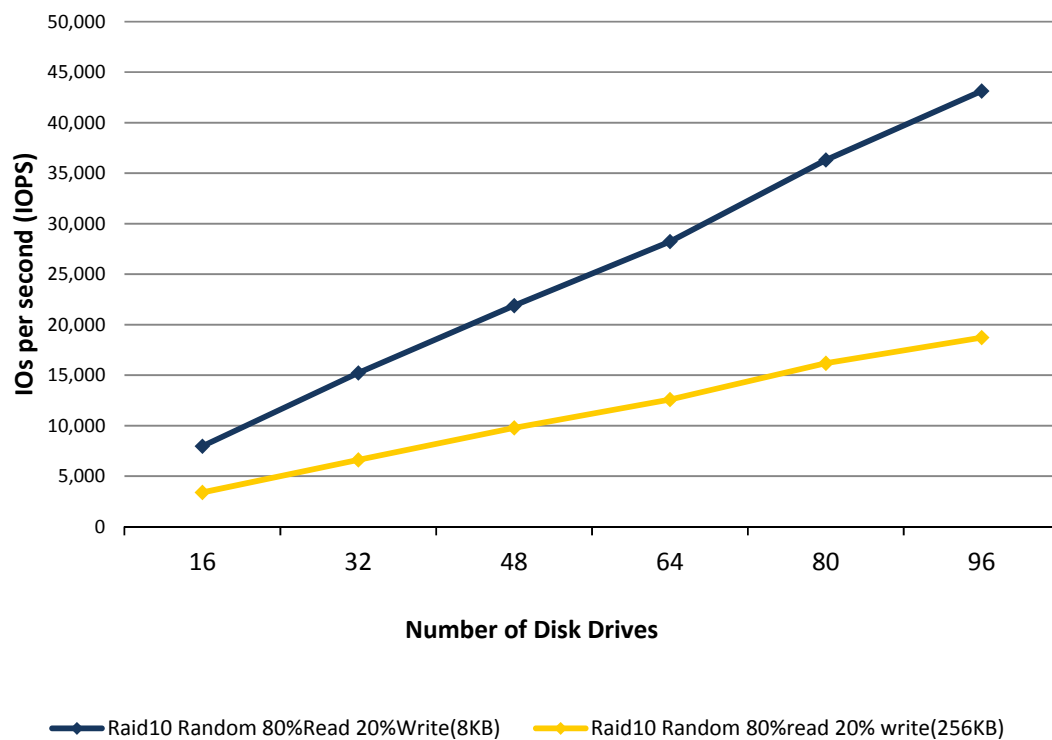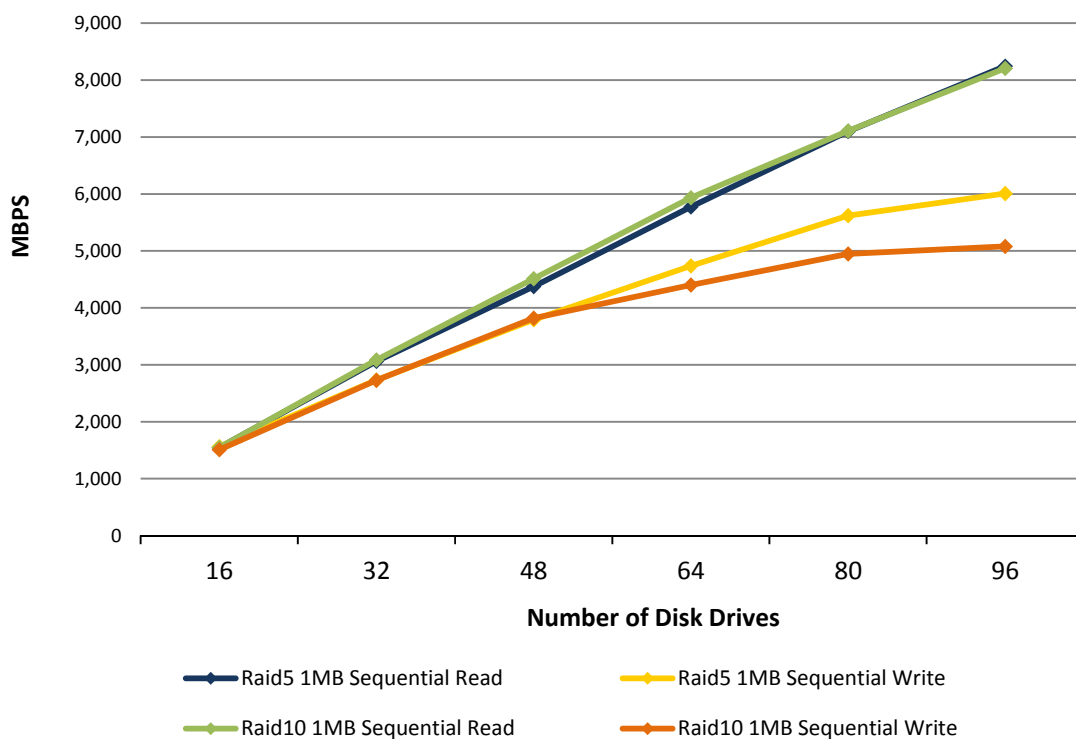*Figure 33. IOPS Linear Scalability Test Results*

Figure 34. MBPS Linear Scalability

Based on these test results, SINO-BRIDGES Lab confirmed that as more disks were added on to the system, the S5600T scaled performance linearly.

Oracle Orion

Oracle Orion is used to test the IOPS and response times of small transfers (8KB) and the throughput of large (1MB) transfers. Small transfers are used to measure OLTP performance and scalability for relational databases which are sensitive to response times. Large transfers are used to test OLAP performance. SINO-BRIDGES Lab tested not to measure maximum performance, but rather to test OLTP and OLAP linear scalability with FC increasing. As shown in 错误!未找到引用源。 and Figure , as more FC switches were added to the S5600T, OLTP and OLAP scalability remained linear or close to linear.

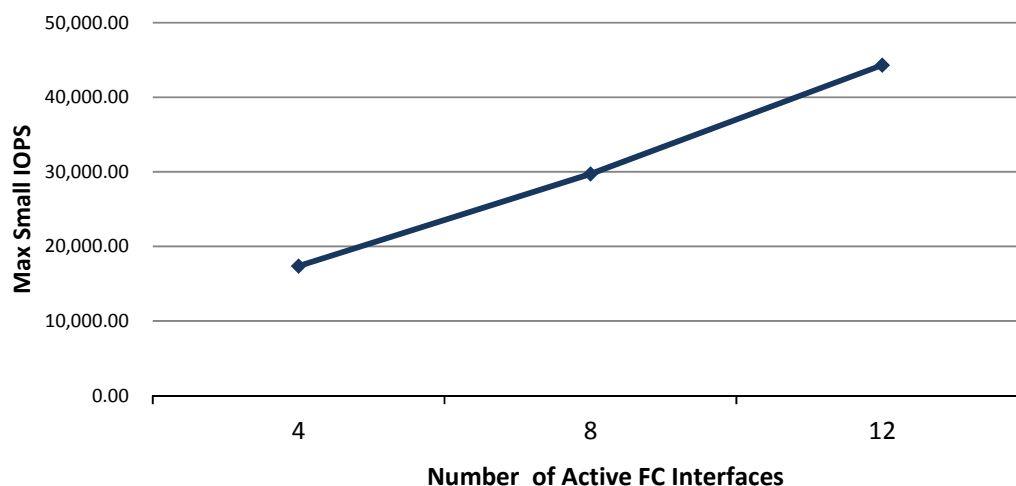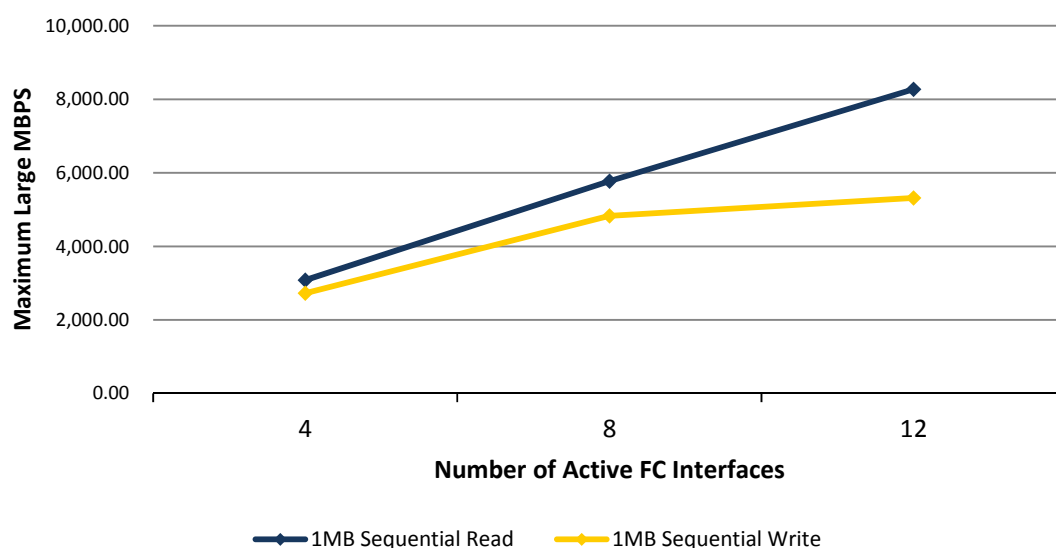*Figure 35. Orion Test Results: OLTP Linear Performance Scalability*

Figure 36. Orion Test Result: OLAP Linear Scalability

Performance Testing in a Virtual Environment

The quantitative economic benefits of server virtualization have accelerated its market adoption. According to SINO-BRIDGES research, more than 76% of enterprise respondents have deployed server virtualization in production and test environments.

SINO-BRIDGES Lab tested the S5600T's mixed workload performance and load balancing capabilities. As shown in Figure , the S5600T was connected to three of IBM X3850 X5 servers (Intel Xeon CPU x 7542@2.67GHz with 32 GB of memory), each with VMware ESX 4.0 installed, through a single QLogic 8Gb FC switch. Each server was

configured to support four virtual machines running Video On Demand (1 MB sequential read), Video Monitoring (1MB sequential write), Web server (256KB random, 80% read, 20% write), and an Oracle OLTP (Oracle Orion) workload. The test was conducted while the mixed workload ran on all 12 virtual machines residing on three physical servers.

Figure 37. Virtual Performance Test Bed
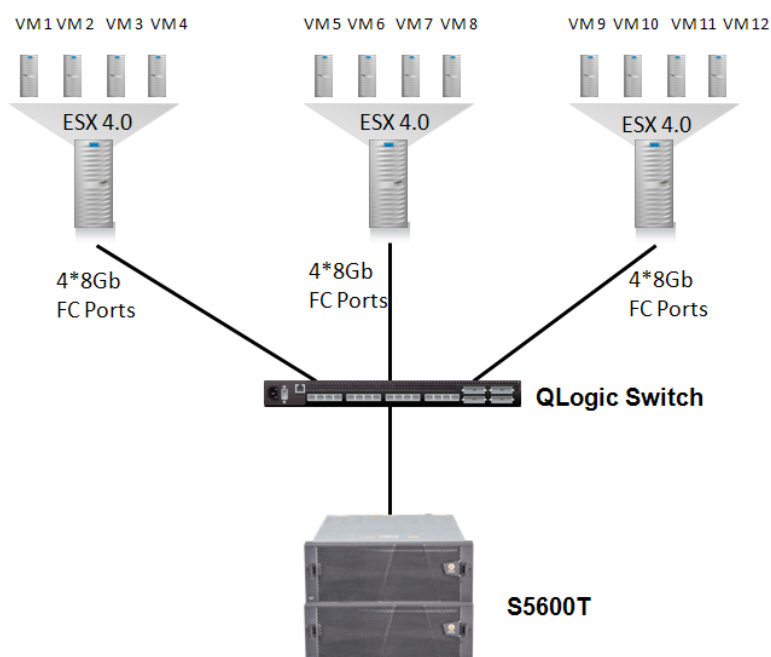
This test measured performance in a virtual server environment. SINO-BRIDGES Lab put 12 virtual machines into four groups of three virtual machines running a mixed workload of 1 MB sequential read on three VMs; 1 MB sequential write on three VMs, 256 KB random read and write on three VMs, and Oracle OLTP (Oracle Orion workload) on final three VMs. Based on the test result shown in Figure 38, SINO-BRIDGES Lab confirmed that S5600T can meet customers' requirement of mixed workloads in virtual environment. As virtual machine added on, performance remains linear growth.

Figure 38. Virtual Environment Performance Linear Scalability
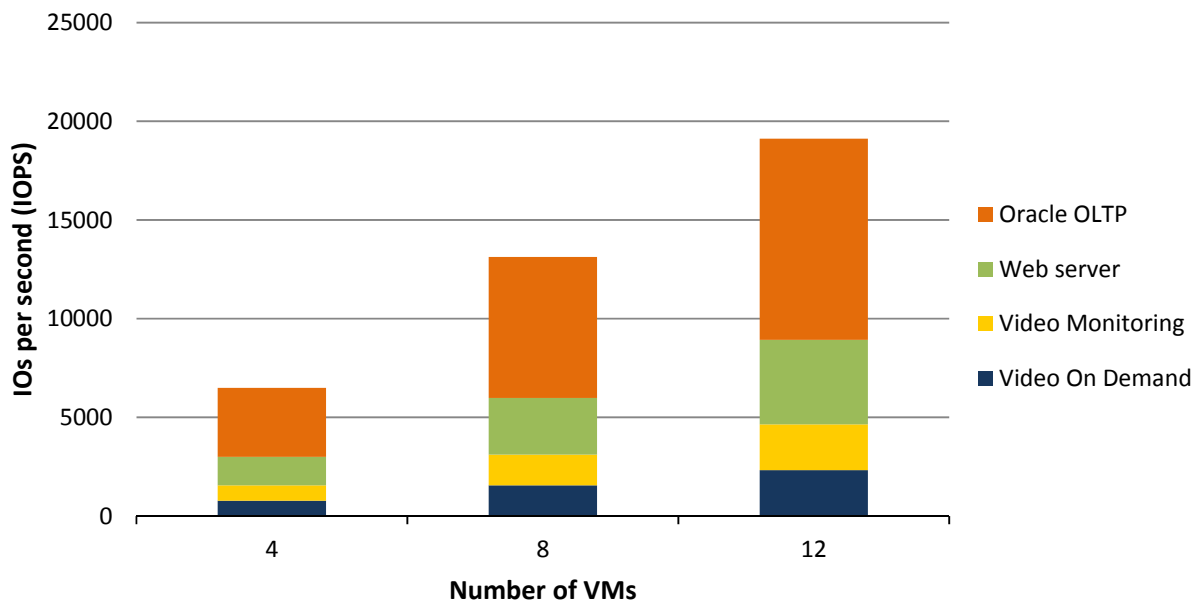
The management interface of all 12 virtual machines in test operation are shown in Figure 39, there three physical servers and each run four virtual machines to simulating 12 of business workloads.

Figure 39. Virtual Environment Testing
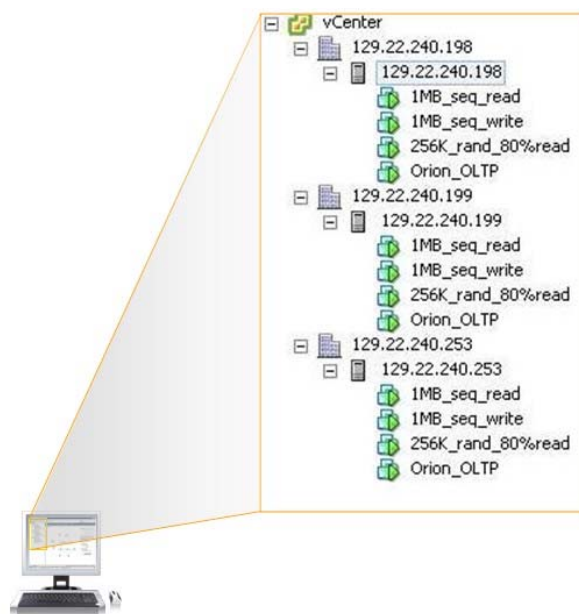
After all 12 simulating workloads in operation, SINO-BRIDGES Lab tested high performance and load balance. Table 1 listed all test results of all 12 workloads in parallel operation, for example, Video On Demand bandwidth is higher than 750MB/S. And for all three virtual machines which running simulating of Oracle OLTP have over 3000 of IOPS.

Table 1. Mixed Workload Test in a Virtual Environment

Virtual Machine	Workload Description	Workload Characteristics	Results (IOPS)
1	Video On Demand	1 MB sequential read	775
2	Video Monitoring	1 MB sequential write	781
3	Web server	256 KB random, 80% read	1,437
4	Oracle OLTP	Oracle Orion small IOPS	3,498
5	Video On Demand	1 MB sequential read	776
6	Video Monitoring	1 MB sequential write	783
7	Web server	256 KB random, 80% read	1,434
8	Oracle OLTP	Oracle Orion small IOPS	3,643
9	Video On Demand	1 MB sequential read	775
10	Video Monitoring	1 MB sequential write	759
11	Web server	256 KB random, 80% read	1,409
12	Oracle OLTP	Oracle Orion small IOPS	3,047

The test results indicated that S5600T provides high performance to mixed workloads in virtual environment. It also provides linear performance to virtual machines scalability. In addition to make each of workload have needed performance, it has good load balance to meet customers' requirements.

Why This Matters

Companies continuously face challenges in cost effectively meeting the storage performance requirements of applications—especially applications with strict performance requirements. Failure to meet these requirements can result in poor response times, lost productivity, and in the worst case, lost revenue. Adding more resources to fix a performance problem can be a waste of time and money.

SINO-BRIDGES Lab has confirmed that the S5600T has excellent performance and scalability which can be used to cost effective meet the performance requirements of transactional and throughput intensive applications including OLTP and OLAP database and mixed virtual server workloads.

Green Storage

The S5600T has multiple intelligent features to optimize power efficiency for CPU, fans, and disk to position it to meet large data center requirements. SINO-BRIDGES Lab use following methodology to test S5600 green features:

Disk Energy Efficient Technology: The S5600T's disk spin-down technology allows disks that are not in active use to be put into a spin-down or sleep mode, which can save energy and extend a disk's overall life.

- Record energy consumption before disk spin-down activation
- Configure energy efficient feature
- Simulate operations by activating IOmeter to keep all related disks active
- Monitor disk energy consumption through the S5600T management interface
- Stop business operations (stop IOmeter)
- Monitoring power consumption changes

Disk spin-down in the S5600T is enabled via one simple setup window. SINO-BRIDGES Lab selected RAID001 and set disk spin-down to ten minutes, which means all disks in the RAID Group will spin down ten minutes after business operations cease.

Figure 40. Set Spin-Down
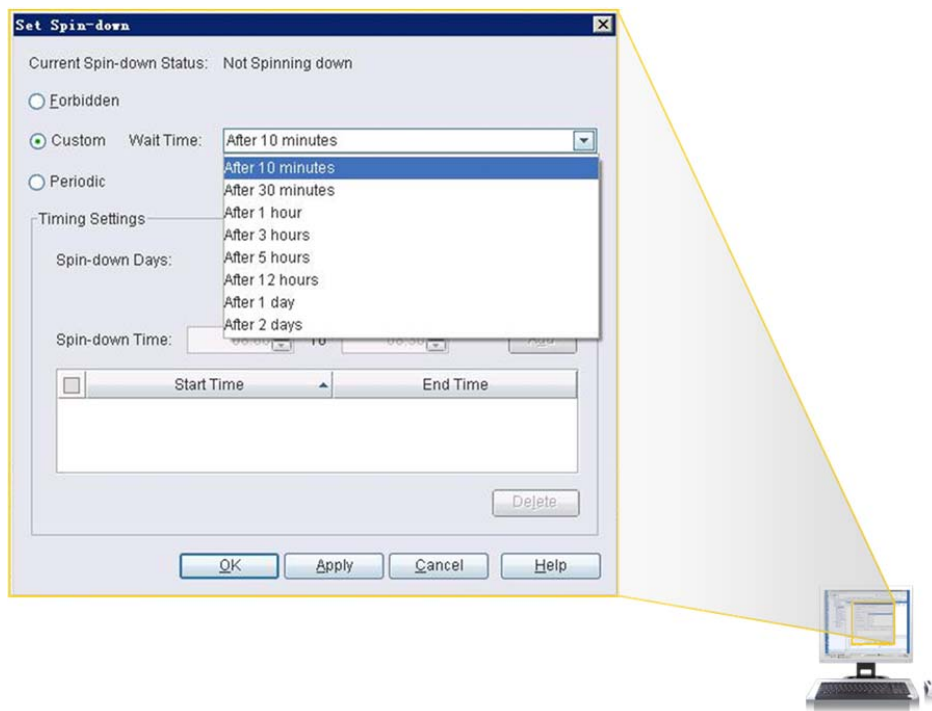
SINO-BRIDGES Lab next tested spin-down results during operations, when operations cease, and after operation ceased before reactivating the disk at full capacity. The management interface displayed CPU, disk, and fan power consumption visually: assuming that power consumption is at 100% without spin-down, the orange bar displayed actual power consumption while the blue bar represented power savings.

Figure 41. Initial Operating Status Monitoring View
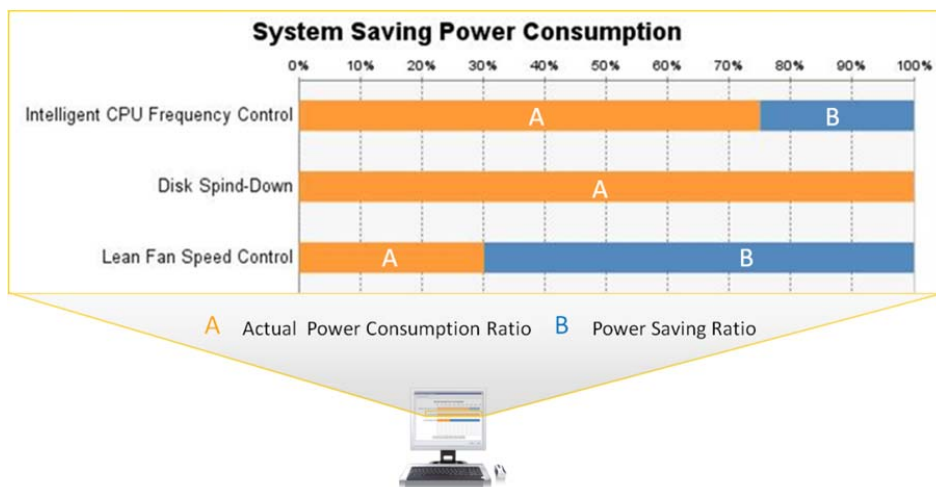
Ten minutes after operations ceased, energy efficient features kicked in. RAID001 ran at normal speed and RAID002 and RAID003 went to spin-down status. As shown in Figure , spin-down can reduce disk power consumption by up to 40%, fan power savings by up to 70%, and CPU power savings by up to 25%. When all disks were spun down, power savings increased to 50%.

Figure 42. Disk Spin-down Monitoring
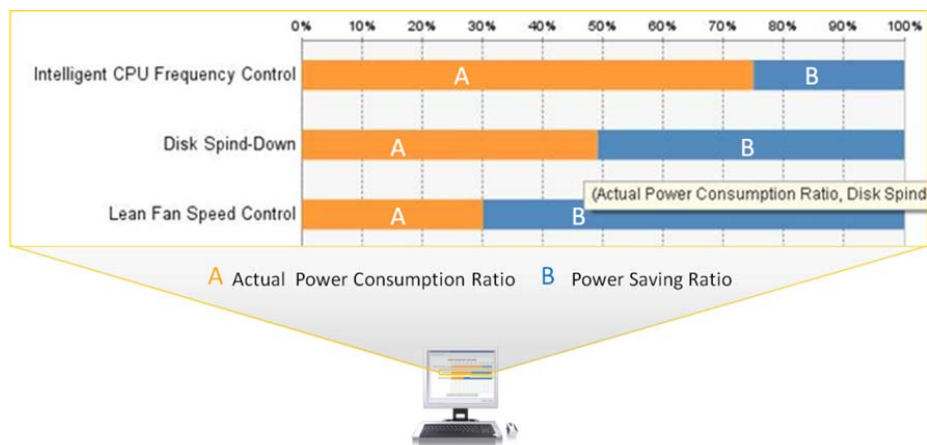
> ## *Why This Matters*
>
> Data center power consumption has become a major concern for enterprises and is becoming a significant storage purchase decision factor. Nearly one in five IT professionals surveyed by SINO-BRIDGES indicated that they expected more investment in power efficient storage hardware.
>
> SINO-BRIDGES Lab has confirmed that the S5600T offers great value in terms of power savings. Disk spin-down, CPU speed adjustment, and fan speed adjustment work together to reduce the power and cooling required by storage. And it is designed to give users the flexibility to design their own storage power saving strategy without impacting operations or performance. SINO-BRIDGES Lab validated that disk spin-down alone can reduce power consumption by up to 50%.

Overview of the S5600T's Key Capabilities

☑ High performance and scalability

- High performance components and high-speed bus: 64 bit multi core processors with large capacity cache. Maximum of 36 GB/s in-band bandwidth with support for a SAS2.0 back-end port channel.
- Support for multiple disk technologies: FC/SAS/SATA/SSD
- Advanced IO scalability and flexibility with up to 10 IO modules and 40 IO ports. Support for 4 and 8 Gb FC, 1/10 Gb Ethernet, and 6 Gb SAS 2.0 connectivity. TurboModule technology dramatically increases modular density. Ports in the front and back of the device offer flexibility to dramatically reduce maintenance costs.
- TurboBoost technology enables on-demand system performance increases thanks to robust hardware and embedded functionality. SmartCache can monitor and migrate hot data to SSD. The system can also use SSD-only RAID to further increase performance. All told, the S5600T can boost performance in three ways leveraging highly scalable hardware to reduce data management TCO.

☑ High flexibility

- High density, 24-disk enclosure design supporting FC/SAS/SATA/SSD drives. Available in 2U and 4U high density disk cages with 24 disks per cage or a 1U enclosure with up to 12 2.5 inch drives. Comparing to traditional enclosure design, it can save capacity scalability cost by 60%.
- Unified IO module: HS T-series products support unified IO modules to minimize capital expenses.

☑ High availability functions

- Hot swappable IO modular design: TurboModule technology enables the controller, fan, power cord, IO module, battery, or disk module to be swapped out without downtime.
- Power outage protection: During power outage, an embedded battery module will automatically write data from cache into a buffer to guarantee that no data is lost due to power failure.
- Disk pre-copy technology: When a potential disk failure is identified, data resided on that disk will be automatically migrated to a hot spare disk to avoid performance degradation or data loss.
- Failed sector repair technology: Failed disk sectors can be repaired, which will reduce failure rates by more than 50% and extend disk lifetimes.
- High catch mirroring bandwidth for dual controllers: A dedicated 8 Gb/s bus for dual controllers to increase controller availability.
- Advanced data protection technology: HyperImage and Host Agent allow the system to take consistency snapshot of application system data, which can be restored at any point in time. HyperCopy technology provides heterogeneous data protection and remote replication enables remote backup and recovery.

☑ Easy to Use and Manage

- Easy to manage and maintain: Initial setup can be completed easily thanks to a unified, five-step process. S5600T supports audio, light, mobile, SMS, and email alert methods. Firmware upgrades are easy and online, reducing time spent on management.

☑ Green Storage

- Smart disk spin-down technology: The S5600T can intelligently spin down drives to reduce energy consumption by up to 40%.
- Smart fan speed tuning technology: The system can intelligently monitor temperature and automatically adjust fan speed accordingly to reduce fan power consumption and noise (fan energy consumption represents about 15% of that of the overall system).
- Smart CPU speed adjustment: based on workload, system can adjust CPU speed intelligently to ad best fit to workload. It can dramatically reduce system power waste and improve power utilization.

SINO-BRIDGES Lab Testing Focus

☑ SINO-BRIDGES Lab found the S5600T to be extremely easy to configure and manage. Through seven simple steps, an IT administrator with little experience should be able to complete the configuration. In addition, its advanced system management interface, diverse alerting methods, easy firmware upgrade, and multi-language support will help customers manage more data with fewer resources.

☑ The S5600T's IO and disk HA features enable users to swap IO modular or disk without downtime, reducing risk of data loss and consequently improving system reliability. In addition, the S5600T offers advanced data protection features such as disk pre-copy, failed disk sector repair, HyperImage, and HostAgent.

☑ The S5600T supports unified FC and iSCSI network connectivity. SINO-BRIDGES Lab confirmed that the S5600T can support mixed FC and iSCSI in the same system. Via flexible IO and disk modules, users can switch out IO and drive technology without disrupting operations.

☑ The S5600T's triple performance boost greatly enhances performance. SINO-BRIDGES Lab testing using simulated workloads confirmed that the S5600T can scale performance linearly. The S5600T's performance was equally impressive in a mixed workload virtual server environment. In addition, SmartCache enables users to immediately eliminate performance bottlenecks to improve IOPS and data transfer rates in support of mission critical applications.

The Bigger Truth

IT administrators are more frequently being asked to justify storage their storage management strategies as organizations struggle with shrinking or stagnant budgets. These administrators are being challenged to keep pace with annual capacity growth of 50% or more while staying within budget, protecting storage investments, and managing more capacity with improved performance and service levels using existing staff. In short, IT needs a winning strategy that works for both the IT team *and* the business.

Based on SINO-BRIDGES survey data, to avoid "storage sprawl," customers tend to purchase frequently in order to accommodate ongoing data growth. Indeed, while 38% of the organizations surveyed by SINO-BRIDGES report purchasing net-new systems annually, almost half (45%) do so at least twice per year. How to use existing IT resources to quickly deploy and effectively manage increasing storage requirements has become a growing challenge. Flexibility and energy efficiency are key product selection factors IT managers look for as these will enable them to do more with less.

What's more, 45% of midmarket respondents to another SINO-BRIDGES survey indicated that "improving business processes" is their number two priority; a storage solution which can increase performance dynamically to support mission critical application is important.

SINO-BRIDGES Lab has verified that the S5600T addresses these requirements. Deployment is quick and easy—the configuration assistant enables any IT professional to deploy and configure a S5600T. Its intuitive management interface facilitates effective management of storage assets and a variety of alert methods give IT administrators peace of mind. The S5600T's modular architecture, unified storage functions, and mixed network support, together with multiple drive technologies, enables users to select the best combination of network (FC or iSCSI) and disk hardware (FC, SAS, SATA, SSD) for their unique storage needs. Also, the S5600T supports most mainstream operating systems such as Linux, Unix, Windows, and AIX.

The Huawei Symantec S5600T is the product of a number of innovative technologies which together can lower TCO while improving service levels. SINO-BRIDGES Lab used SmartCache to leverage flash drives to avoid wasteful over-provisioning of disk capacity for applications with extreme performance requirements and confirmed that the S5600T's TurboCooling energy efficient features can enable customers to optimize resource utilization of CPU, disks, and fans to reduce power consumption dramatically.

With the S5600T, Huawei Symantec has dramatically enhanced simplicity, performance, and storage efficiency for consolidated, virtualized midrange storage environments. While the speeds and feeds are impressive, SINO-BRIDGES Lab is most impressed by its easy, comprehensive manageability and the long list of valuable capabilities that have been built into the offering. The breadth and depth of the features offered by Huawei Symantec storage can be used to meet the precise needs of almost any business. In addition, its linear performance/capacity scalability and mixed workload performance in virtual environments offer an optimal long term performance/cost ratio. SINO-BRIDGES Lab recommends that customers consider Huawei Symantec storage when building a foundation for a storage strategy that will help keep up with data growth while providing ever higher levels of performance and availability for modest, midmarket storage budgets.

Appendix

Table 2. SmartCache Test Bed Platform

Server	
One Dell 2950	CPU Type: Intel Xeon 5410 Total RAM: 4GB
Operating System	
Windows Server 2003 sp2 (Enterprise Edition)	
Storage	
One S5600T	8 15Krpm 300GB SAS , 8 1TB SATA, 4 100 GB Huasai SSD
Multi-path Software	
Huasai Ultrapath for Windows	
HBA Bus Adapters	
One QLE 2562 8Gb FC HBA	
FC Switch	
One QLogic SANbox 9000 series	

Table 3. Physical Performance Test Bed Overview

Servers	
Three Dell 2950	CPU Type: Intel Xeon 5410 Total RAM: 4GB
Operating System	
Windows Server 2003 sp2 (Enterprise Edition)	
Storage	
One S5600T	96 15Krpm 300GB SAS
Multipath Software	
Huasai Ultrapath for Windows	
HBA Bus Adapters	
6 QLE 2562 8Gb FC HBA	
FC Switch	
One QLogic SANbox 9000 series	

Table 4. Virtual Test Bed Overview

Server	
Three IBM X3850	CPU Type: Intel Xeon CPU X7542 @ 2.67GHz Total RAM: 32 GB
Operating System	
Server Virtualization	ESX4.0
Guest OS	Windows Server 2003 sp2 (Enterprise Edition)
Storage	
One S5600T	96 15Krpm 300GB SAS
HBA Bus Adapters	
6 QLE 2562 8Gb FC	
FC Switch	
QLogic SANbox 9000 series	